

# Economics of Growth and Development

---

## DECO501

Edited by:  
Dr.Pavitar Parkash Singh



**L** OVELY  
**P** ROFESSIONAL  
**U** NIVERSITY

---



# **ECONOMICS OF GROWTH AND DEVELOPMENT**

Edited By  
**Dr. Pavitar Parkash Singh**

Printed by  
**USI PUBLICATIONS**  
2/31, Nehru Enclave, Kalkaji Ext.,  
New Delhi-110019  
for  
Lovely Professional University  
Phagwara

## SYLLABUS

### Economics of Growth and Development

#### Objectives :

The purpose of this course is to introduce students to issues and problems related to economic development. Specifically, we will discuss the characteristics of developing nations as well as alternative theories of economic growth. Student will examine some of the dominant domestic problems faced by developing countries, such as, low levels of human capital, urbanization, rural transformation as well as different policies to resolve them.

Sr. No.	Description
1	Economics of Growth and Development: Meaning, Measurement, Difference and Comparisons. Sources of Economic Growth. Human Development Index and PQLI
2	Economic Growth Models-I: Harrod-Domar Growth Model, Neo-Classical Growth Models
3	Economic Growth Models-II: Growth and Distribution, Total Factor Productivity and Growth Accounting, Technological Change and Progress
4	Economic Growth Models – III : Model of Optimal Economic Growth, Multi-Sector Models of Growth,
5	Endogenous Growth Models, Stochastic Growth Models- Business Cycle Theory
6	Social and Institutional Aspects of Development: Difference between Development and Underdevelopment, Measurement and Indicators of Development, Population and Development, Economic Development and Institutions
7	Approaches to Development : Vicious Circle of Poverty and Unlimited Supply of Labor, Lewis Model, Ranis and Fei Model, Big Push Theory of Growth
8	Balanced Growth and Unbalanced Growth, Critical Minimum Efforts Thesis, Low - Level Equilibrium Trap
9	Dualism and Dependency Theory, Theories of Development: Classical Theories of Development, Schumpeter Model of Growth
10	Theories of Underdevelopment, Development Strategies: Allocation of Resources, Cost-Benefit Analysis, Role of planning

## CONTENTS

<b>Unit 1:</b>	Economics of Growth and Development: Meaning, Measurement, Difference and Comparisons <i>Pavitar Parkash Singh, Lovely Professional University</i>	1
<b>Unit 2:</b>	Sources of Economic Growth <i>Hitesh Jhanji, Lovely Professional University</i>	15
<b>Unit 3:</b>	Human Development Index and PQLI <i>Hitesh Jhanji, Lovely Professional University</i>	19
<b>Unit 4:</b>	Economic Growth Models-I: Harrod-Domar Growth Model <i>Pavitar Parkash Singh, Lovely Professional University</i>	26
<b>Unit 5:</b>	Neo-Classical Growth Models <i>Hitesh Jhanji, Lovely Professional University</i>	35
<b>Unit 6:</b>	Economic Growth Models-II: Growth and Distribution <i>Pavitar Parkash Singh, Lovely Professional University</i>	58
<b>Unit 7:</b>	Total Factor Productivity and Growth Accounting <i>Hitesh Jhanji, Lovely Professional University</i>	69
<b>Unit 8:</b>	Technological Change and Progress <i>Pavitar Parkash Singh, Lovely Professional University</i>	84
<b>Unit 9:</b>	Economic Growth Model – III : Models of Optimal Economic Growth <i>Hitesh Jhanji, Lovely Professional University</i>	91
<b>Unit 10:</b>	Multi-Sector Models of Growth <i>Pavitar Parkash Singh, Lovely Professional University</i>	99
<b>Unit 11:</b>	Endogenous Growth Models <i>Hitesh Jhanji, Lovely Professional University</i>	108
<b>Unit 12:</b>	Stochastic Growth Models-Business Cycle Theory <i>Pavitar Parkash Singh, Lovely Professional University</i>	115
<b>Unit 13:</b>	Social and Institutional Aspects of Development: Difference between Development and Underdevelopment <i>Pavitar Parkash Singh, Lovely Professional University</i>	122
<b>Unit 14:</b>	Measurement and Indicators of Development <i>Pavitar Parkash Singh, Lovely Professional University</i>	136
<b>Unit 15:</b>	Population and Development <i>Pavitar Parkash Singh, Lovely Professional University</i>	146

<b>Unit 16:</b>	Economic Development and Institutions <i>Pavitar Parkash Singh, Lovely Professional University</i>	154
<b>Unit 17:</b>	Approaches to Development : Vicious Circle of Poverty and Unlimited Supply of Labor <i>Hitesh Jhanji, Lovely Professional University</i>	161
<b>Unit 18:</b>	Lewis Model <i>Hitesh Jhanji, Lovely Professional University</i>	168
<b>Unit 19:</b>	Ranis and Fei Model <i>Tanima Dutta, Lovely Professional University</i>	177
<b>Unit 20:</b>	Big Push Theory of Growth <i>Tanima Dutta, Lovely Professional University</i>	190
<b>Unit 21:</b>	Balanced Growth and Unbalanced Growth <i>Dilfraz Singh, Lovely Professional University</i>	198
<b>Unit 22:</b>	Critical Minimum Efforts Thesis <i>Dilfraz Singh, Lovely Professional University</i>	213
<b>Unit 23:</b>	Low - Level Equilibrium Trap <i>Hitesh Jhanji, Lovely Professional University</i>	226
<b>Unit 24:</b>	Dualism and Dependency Theory <i>Hitesh Jhanji, Lovely Professional University</i>	232
<b>Unit 25:</b>	Theories of Development: Classical Theories of Development <i>Dilfraz Singh, Lovely Professional University</i>	241
<b>Unit 26:</b>	Schumpeter Model of Growth <i>Pavitar Parkash Singh, Lovely Professional University</i>	251
<b>Unit 27:</b>	Theories of Underdevelopment <i>Pavitar Parkash Singh, Lovely Professional University</i>	256
<b>Unit 28:</b>	Development Strategies: Allocation of Resources <i>Dilfraz Singh, Lovely Professional University</i>	267
<b>Unit 29:</b>	Cost-Benefit Analysis <i>Pavitar Parkash Singh, Lovely Professional University</i>	276
<b>Unit 30:</b>	Role of Planning <i>Dilfraz Singh, Lovely Professional University</i>	281

# **Unit 1 : Economics of Growth and Development: Meaning, Measurement, Difference and Comparisons**

## **CONTENTS**

Objectives

Introduction

- 1.1 Meaning of Economic Development
- 1.2 Definition of Economic Development
- 1.3 Characteristics of an Developed Economy
- 1.3 Economic Growth and Development: A Contrast
- 1.4 Distinction Between Developed and Underdeveloped Economies
- 1.5 Difference between Economic Growth and Economic Development
- 1.6 Comparison of Economic Growth and Economic Development
- 1.7 Economic Development and Economic Growth
- 1.8 Measuring of Growth and Production Possibilities
- 1.9 Factors Affecting Economic Growth
- 1.10 Summary
- 1.11 Key-words
- 1.12 Review Questions
- 1.13 Further Readings

## **Objectives**

After reading this unit students will be able to:

- Describe the economic development and economic growth.
- Explain the economic growth and development : A contrast.
- Understand the growth performance of the world economy.
- Know about the study the process of economic growth.
- Learn the measurement of growth.

## **Introduction**

In recent years, there has come into existence a new branch of economics known as the “Economics of Development”. It refers to the problems of the economic development of underdeveloped or backward countries. In addition to the illuminating reports of the U.N.O. on the subject, some top ranking economists like Nurkse, Dobb, Staley, Buchanan, Rostow and Ellis have made some original contributions to the Economics of Development. The main reason for the growing popularity of “Economics of Development” as a separate branch of economic theory is the increasing tendency on the part of the newly independent countries of Asia and Africa to resort to developmental planning as a means to eliminate their age-old poverty and raise living standards.

## 1.1 Meaning of Economic Development

Economic development is a process whereby an economy's real national income as well as per capita income increases over a long period of time. Here, the process implies the impact of certain forces which operate over a long period and embody changes in dynamic elements. It contains changes in resource supplies, in the rate of capital formation, in demographic composition, in technology, skills and efficiency, in institutional and organisational set-up. It also implies respective changes in the structure of demand for goods, in the level and pattern of income distribution, in size and composition of population, in consumption habits and living standards, and in the pattern of social relationships and religious dogmas, ideas and institutions. In short, economic development is a process consisting of a long chain of inter-related changes in fundamental factors of supply and in the structure of demand, leading to a rise in the net national product of a country in the long run.

## 1.2 Definitions of Economic Development

The term 'economic development' is generally used in many other synonymous terms such as economic growth, economic welfare, secular change, social justice and economic progress. As such, it is not easy to give any precise and clear definition of economic development. But in view of its scientific study and its popularity, a working definition of the term seems to be quite essential. Economic development, as it is now generally understood, includes the development of agriculture, industry, trade, transport, means of irrigation, power resources, etc. It, thus, indicates a process of development. The sectoral improvement is the part of the process of development which refers to the economic development. Broadly speaking, economic development has been defined in different ways and as such it is difficult to locate any single definition which may be regarded entirely satisfactory.

## 1.3 Characteristics of an Developed Economy

A developed economy is the characterised by increase in capital resources, improvement in efficiency of labour, better organisation of production in all spheres, development of means of transport and communication, growth of banks and other financial institutions, urbanisation and a rise in the level of living, improvement in the standards of education and expectation of life, greater leisure and more recreation facilities and the widening of the mental horizon of the people, and so on. In short, economic development must break the poverty barrier or the vicious circle and bring into being a self-generating economy so that economic growth becomes self-sustained.

The main characteristics of developed countries are as follows:

1. Significance of Industrial Sector.
2. High Rate of Capital Formation.
3. Use of High Production Techniques and Skills.
4. Low Growth of Population.

These are discussed in below.

**1. Significance of Industrial Sector:** Most of the developed countries in the world have given much importance of the development of industrial sector. They have large capacities to utilise all resources of production, to maximise national income and to provide employment for the jobless people. As we are quite aware that these countries receive the major portion of their national income from the non-agriculture sectors which include industry, trade, transport, and communication. For instance, England generally receives nearly 50% of her national income from industrial sector, 21% from transport and commerce, 4% from agriculture and 25% from other sectors. The same case is with the U.S.A., Japan and other West European countries. But in India and other developing countries agriculture contributes, say, 35 to 40 percent, to their national income.

**2. High Rate of Capital Formation:** Developed countries are generally very rich, as they maintain a high level of savings and investment, with the result that they have huge amount of capital stocks.

The rate of investment constitutes 20 to 25 percent of the total national income. The rate of capital formation in these countries is also very high.

Besides this, well-developed capital market, high level of savings, broader business prospects and capable entrepreneurship have led to a high growth of capital formation in these economies.

**3. Use of High Production Techniques and Skills:** High production techniques and skills have become an essential part of economic development process in the developed countries. The new techniques have been used for the exploitation of the physical human resources. These countries have, therefore, been giving priority to the scientific research, so as to improve and evolve the new and technique of production. Consequently, these countries find themselves able to produce goods and services of a better equality comparatively at the lesser cost. It is because of the use of high production techniques and latest skills, that the countries like Japan, Germany and Israel could have developed their economies very rapidly, though they have limited natural resources.

**4. Low Growth of Population:** The developed countries, like the U.S.A., the U.K. and other Western European countries have low growth of population because they have low level of birth rate followed by low level of death rate. Good health conditions, high degree of education and high level of consumption of the people have led to maintain low growth of population followed by low level of birth and death rates. The life expectancy in these countries is also very high. The high rate of capital formation on the one hand and low growth of population have resulted in high level of per capita income and prosperity in these countries. Consequently, the people in these countries enjoy a higher standard of living and work together unitedly for more rapid economic and industrial development of the nations. Besides this, the entire society, its structure and values are found to be dedicated to the goal of rapid economic and industrial development. The position of individuals in the society is decided by the ability of the persons and not by their birth, caste or creed. Dignity of labour is maintained. The economic motive and strong desire to lead a better social life always inspire people to contribute to the process of development. The main objective of rapid economic development, particularly in the developed economies is to achieve the level of stagnant economic growth, so that they may maintain the existing economic status and exercise control over business cycle.

## **1.4 Distinction Between Developed and Underdeveloped Economies**

We may now distinguish between the features of an underdeveloped economy from that of developed one as follows:

1. Underdeveloped economies are distinguished from developed economies on the basis of per capita income. In general, those countries which have real per capita incomes less than a quarter of the per capita income of the United States, or roughly less than 5000 dollars per year, are categorized as under-developed countries.
2. An underdeveloped economy, compared with an advanced economy, is underequipped with capital in relation to its population and natural resources. The rate of growth of employment and investment in such an economy lags behind the rate of growth of population. The resources are not only employed but also underemployed. In technical jargon, the production possibility frontier of a poor country is far ahead of the actual production curve, whereas the gap between the potentiality and actual utilisation of resources is narrow in a developed economy.
3. High rate of growth of population is an important characteristic of most of the underdeveloped economies. Population growth in underdeveloped countries neutralises economic growth. In advanced economies, the case is different. As Prof. Hansen points out, one of the empirical tests of secular stagnation in advanced economies is the declining rate of population growth. The stagnation problem in a developed economy is a problem of population, natural resources and technology failing to keep pace with capital accumulation.
4. The central problem of underdeveloped economies is the prevalence of mass poverty which is the cause as well as the consequence of their low level of development. Shortage and scarcity are the main economic problems in these economies, whereas the affluent societies of advanced countries have economic problems resulting from abundance.

**Notes**

5. In an underdeveloped economy, the fundamental problem is that of output, real income or the standard of living, as these economies are characterised by low productivity, low income and a poor standard of living. A vast majority of people in an underdeveloped country are ill-clothed, undernourished and without adequate shelter. To use Rostow's terminology, economies of poor countries similar to those of a traditional society, where modern science and technology are either not available or not regularly and systematically applied. On the other hand, most of the developed countries at present enjoy a high rate of mass-consumption. In their economies, per capita real income has risen to a level at which a large number of people can afford consumption transcending food, shelter and clothing.
6. Capital deficiency is the main cause of poverty of a poor country, while affluent capital accumulation is the main cause of stagnation of an advanced country.
7. In an underdeveloped economy, the problem of under-employment is more important than that of unemployment, whereas a developed economy may have a cyclical unemployment problem. There is chronic unemployment in an underdeveloped economy. An advanced economy may have unemployment occasionally due to business fluctuations and a low marginal propensity to consume. Whereas an under developed economy is confronted with the problem of disguised unemployment in the sense that even with unchanged techniques in agriculture could be removed without reducing agricultural output. Thus, in a developed economy, unemployment means waste of resources, while in an underdeveloped economy, it is of disguised type.
8. Poor countries are poor in technology, advanced countries are advanced in technology. In fact, the level of technology attained in production is a reliable indication of the level of economic development. Employment of advanced technology goes along with large capital resources, high attainments in the fields of scientific research, greater availability of entrepreneurial skill and a good supply of efficient skilled labour. Thus, development of technology is the basic objective of the backward economy whereas development of technology no longer remains the overriding objective of an affluent society.



Notes Economic growth is a necessary but not sufficient condition of economic development.

**Self-Assessment**

1. Fill in the blanks:
  - (i) ..... a way of life.
  - (ii) Economic growth is a narrower concept than ..... development
  - (iii) Economic development is a ..... concept.
  - (iv) Economic growth does not take into account the size of the ..... economy.
  - (v) Economic growth is ..... but not sufficient condition of economic development.

**1.5 Difference between Economic Growth and Economic Development**

---

The difference between economic growth and economic development are:

1. Economic Growth is quantitative while economic development is qualitative.
2. Economic growth is comparatively a narrow concept and development is much more comprehensive.
3. Economic growth refers to increase in the total output of final goods and services in a country over a long period of time. In contrast, economic development refers to progressive change in the socio-economic structure of the country. It includes gender equality, change in composition of output, shift of labour force from agriculture to other sectors.

4. Economic growth is easy to realize as only monetary aspect is involved. But, it is very difficult to attain the goal of development as it involves many socio-economic-political aspects.
5. Economic growth can easily be estimated by real GDP or Real Per Capital income. But it is very difficult to measure development as it has some aspects that can't be quantified. Economic development however is indicated by Human Development Index.
6. Economic growth can take place without Economic development; however, economic development can't take place without economic growth.

The difference between extensive and intensive growth can be summarized as below :

1. Extensive growth refers to growth in total output level of an economy. Intensive growth refers to increase in per capita level of the output.
2. If output takes a jump due to unexpected one time force, it is called extensive growth. If there is continuous expansion in output due to some positive change over time, it is called intensive growth.
3. Extensive growth is temporary and short lived. However intensive growth is permanent and has long lasting effects.
4. Extensive growth is relevant to study aggregative phenomenon such as economies of scale. Intensive growth is relevant to study the increase in standard of living of the people of a country.



*Did u know?* There is no doubt that the performance of Indian economy has improved a lot and is superior to many other countries of the world.

## 1.6 Comparison of Economic Growth and Economic Development

Economic	Development	Economic Growth
Concept:	Normative concept	Narrowed concept than economic development
Scope:	Concerned with structural changes in the economy	Growth is concerned with increases in the economy's output
Growth:	Development relates to growth of huma capital indexes, a decrease in inequality figures, and structural changes that improve the general population's quality of life	Growth relates to a gradual increase in one of the components of Gross Domestic Product: consumption, government spending, investment, net exports
Implication:	It implies changes in income, saving and investment along with progressive changes in socio-economic structure of country (institutional and technological changes)	It refers to an increase in the real output of goods and services in the country like increase the income in savings, in investment etc.
Measurement:	Qualitative. HDI (Human Development Index), gender-related index (GDI), Human poverty index (HPI), infant mortality, literacy rate etc.	Quantitative Increase in real GDP. Shown in PPF.
Effect:	Brings qualitative and quantitative changes in the economy	Brings quantitative changes the economy

## 1.7 Economic Development and Economic Growth

By a “developed” economy, people roughly mean ones with a high, persistently-growing per-capita income which is not simply based on resource extraction (i.e., oil) or remittances or rentierism – an industrial (or, if there is such a thing, post-industrial) economy which makes most of its participants reasonably and increasingly prosperous. While there are of course differences among them – the United States is not New Zealand, which is not Belgium, which is not Finland, which is not Japan – they are all more similar to each other than they are to the vast variety of “undeveloped”, “under-developed”, or (most optimistically) “developing” economies across the world. (Some people refer to the developed countries as “the North” and the others as “the South”; this drives me up the wall, if only from looking at where China and Australia are on the map.) Economies in the first category tend to stay there; so, sadly, do countries in the second. Development economics is the sub-discipline of economics which attempts to study how economies which have not attained this happy condition can be made to do so, and the factors which hold others back.

Normally in economic textbooks, growth and development are used synonymously, and this usage is widely acceptable. However, in particular, the two terms have been distinguished by different economists as follows:

1. To some economists, economic development refers to the process of expansion of backward economies, while economic growth relates to that of advanced economies.
2. **Schumpeter**, however, uses the term “economic development” as a spontaneous and discontinuous change in the stationary state which disturbs the equilibrium state previously existing. And the term “economic growth” is used to denote a steady and gradual change in the long run which comes through a general increase in the rate of saving and population in a dynamic economy.
3. **Prof. Kindleberger** has given the differences between growth and development as; “Growth may well imply not only more output and also more inputs and more efficiency, i.e., an increase in output per unit of input. Development goes beyond these to imply changes in the structure of outputs and in the allocation of inputs by sectors. By analogy with human beings to stress growth involves focusing on height and weight, while to emphasize development, draws attention to the change in functional capacity in physical coordination. For example, growth without development—more and more steel in the Soviet Union or more and more coffee in Brazil—leads nowhere. It is virtually impossible to contemplate development without growth because change in function requires a change in size. Until an economy can produce a margin above its food, through growth, it will be unable to allocate a portion of its resources to other types of activity”.
4. To some, economic development is the outcome of conscious and deliberate efforts involved in planning. Economic growth, on the other hand, signifies the progress of an economy under the stimulus of certain favourable circumstances, e.g., the progress achieved by the United Kingdom during the Industrial Revolution.
5. In his simple words, **A. Maddison** says, “The raising of income levels is generally called economic growth in rich countries and in poor ones it is called economic development”. **Mrs. Hicks** has also expressed almost the same views and said that economic development refers to the problems of underdeveloped countries and economic growth to those of advanced countries she points out that the problems of underdeveloped countries are concerned with development of unused resources, even though their uses are well-known; while those of advanced countries are related to growth, most of their resources being already known and developed to a considerable extent.
6. According to **Prof. Mehta**, however, the term “growth” has quantitative significance. Growth suggests an increase in the quantity or volume of something. An increase in a country’s population, national income; per capita income, consumption, saving, investment, foreign

trade etc. over a period, all imply growth. In economics, however, growth strictly means an increase in real income, gross and per capita. On the other hand, development is a process of expansion, fulfilling the desire to have an increase in national income. From the above will be clear, the distinction and interface of growth and development.



*Caution* It also occurs by increasing the productivity of existing factors through investment in education (labour) and technology (capital).

## 1.8 Measuring of Growth and Production Possibilities

Economic growth is the increase in the amount of the goods and services produced by an economy over time. It is conventionally measured as the percent rate of increase in real gross domestic product, or real GDP. Growth is usually calculated in real terms, i.e. inflation-adjusted terms, in order to obviate the distorting effect of inflation on the price of the goods produced. In economics, “economic growth” or “economic growth theory” typically refers to growth of potential output, i.e., production at “full employment”.

As an area of study, economic growth is generally distinguished from development economics. The former is primarily the study of how countries can advance their economies. The latter is the study of the economic aspects of the development process in low-income countries. See also Economic development.

Since economic growth is measured as the annual percent change of gross domestic product (GDP), it has all the advantages and drawbacks of that measure.

### 1.8.1 Economic Growth: Measurement

Economic growth is the sustained increase in welfare of an economy nation, region, city together with the ongoing changes in that economy’s industrial structure; public health, literacy, and demography; and distribution of income. In the long run, as this economic transformation evolves, so do social, political, and cultural norms. Societies change profoundly and multi-dimensionally, as economic performance improves.

To measure economic growth is to quantify this increase in welfare and to endow with numerical precision these large-scale economic and social changes. Given the breadth of possibilities, it is impossible to undertake this measurement exercise without guidance of what can be pared away, what is essential from some view on the causes of growth (see, e.g., Economic Growth: Theory).

This article sets down some key (measurement) facts concerning economic growth, and documents how they have evolved, if at all, over time. In doing this, the article attempts also to illustrate the historical interplay between two lines of research, measurement of and theories about economic growth, each influencing the other.

**1. National Income:** The panorama above of profound social and economic changes can be simplified dramatically by concentrating on just a single key economic variable, income per capita. (We will return in Sect. 8 below to issues of broader structural transformations). Income per capita is the per head measure of the total value of all goods and services produced in an economy. Taking national income measured by either gross national product (GNP) or gross domestic product (GDP), or its regional counterpart and dividing it by population in the appropriate nation or region gives a convenient first measure on the state of economic well-being. Since total income is the same as total output, this measure might sometimes be usefully replaced by output per worker, or labor productivity, where the denominator is then the size of the labor force; or, even output per worker-hour, where the measure then takes into account the time spent working by the labor force. In some detailed analyses, these alternatives can provide different useful insights into economic performance different countries, at different times, have had their labor force markedly different from their population, or have had workers and make different choices on the length of their workday.

**Notes**

However, for the kind of long-horizon, large-scale developments that are typically of interest in economic growth, these differences are inessential. Potentially more important is whether this one measure can suitably proxy for the wide spectrum of different variables of concern in economic growth. Across countries, per capita income is positively correlated with a broad range of alternative indicators for economic performance including life expectancy, (the negative of) infant mortality, and adult literacy.

## **1.9 Factors Affecting Economic Growth**

The process of economic growth is a highly complex phenomenon and is influenced by numerous and varied factors such as political, social and cultural factors. As such economic analysis can provide only a partial explanation of this process. To repeat here the remark of Prof. Ragnar Nurkse in this connection, "Economic development has much to do with human endowments, social attitudes, political conditions and historical accidents. Capital is a necessary but not a sufficient condition of progress". The supply of natural resources, the growth of scientific and technological knowledge—all these too have a strong bearing on the process of economic growth. We shall briefly notice some of these factors one by one.

### **1.9.1 Economic Factors**

The following are the important factors which determine the economic growth of an economy.

- 1. Natural Resources:** The principal factor affecting the development of an economy is the natural resources. Among the natural resources, we generally include the land area and the quality of the soil, forest wealth, good river system, minerals and oil resources, good and bracing climate, etc. For economic growth, the existence of natural resources in abundance is essential. A country deficient in natural resources may not be in a position to develop rapidly. In fact natural resources are a necessary condition for economic growth but not a sufficient one. Japan and India are the two contradictory examples. As pointed out by Lewis, "other things being equal man can make better use of rich resources than they can of poor". In less developed countries, natural resources are unutilised, underutilized or misutilised. This is one of the reasons of their backwardness. There is little reason to expect natural resource development if people are indifferent to the products or service which such resources can contribute. This is due to economic backwardness and lack of technological factors. According to Professor Lewis, "A country which is considered to be poor in resources may be considered very rich in resources some later time, not merely because unknown resources are discovered, but equally because new methods are discovered for the known resources". Japan is one such country which is deficient in natural resources but it is one of the advanced countries of the world because it has been able to discover new use for limited resources.
- 2. Capital Formation:** Among several economic factors, capital formation is another important factor for development of an economy. Capital may be defined as the stock of physical reproducible factors of production. Capital accumulation and capital formation, both of these terms carry the same meaning which may be understood simply by the stock of capital. As we know, capital formation is cumulative and self-feeding and includes three interrelated stages; a) the existence of real savings and rise in them; b) the existence of credit and financial institutions to mobilise savings and to divert them in desired channels; and c) to use these savings for investment in capital goods.

Low propensity to save in underdeveloped countries is due to low per capita income of the people, which may not be raised merely by voluntary savings. Hence, the rate of per capita savings can be increased by emphasizing forced savings which will reduce consumption and thereby release savings for capital formation. Forced savings can be possible through the implementation of a proper fiscal policy. In this regard, taxation, deficit financing and public borrowing are better instruments in the hands of the State to collect savings and accumulate

capital. Nurkse's suggestion to use unemployed or underemployed rural youths in construction works has importance for capital formation in backward economies. In addition to it, the external resources like foreign loans and grants, and larger exports can also help these economies in capital formation.

The capital formation possesses special significance, as it is key to economic growth, particularly in backward economies. It increases sectoral productivity in the economy on the one hand and enhances ultimately national output by raising effective demand, on the other. According to Kuznets' estimates, during modern economic growth the gross capital formation and net capital formation was gradually between 11.13 to 20 percent and 6 to 12.14 percent in developed countries. According to Lewis, the rate in underdeveloped countries was 5 percent or less which should be raised to the level of 12 to 15 percent.

3. **Technological Progress:** The technological changes are most essential in the process of economic growth. Adam Smith, the father of political economy, pointed out the great importance of technological progress in economic development. Ricardo visualised the development of capitalist economies as a race between technological progress and growth of population. The great importance of technological progress in capitalist development was recognised by Karl Marx too.

There is no doubt that technological progress is a very important factor in determining the rate of economic growth. In fact, even capital accumulation is not possible without technical progress. A country may be adding to its means of transportation and communications, its power resources and its factories.

According to modern technique, it is called widening of capital. The use of improved techniques in production and technological progress bring about a significant increase in per capita income. Technological progress has something to do with the research into the use of new and better methods of production or the improvement of the old methods. Sometimes technical progress results in the availability of natural resources. But generally technological progress results in increase in productivity, e.g., green revolution. In other words, technological progress increases the ability to make a more effective and fruitful use of natural and other resources for increasing production. By the use of improved technology it is possible to have greater output from the use of given resources or a given output can be obtained by the use of a smaller quantity of resources.

It is a matter of common knowledge that technological progress adds greatly to our ability to make a fuller use of the natural resources, e.g., generation of hydro-electricity. With the aid of power - driven farm equipment a marked increase has been brought about in agricultural yields per acre and per worker.

Technical progress also increases the ability to make a more effective use of capital equipment. Technological progress has very close connection with capital formation. In fact, both go hand in hand. Without capital formation technical progress is out of the question because heavy investment is required for making use of better and more efficient methods of production, although after they are well established, capital cost per unit of output may fall.

Thus, technological progress has a very important role to play in the economic development of a country. No backward country can hope to march ahead on the road of economic development with out adopting a newer and newer techniques of production and unless it is assisted in its march by technological progress. We have already brought out the importance of capital accumulation in economic growth. But capital accumulation promotes economic growth because it facilitates technological improvements, which raise labour productivity and thus add to the national and percapita income.

4. **Human Resources:** A good quality of population is very important in determining the rate of economic progress. Instead of a large population a small but high quality of human race in a

Notes

country is better for development. Thus, for economic growth, investment in human capital in the form of educational and medical and such other social schemes is very much desirable.

According to **Peter Drucker** : “The most important requirement of rapid industrial growth is people. People ready to welcome the challenge of economic change and opportunities in it. People, above all, who are dedicated to the economic development of their country, and to high standards of honesty, competency, knowledge and performance. What are needed beyond all else are leadership and example, and that, only the right kind of people can provide”. Prof. Drucker stressing the significance of human capital says further : “Capital without people is sterile, but people can move mountains without capital. Development, therefore, requires rapid growth of human talents and opportunities to employ them”.

5. **Population Growth:** Labour supply comes from population growth. But the population growth should be normal. A galloping rise in population retards economic progress. Population growth is desirable only in a under-populated country. It is, however, unwarranted in an overpopulated country like India. In fact, a high population growth at the rate of 2.5 percent per annum is very much detrimental to the economic growth of our country.
6. **Social Overheads:** Another important determinant of economic growth is the provision of social overheads like schools, colleges, technical institutions, medical colleges, hospitals and public health facilities. Such facilities make the working population healthy, efficient and responsible. Such people can well take their country economically forward.
7. **Organisation:** In the process of growth, organisation is very important. It is organization that emphasises maximum use of the means of production in production. Organisation is complementary to capital and labour and helps production to reach the maximum level. In the modern economic system, the entrepreneur performs the duty of an organiser and bears all risks and uncertainties. Hence, entrepreneurship is an indispensable part in the process of economic growth. For instance, the Industrial Revolution in England succeeded because of the entrepreneurship.

Most of the underdeveloped countries in the world are poor not because there is shortage of capital, weak infrastructure, unskilled labour and deficiency of natural resources, but because of acute deficiency of entrepreneurship.

**Myrdal** rightly comments, “the Asian countries lack entrepreneurship not because they are deficient in capital or raw materials but because they are deficient in persons with right attitude for entrepreneurship”. Behind Japan’s rapid economic growth there is only one reason that it has entrepreneurship in abundance. It is, therefore, essential in LDCs to create climate for promoting entrepreneurship by emphasising education, new researches, and scientific and technological developments. Apart from it, the state should also give priority to necessary imports of machines, raw materials and equipments to provide facilities for wider markets, and to allow tax rebates, special grants and loans to the new entrepreneurs for starting business or industries particularly in the undeveloped areas of an economy.

8. **Transformation of Traditional Agricultural Society:** The transformation of traditional agricultural society into a modern industrial society, i.e., structural changes lead to enhancement of employment opportunities, higher labour productivity and the stock of capital, exploitation of the newly developed resources and improved technology. Mostly, LDCs have a very large primary sector and very small secondary and tertiary sectors. In such economies the structural changes involve the transfer of population from the primary sector to the secondary and then to tertiary sectors. Agriculture being the main occupation of the 70-80 percent population in the LDCs passes through several structural changes. The number of dependents on agriculture sector progressively reduce with the expansion of industrial or nonagricultural sector.

Similarly, the proportion of contribution of agriculture in the real national income also reduces gradually. But net output in agriculture sector progressively increases in absolute terms, as it is accompanied by a strong productivity movement, relating to the implementation of several

programmes like land reforms, expansion of banks, improved agricultural techniques and other farm implements, availability of better marketing facilities, means of power and irrigation, and so on. In LDCs the agriculture and industry become complementary to each other. The progressively increasing productivity in agriculture enhances the per capita real income of the people, engaged in agriculture sector. This, in turn, expands rural demand for consumer goods and agricultural inputs which stimulates the expansion of industrial sector, and further, it also develops agriculture sector by providing improved farm techniques along with machines, fertilisers and other inputs. The scope for increasing agricultural productivity and incomes, in other words, is heavily dependent upon the structural transformation of the economy as it affects the growth of commercial demand for goods produced, the growth of alternative employment opportunities, and the increased quantity of purchased inputs available to the agricultural sector".

### 1.9.2 Non-Economic Factors

Both of the economic or noneconomic factors do play an important role in the process of economic growth. In this regard, socio-economic, cultural, psychological and political factors are also equally significant as are economic factors in economic development of the LDCs Cairncross rightly observes:

"Development is not just a matter of having plenty of money, nor is it purely an economic phenomenon. It embraces all aspects of social behaviour; the establishment of law and order; scrupulousness in business dealings, including dealings with the revenue authorities; relationships between the family, literacy, familiarity with mechanical gadgets and so on". We discuss here some of the essential noneconomic factors which determine the economic growth of an economy.

- 1. Political Factors:** Political stability and strong administration are essential and helpful in modern economic growth. It is because of political stability and strong administration that the countries like the U.K. the U.S.A., Germany, France and Japan have reached the level of highest economic growth in the world. But in most of the poor countries there is political instability and weak administration which have largely influenced their economic development programmes. It is, therefore, essential for their faster economic development to have a strong, efficient and incorrupt administration. In conclusion, we can say that a clean, just and strong administration can put an economy on the way to rapid economic development. Lewis rightly comments that "no country has made progress without positive stimulus from intelligent governments".
- 2. Social and Psychological Factors:** Modern economic growth process has been largely influenced by social and psychological factors. Social factors include social attitudes, social values and social institutions which change with the expansion of education and transformation of culture from one society to the other. The Industrial Revolution of England and other Western European countries in the 18th century was largely influenced by the spirit of adventure and the expansion of education which led to new discoveries and inventions and consequently to the rise of the new entrepreneurs. Social attitudes, values and institutions changed. Joint family system was replaced by the new single family system which further led to the rapid economic development in these countries.

But the society in LDCs has been badly enveloped and guided by traditional customs, outdated ideology, values, and obsolete attitudes which have not been conducive to their economic development. Thus, there is need to change or modify these social and psychological factors for the rapid economic development in these countries. But it is not an easy task, and moreover, any rapid change may bring discontentment and resistance in the society, with the result that it may adversely affect the economic growth in the economies.

Only the selective social and psychological changes can lead to economic growth in LDCs. According to the UN Report on Economic Development of Underdeveloped Countries, it is hence impossible to speed up economic growth in these economies without painful adjustments.

**Notes**

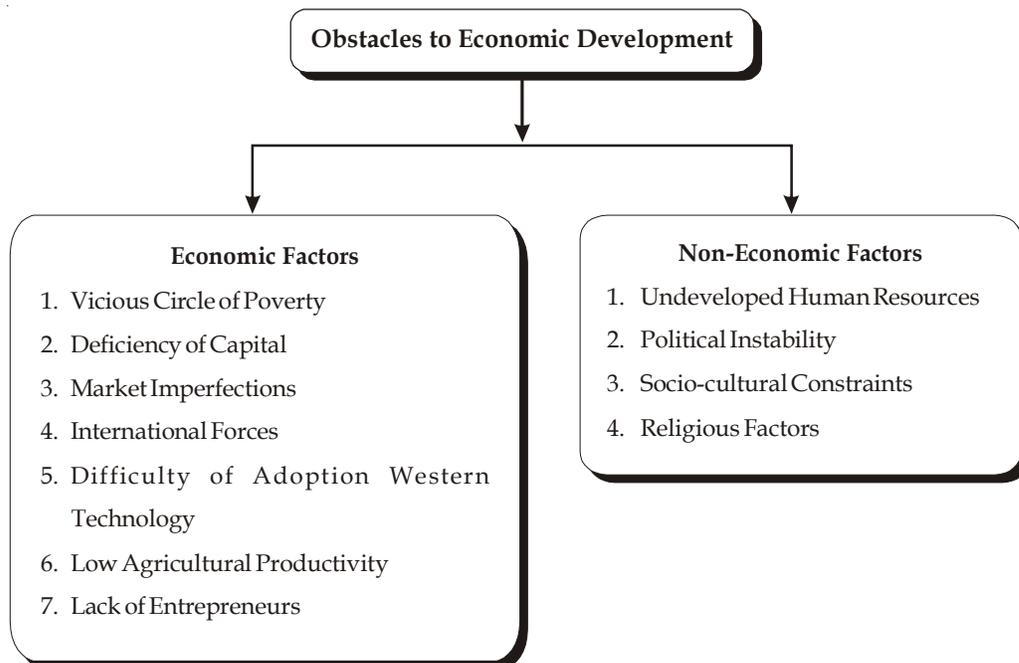
It, thus, advises to adopt an evolutionary change in social and cultural factors rather than revolutionary ones. **Myrdal** in his book **Asian Drama** also advocates the adoption of “modernisation values” or “modernisation ideals” for the rapid economic development of underdeveloped countries.

- 3. **Education:** It is now fairly recognised that education is the main vehicle of development. Greater progress has been achieved in those countries, where education is wide spread. J.K. Garlbraith in his book “Economic Development” has rightly stressed the role of education as an engine of economic growth.
- 4. **Urbanisation:** Another noneconomic factor promoting development is the process of urbanisation. In poor agrarian economies, the structural change must begin with the change in the size of population in rural and urban sectors.
- 5. **Religious Factors:** Religion plays a great role in economic growth. It may give rise to a peculiar sense of self-satisfaction. For example, the Hindu religion encourages faith in fate and prevents people from working hard. They are educated to remain satisfied with their lot and to hate risk and enterprise. Then our religion gives a higher place to spirit than matter.

In short economic growth is the result of concerted efforts of both economic and non economic factors. However, the mere presence of one or more or all of these factors may not ensure that the economy will be in a position to generate forces that bring about a fast economic growth. Some further factors may also be required that may work as a catalyst for growth. This function can well be performed by the state.

**1.9.3 Obstacles to Economic Development**

Broadly speaking, the features of an under developed economy create obstacles in the way of economic development, and hamper economic progress. These features emerge out of economic, social, political, religious and institutional factors. It would be wrong to conclude that only economic factors are responsible for poverty or economic backwardness of a country. Non-economic factors are equally responsible for the under development of an economy. The factors discouraging economic development may be classified into economic and noneconomic factors which are as under.





Task Write the growth theory.

### Self-Assessment

2. State whether the following statements are 'true' or 'false'.
  - (i) The economic growth in different countries has been different and uneven.
  - (ii) If the growth rate is 10% it will only take 0.2 years for the economy to double.
  - (iii) A theory can help us to identify some strategic variables involved in the process of growth.

### 1.10 Summary

- Growth is a way of life. None of us wants to stay at the same level of standard of living. Each one of us puts best of his effort to grow economically and have a better standard of living.
- **Economic Growth** : is a narrower concept than economic development.
- **Economic development** is a normative concept i.e. it applies in the context of people's sense of morality (right and wrong, good and bad).
- The most accurate method of measuring development is the Human Development Index which takes into account the literacy rates & life expectancy which affect productivity and could lead to Economic Growth.
- Economic Growth does not take into account the size of the informal economy.
- Development alleviates people from low standards of living into proper employment with suitable shelter.
- If economic growth is 1%, it will take approximately 72 years for the value of the economy to double.
- If the growth rate is 10% it will only take 7.2 years for the economy to double.

### 1.11 Key-words

- Normative : Describing or setting standards or rules of behavior.
- Informal : Related and friendly not following strict rules of how to behave

### 1.12 Review Questions

1. What are difference between economic development and economic growth?
2. Explain the growth performance of the word economy.
3. Describe the process of economic growth.
4. What are the stages of growth?
5. Define growth also describe the measurement of growth.

### Answer: Self-Assessment

1. (i) growth (ii) economic (iii) normative (iv) informal  
(v) necessary
2. (i) T (ii) F (iii) T

Notes

### **1.13 Further Readings**



*Books*

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 2 : Sources of Economic Growth

Notes

### CONTENTS

Objectives

Introduction

- 2.1 Sources of Economics Growth
- 2.2 Factors of source of Economic Growth
- 2.3 Summary
- 2.4 Key-words
- 2.5 Review Questions
- 2.6 Further Readings

### Objectives

After reading this unit students will be able to:

- Explain about the sources of economic growth.
- Describe about the factors of source of economic growth.

### Introduction

Economic growth is the continuous improvement in the capacity to satisfy the demand for goods and services, resulting from increased production scale, and improved productivity (innovations in products and processes). Factors improving productivity are particularly important sources of growth for developed economies with mature industries, but facing increasing global competition and rapid technological progress. Consumption has made a strong contribution to the growth of UK demand in recent decades, but the negative impact of the global financial crisis on consumer expenditure will persist for some time. Business investment is likely to become an increasingly important driver of growth. The UK's net trade position is expected to improve. Specialised and knowledge-intensive service and manufacturing sectors are likely to contribute strongly to future growth, building on the UK's relative specialization in Finance, Business Services, Communications, and Computer and Information Services.

### 2.1 Sources of Economic Growth

There are different concepts of economic growth and ways of measuring it, but the core definition is in terms of growth in the long run productive capacity of the economy, typically measured by real growth in Gross Domestic Product GDP.

Broader concepts of growth such as sustainable or balanced growth, or growth in measures of wellbeing are closer to welfare objectives but more complicated and harder to measure. Lets know the sources of economic growth.

#### **2.1.1 Growth Accounting**

Policy tends to focus on growth in output per capita, because it is more closely related to social welfare objectives. Growth in output per capita can be broken down into growth in the employment rate and in output per worker (a measure of productivity).

Notes

### 2.1.2 Drivers of Long Run Growth

There is a limit to how far the employment rate can be improved in the long term in developed countries, so long term growth is driven primarily by productivity. (*"Productivity isn't everything, but in the long run it is almost everything."* Paul Krugman). Over the longer term, growth will be determined primarily by the factors which determine productivity, and secondly those which improve labour participation.

The drivers of productivity growth are factors which either improve the quality of outputs, or the efficiency with which inputs (such as capital, labour and materials) are transformed into outputs. The contribution of some of these factors to output growth can be captured by appropriate input measures, with everything else (e.g. unmeasured inputs and technological progress) allocated to a residual called Total Factor Productivity (TFP).

### 2.1.3 Direct Inputs to Production

The main production inputs are capital, labour, management services and materials.

In the traditional Solow neoclassical growth model, a one-off increase in inputs to increase the scale of production only has an impact on per capita output growth in the short run, while technological progress (captured in TFP) makes a persistent contribution. However, in later endogenous growth models, investment (particularly in innovation) drives technological progress, so has an impact on growth in the long as well as short term.

### 2.1.4 Ancillary Firm Activities

Firms allocate resources to a range of activities (such as innovation, marketing, and specialisation) which do not form direct inputs into the production process, but ultimately affect the quality of outputs or the efficiency of input use.

Innovation by firms exploiting scientific advances creates the technological progress which is the main driver of growth in the long run.

Specialisation in products and processes (often involving greater trade) is an important route to increased productivity.

### 2.1.5 The Business Environment

There are a range of factors in the business environment (such as infrastructure, the efficiency of markets, market incentives, taxation and regulation) which affect the productivity of firms and the efficiency of the economy as a whole. Investment in infrastructure affects the costs to firms of accessing resources and markets, and market conditions affect firm incentives to invest, be enterprising and innovate.



Task

Which factors are responsible for economic growth?

## 2.2 Factors of Source of Economic Growth

---

**Capital Formation:** Capital is the foremost requirement for enhancing the productive capacity of the economy. The greater is the capital formation, greater will be the productivity of all other factors of production, and hence greater will be the total output of goods and services in the economy.

Empirical evidence also suggests that there is a strong positive correlation between the rate of capital formation and the rate of economic growth. Most of the developed countries of the world have high rates of capital formation.

**Capital-Output Ratio:** Another important factor determining the rate of economic growth is capital output ratio. It refers to the number of units of capital that are required in order to produce one unit of output.

There is a tendency that as an economy grows the capital output ratio becomes more and more favourable. Besides, capital output ratio also varies sector to sector and industry to industry.

To achieve high rate of economic growth of GDP, an economy has to ensure :

- (a) Increasing in the rate of capital formation;
- (b) Generating forces that increase the productivity of capital

Capital output ratio depends upon:

- (a) Efficiency in the use of capital;
- (b) Quality of managerial and organizational skill;
- (c) Marginal efficiency of capital.



*Did u know?* Rate of Growth of GDP =  $\frac{\text{Investment - Income Ratio}}{\text{Capital - Output Ratio}}$

**Occupational Structure:** Occupational Structure refers to the distribution of work force over different sectors of an economy. There is an empirical evidence that as an economy grows there is a shift of labour force from primary to secondary and then to tertiary sector. This is called flight from land.



*Notes* With the shifting of labour from agriculture to service sector, efficiency of labour increases which in turn increases the efficiency of the economy.

**Technological Progress:** Technology can help to increase the productivity of existing resources. With improvement in technology, same resources become more productive. For example, Computer technology has increased the output of all kinds of offices many times. DMRC is another wonderful example for it. For technological advancement, we need to have quality of education and well equipped research and development.

### Self-Assessment

1. Fill in the blanks:
  - (i) ..... in physical and human capital increases the productive capacity of the economy.
  - (ii) ..... helps to utilize the existing resources of the economy more efficiently.
  - (iii) The greater is the capital formation, greater will be the ..... of all other factors of production.
  - (iv) Most of the developed countries of the world have high rates of .....
  - (v) ..... is the wonderful example of technology.

### 2.3 Summary

- Increases in productivity are the main factor responsible for economic growth, especially since the mid 19th century.
- The balance of growth has come from using more inputs overall because of the growth in output including new kinds of goods and services.

**Notes**

- Occupational Structure refers to the distribution of work force over different sectors of an economy.
- Investment in physical and human capital increases the productive capacity of the economy. Thereby, it helps to increase the total production of final goods and services in the economy over a long period of time. This is called economic growth.
- Technological progress helps to utilize the existing resources of the economy more efficiently.
- Capital is the foremost requirement for enhancing the productive capacity of the economy. The greater is the capital formation, greater will be the productivity of all other factors of production.

**2.4 Key-words**

- Occupational : Connected with a person's job or profession
- Structure : A thing that is made of several parts
- Technological : Scientific knowledge used in practical ways in industry

**2.5 Review Questions**

1. What are the sources of Economic Growth?
2. What are the factors of source of economic growth?
3. Give the formula to calculate rate of growth or GDP.

**Answer: Self Assessment**

1. (i) Investment (ii) Technological progress  
(iii) productivity (iv) Capital formation (v) DMRC

**2.6 Further Readings**



- Books*
1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
  2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
  3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 3: Human Development Index and PQLI

Notes

### CONTENTS

Objectives

Introduction

- 3.1 Human Development Index
- 3.2 New Method for 2011 Data onwards
- 3.3 Dimensions and Calculation
- 3.4 Future HDI Projections
- 3.5 Physical Quality of Life Index (PQLI)
- 3.6 Summary
- 3.7 Key-Words
- 3.8 Review Questions
- 3.9 Further Readings

### Objectives

After reading this unit students will be able to:

- Define development Index.
- Know the method for 2001 data onwards.
- Explain the dimensions and calculation.
- Describe the physical quality and life income.

### Introduction

The **Human Development Index (HDI)** is a composite statistic used to rank countries by level of “human development”, taken as a synonym of the older terms (the standard of living and/or quality of life), and distinguishing “very high human development”, “high human development”, “medium human development”, and “low human development” countries. HDI was devised and launched by Pakistani economist Mahbub ul Haq and Indian economist Amartya Sen in 1990. The HDI is a comparative measure of life expectancy, literacy, education, and standards of living of a country. It is a standard means of measuring well-being especially child welfare. It is also used to distinguish whether the country is a developed, a developing or an under-developed country, and also to measure the impact of economic policies on quality of life. There are also HDI for states, cities, villages, etc. by local organizations or companies.

### 3.1 Human Development Index

The origins of the HDI are found in the annual Human Development Reports of the United Nations Development Programme (UNDP). These were devised and launched by Pakistani economist Mahbub ul Haq in 1990 and had the explicit purpose “to shift the focus of development economics from national income accounting to people centered policies”. To produce the Human Development Reports, Mahbub ul Haq brought together a group of well-known development economists including: Paul Streeten, Frances Stewart, Gustav Ranis, Keith Griffin, Sudhir Anand and Meghnad Desai. But it was Nobel laureate Amartya Sen’s work on capabilities and functionings that provided the underlying conceptual framework. Haq was sure that a simple composite measure of human

Notes

development was needed in order to convince the public, academics, and policy-makers that they can and should evaluate development not only by economic advances but also improvements in human well-being. Sen initially opposed this idea, but he went on to help Haq develop the Index.



*Notes* Sen was worried that it was difficult to capture the full complexity of human capabilities in a single index but Haq persuaded him that only a single number would shift the attention of policy-makers from concentration on economic to human well-being.

### 3.2 New Method for 2011 Data Onwards

In its 2010 Human Development Reports, the UNDP began using a new method of calculating the HDI. The following three indices are used:

1. Life Expectancy Index (LEI)  $= \frac{LE - 20}{83.4 - 20}$
2. Education Index (EI)  $= \frac{\sqrt{MYS \cdot EYSI}}{0.951}$ 
  - 2.1 Mean Years of Schooling Index (MYSI)  $= \frac{MYS}{13.2}$
  - 2.2 Expected Years of Schooling Index (EYSI)  $= \frac{EYS}{20.6}$
3. Income Index (II)  $= \frac{\ln(GNI_{pc}) - \ln(100)}{\ln(107,721) - \ln(100)}$

Finally, the HDI is the geometric mean of the previous three normalized indices :

$$HDI = \sqrt[3]{LEI \cdot EI \cdot II}$$

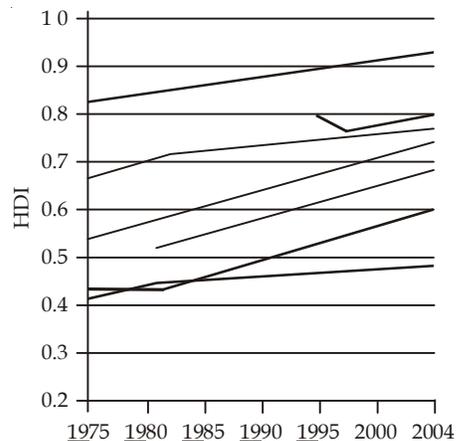
- LE : Life expectancy at birth
- MYS : Mean years of schooling (Years that a 25-year-old person or older has spent in schools)
- EYS : Expected years of schooling (Years that a 5-year-old child will spend with his education in his whole life)
- GNI<sub>pc</sub> : Gross national income at purchasing power parity per capita



*Task* What is the full form of HDI?

### 3.3 Dimensions and Calculation

Notes



HDI trends between 1975 and 2004

OECD

(Central and) Eastern Europe and the CIS

Latin America and the Caribbean

East Asia

Arab States

South Asia

Sub-Saharan Africa

This is the methodology used by UNDP up until its 2011 report.

The formula defining the HDI is promulgated by the United Nations Development Programme (UNDP). In general, to transform a raw variable, say,  $x$ , into a unit-free index between 0 and 1 (which allows different indices to be added together), the following formula is used :

$$x\text{-index} = \frac{x - \min(x)}{\max(x) - \min(x)}$$

- where  $\min(x)$  and  $\max(x)$  are the lowest and highest values the variable  $x$  can attain, respectively.

The Human Development Index (HDI) then represents the uniformly weighted sum with  $\frac{1}{3}$  contributed by each of the following factor indices :

- Life Expectancy Index =  $\frac{LE - 25}{85 - 25}$
- Education Index =  $\frac{2}{3} \times ALI + \frac{1}{3} \times GEI$ 
  - Adult Literacy Index (ALI) =  $\frac{ALR - 0}{100 - 0}$
  - Gross Enrollment Index (GEI) =  $\frac{CGER - 0}{100 - 0}$

Notes

- $$GDP = \frac{\log(GDP_{pc}) - \log(100)}{\log(40000) - \log(100)}$$



*Did u know?* Other organizations/companies may include Democracy Index, Population, etc. which produces different number of HDI.

**Self-Assessment**

1. Fill in the blanks:
  - (i) The origins of HDI are found in the annual Human Development reports of the .....
  - (ii) The ..... is a composite statistic.
  - (iii) 
$$GDP = \frac{\log(GDP_{pc}) - \log(100)}{\log(\dots) - \log(100)}$$

**3.4 Future HDI Projections**

The origins of the HDI are found in the annual Development Reports of the United Nations Development Programme (UNDP). These were devised and launched by Pakistani economist Mahbub ul Haq in 1990 and had the explicit purpose “to shift the focus of development economics from national income accounting to people centered policies”. To produce the Human Development Reports, Mahbub ul Haq brought together a group of well-known development economists including: Paul Streeten, Frances Stewart, Gustav Ranis, Keith Griffin, Sudhir Anand and Meghnad Desai. But it was Nobel laureate Amartya Sen’s work on capabilities and functionings that provided the underlying conceptual framework. Haq was sure that a simple composite measure of human development was needed in order to convince the public, academics, and policy-makers that they can and should evaluate development not only by economic advances but also improvements in human well-being. Sen initially opposed this idea, but he went on to help Haq develop the Index. Sen was worried that it was difficult to capture the full complexity of human capabilities in a single index but Haq persuaded him that only a single number would shift the attention of policy-makers from concentration on economic to human well-being.

The list of countries, ranked by their anticipated Human Development Index (HDI) in 2010–2030, was published in 2010 by the Human Development Report Office of the United Nations Development Programme (UNDP), as part of its Human Development Research Paper Series. The Human Development Research Paper (HDRP) Series is a medium for sharing recent research commissioned to inform the global Human Development Report, which is published annually, and further research in the field of human development. The HDRP Series is a quick disseminating, informal publication whose titles could subsequently be revised for publication as articles in professional journals or chapters in books. The authors include leading academics and practitioners from around the world, as well as UNDP researchers. The findings, interpretations and conclusions are strictly those of the authors and do not necessarily represent the views of UNDP or United Nations Member States. Moreover, the data may not be consistent with that presented in Human Development Reports.

For this Human Development Report Paper, the authors projected the HDI for every country which had a complete data series for the upcoming twenty years, whereas the HDI projection used projections of the components conducted by agencies that provide the UNDP with data for the HDI. The HDI list contains 81 countries, most of which are expected to have a “Very High” HDI by 2025.

In October 2009, the United Nations Development Programme published (in its 2009 Human Development Report) its last country list by Human Development Index (HDI), for 2007, classifying the countries into four categories, the first one of which is the group of countries having a “Very

High” HDI. Half a year later, in April 2010, the Human Development Report Office provided the 2010–2030 HDI projections (quoted in September 2010, by the United Nations Development Programme, in the Human Development Research paper 2010/40). These projections were reached by re-calculating the HDI, using (for components of the HDI) projections of the components conducted by agencies that provide the UNDP with data for the HDI.

The HDI was projected for all countries for which there was a complete data series for the 2010–2030 period. For example, the HDI was projected for every “non-tiny” country (i.e. for every country whose population is more than 800,000), that had a “Very High” HDI (i.e. an HDI of 900 or higher), in the 2009 Human Development Report. The HDI was not projected for countries for which there was no complete data series for the 2010–2030 period; Hence, the projection ignores countries which are not UN members (Hong Kong being an exception), and also ignores all “tiny” countries (among which seven had a “Very High” HDI in the 2009 Human Development Report: Andorra, Barbados, Brunei, Iceland, Liechtenstein, Luxembourg and Malta). All non-“tiny” UN members for which no projection was made, didn’t have a “Very High” HDI in the 2009 Human Development Report, although ten of them had (in the 2009 Human Development Report) a “High” HDI (i.e. 800 or higher): Albania, Belarus, Bosnia Herzegovina, Lebanon, Macedonia, Mauritius, Oman, Panama, Trinidad and Tobago, Uruguay.

According to these projections, Japan will lead among countries in the data set, with an HDI of 998 in 2030.

### 3.5 Physical Quality of Life Index (PQLI)

The **Physical Quality of Life Index (PQLI)** is an attempt to measure the quality of life or well-being of a country. The value is the average of three statistics : basic literacy rate, infant mortality, and life expectancy at age one, all equally weighted on a 0 to 100 scale. It was developed for the Overseas Development Council in the mid-1970s by Morris David Morris, as one of a number of measures created due to dissatisfaction with the use of GNP as an indicator of development. PQLI might be regarded as an improvement but shares the general problems of measuring quality of life in a quantitative way. It has also been criticized because there is considerable overlap between infant mortality and life expectancy.

Steps to Calculate Physical Quality of Life:

- (1) Find percentage of the population that is literate (literacy rate).
- (2) Find the infant mortality rate. (out of 1000 births) INDEXED Infant Mortality Rate =  $(166 - \text{infant mortality}) \times 0.625$
- (3) Find the Life Expectancy. INDEXED Life Expectancy =  $(\text{Life expectancy} - 42) \times 2.7$



**Caution** Physical Quality of Life =  $(\text{Literacy Rate} + \text{INDEXED Infant Mortality Rate} + \text{INDEXED Life Expectancy})$

In 1979, D. Morris constructed a composite Physical Quality of Life Index (PQLI). He found that most of the indicators were inputs to development process rather than result of the development process. These indicators reflected that economically less developed countries are simply underdeveloped versions of industrialized countries.

He, therefore, combines three component indicators of Infant Mortality, Life Expectancy and Basic Literacy to measure performance in meeting the basic needs of the people. However, the choice of indicators is

1. Life Expectancy Indicator (LEI)
2. Infant Mortality Indicator (IMI)
3. Basic Literacy Indicator (BLI)

**Notes**

These three indicators can be improved in a variety of ways. However, Prof. Morris used Life Expectancy (LE) at birth as the indicator. Infant mortality implies deaths before age one instead of life expectancy at birth. In case, the figure for life expectancy at age one was not available, it could be worked out by using a formula which relates life expectancy at birth, infant mortality and the proportion of children.

**3.5.1 How to Normalize Indicators**

We are familiar that life expectancy is measured in terms of years, infant mortality rate in terms of per thousand and basic literacy rate in terms of percentage. They can Indian Economic Development and Elementary Statistics not be simply added. Moreover, basic literacy can have a natural zero for minimum and 100 for maximum, thus there exists no natural minimum or maximum values for other indicators. For comparison, each of the levels should be normalized. Prof. Morris chose the best and worst levels in each of the three cases. In the case of positive indicators of life expectancy and basic literacy, the best is shown by the maximum and worst by the minimum. While in case of negative indicator of infant mortality, the best is denoted by the minimum and the worst by the maximum. For converting the actual levels of a positive variable into normalized indicators, first the minimum values are subtracted from the actual values and then the gap is divided by the range. For positive indicators, the formula is:

$$\text{Achievement Level} = \frac{\text{Actual Value} - \text{Minimum Value}}{\text{Maximum Value} - \text{Minimum Value}}$$

For negative indicator of infant mortality, actual value has to be subtracted from the maximum value and the gap if any has to be dividing by the range. The formula is

$$\text{Achieve mental Level} = \frac{\text{Minimum Value} - \text{Actual Value}}{\text{Maximum Value} - \text{Minimum Value}}$$

If not shell, there indicators are averaged to give what is called the Physical Quantity of life Index (PQLI).

$$PQLI = (1/3)(LEI + IMI + BLI)$$

**3.5.2 Choice of Minimum and Maximum Values:**

In case of life expectancy and infant mortality, there exist no natural minimum and maximum values. The conversions from values to indices are linear. Put the actual value of these indicators of the country in the expression and get the reasonable indices as Physical Quantity of Life Index.

**Self-Assessment**

2. State whether the following statements are 'true' or 'false'.
  - (i) HDI for a sample of 150 countries shows a very high co-relation with logarithm of GDP per capita.
  - (ii) The physical quality of life Index is an attempt to measure the quality of life or well-being of a country.
  - (iii) Ratan Lan Basu does not criticises the HDI concept from a completely different angle.

**3.6 Summary**

- HDI was devised and launched by Pakistani economist Mahbub ul Haq and Indian economist Amartya Sen in 1990.
- The origins of the HDI are found in the annual Human Development Reports of the United Nations Development Programme (UNDP).
- Haq was sure that a simple composite measure of human development was needed in order to convince the public, academics, and policy-makers that they can and should evaluate development not only by economic advances but also improvements in human well-being.
- The index has also been criticized as "redundant" and a "reinvention of the wheel", measuring aspects of development that have already been exhaustively studied.

- Ratan Lan Basu criticises the HDI concept from a completely different angle.
- A few authors have proposed alternative indices to address some of the index's shortcomings.
- The Physical Quality of Life Index (PQLI) is an attempt to measure the quality of life or well-being of a country.

Notes

### 3.7 Key-Words

- Index : a list of names or topics that one referred to in a book.
- Explicit : clear and easy to understand
- Expectancy : the state of expecting or hopint that 5th, especially 5th good or exciting.

### 3.8 Review Questions

1. What is Human Development Index? Explain.
2. Describe the dimensions and claculation of HDI.
3. What is physical quality of life index?  
Explain. Also write the steps to calculate physical quality of life.

### **Answer: Self Assessment**

1. (i) United Nations development programme  
(ii) Human and Development Index (iii) 40000
2. (i) T (ii) T (iii) F

### 3.9 Further Readings



- Books*
1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
  2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
  3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

Notes

## **Unit 4: Economic Growth Models-I: Harrod-Domar Growth Model**

### CONTENTS

Objectives

Introduction

- 4.1 Background to the Harrod-Domar Growth Model
- 4.2 The Harrod Model (HM)
- 4.3 The Domar Model (DM)
- 4.4 Comparison of Harrod Model and Domar Model
- 4.5 Harrod-Domar Growth Model
- 4.6 Summary
- 4.7 Key-words
- 4.8 Review Questions
- 4.9 Further Readings

### **Objectives**

After reading this unit students will be able to:

- Know about the background to the Harrod-Domar growth model.
- Explain the Harrod model and Domar model.
- Compare between Harrod model and Domar model.
- Understand Harrod-Domar Growth model.

### **Introduction**

There are many theories which have tried to explain the process of economic growth. These theories are also called growth models. Growth models set out the quantitative relationship among the critical variables in a rigorous form. Different economists have different opinions on the fact that which factors are most important in determining the rate of economic growth. Accordingly, each economist has formulated a different growth model. In this chapter, Harrod-Domar model has been explained.

### **4.1 Background to the Harrod-Domar Growth Model**

Two economists R.F. Harrod and E.D. Domar worked almost concurrently to develop this model of economic growth. The ideas in the two models are different in details but are so similar in their essence that that two models have got integrated and are presented as Harrod-Domar Model.

HDM considered demand as well as supply side of the investment process and hence, integrated the classical and Keynesian analysis.

#### *Essence of the Model*

If there is increase in productive capacity of the economy without parallel increase in real national income, it may lead to under-utilization of new capital, there may be lack of other factors of production or the new capital may be substituted for labour. In simple words, unless and until capital formation and increase in real national income go side by side, growth will not sustain for long.

*Assumptions of the Model*

1. There is full employment equilibrium of national income initially.
2. No government interference.
3. It is a closed economic model.
4. No lags in adjustment.
5. APS and MPS are equal.
6. Capital output ratio and propensity to save are constant.

**Self-Assessment**

1. Fill in the blanks:
  - (i) Two economists R.F. Harrod and ..... worked almost concurrently to develop the model economic growth.
  - (ii) ..... considered demand as well as supply side of the investment process and hence, integrated the classical and Keynesian analysis.
  - (iii) Unless and until capital formation and increase in real national income go side by side ..... will not sustain.
  - (iv) There is full ..... equilibrium of national income initially.
  - (v) Capital output ..... and propensity to save are constant.

**4.2 The Harrod Model (HM)**

R.F. Harrod showed through his model that steady growth rate may be achieved with fixed capital-output ratio and fixed propensity to save. He also explained the conditions that need to be fulfilled to maintain this steady growth rate. He further elaborated how natural resources put a ceiling on the growth rate of the economy.

**Statement of the Model:** It is based on three growth rates:

- (a) **Actual Growth Rate (G):** It is the first fundamental equation of Harrod Model. It is:

$$G = s$$

Where,  $G$  = annual growth rate  $(\Delta Y/Y)$

$C$  = marginal capital output ratio  $(I/\Delta Y)$

$S$  = APC

Equation 1 simply explains that savings = investment. It can be shown by substituting the values of  $G$ ,  $C$  and  $S$  in equation 1.

$$G = S$$

Substituting the values,

$$(\Delta Y/Y) * (I/\Delta Y) = S/Y$$

$$I/Y = S/Y$$

$$I = S$$

- (b) **Warranted Growth Rate ( $G_w$ ):** It is the growth rate which is attainable at full employment level. The equation for warranted growth can be stated as follows:

$$G_w C_r = s$$

Where  $G_w$  is warranted growth rate

$C_r$  is capital formation required to maintain it.

$s$  = APS

Notes

Warranted growth rate equation in the model implies that actual investment must be equal to expected investment to attain stable growth. It will happen when:

$$G = G_w$$

$$C = C_r$$

**State of Disequilibrium**

**When  $G > G_w$ :** In this situation, income is growing faster than output, hence, the economy would face inflation.

**When  $G < G_w$ :** In this situation, output is growing faster than income, hence, there would be deficient demand.

**When  $C < C_r$ :** In this situation, the actual amount of capital will be less than required capital. Hence, there will be deficiency in capital. This will lead to fall in output and thereby inflation.

**When  $C > C_r$ :** In this situation, the amount of capital available is larger than required capital and hence, MEC will fall that will lead economy into the depression.

- (c) **Natural Growth Rate:** It is the maximum growth rate that can be attained by an economy, given the natural resources. It is determined by macro variables like population technology, natural resources etc.

**Interaction between three equations:** There are three possibilities.

- (a)  $G_w = G_n$ : In this situation, steady growth would prevail in the economy but this happens rarely. More frequently the two of these are unequal.
- (b)  $G_w > G_n$ : This is a situation in which many resources of the economy would be lying unemployed and hence, there is a scope for increasing the rate of growth through suitable government policies.
- (c)  $G_w < G_n$ : Since the economy has already attained full employment level, such a situation will create inflation in the economy.



*Notes* Capital-output ratio and labour-output ratios are constant.

**Policy Implications of the Model**

It is advisable to make such policy instruments that help to decrease the savings if  $G_n < G_w$  as it will increase AD and hence new equilibrium will be at a higher level. But if  $G_n > G_w$ , then decrease in savings will lead to inflation and hence it should be increased.

**The Harrod Model and Trade Cycles**

- (a) When  $G_w > G_n$  at full employment level, there will be recession in the economy.
- (b) When  $G_w < G_n$  at full employment level, there probabilities.
  - (i) There is a strong probability that in the long run it will ride above  $G_n$  and if so happens there will be vicious spiral of depression after attainment of full employment level.
  - (ii) If  $G_w$  does not overtake  $G_n$  in the long run, there will be inflation in the economy.

**Critique of the Harrod Model**

1. In real scenario, there is no evidence of the existence of fixity of production function, saving ratio, growth rate of labour force as assumed by Harrod.
2. There are many other factors leading to economic growth like improvement in technology which Harrod model does not discuss.

### 4.3 The Domar Model (DM)

The Domar model has tried to explain that what should be the growth rate to maintain full employment equilibrium in the economy? Domar Model has explained the conditions which need to be satisfied to attain the given goal.

#### Statement of the Model

Investment in the economy affects AD as well as AS because on the one hand, investments increases productive capacity, and at the same time it generates income through multiplier effect.

#### The equation for demand side is

$$Y_d = I/d$$

Where,  $Y_d$  is the level of effective demand at full employment level.

$I$  is net investment

$$d = \text{Marginal Propensity to Save}$$

It is clear from the equation that there is direct relation between effective demand and level of investment and inverse relation between effective demand and MPC.

#### The equation for supply side of investment is

$$Y_s = \sigma k$$

Where,  $Y_s$  is the level of productive capacity at full employment level.

$\sigma$  is the productive capacity of capital;

$k$  is real capital

**Equilibrium:** Economy is in equilibrium where  $Y_d = Y_s$

$$\text{Or } I/d = \sigma k$$

$$\text{Or } I = d \sigma k$$

*Equation derived above is the equation to be satisfied for steady rate of economic growth.*

From this **condition of maintaining steady growth** can be explained. If demand and supply change, the increment equation for the two can be stated as follows:

$$\Delta Y_d = \Delta I/d \quad (d \text{ is not changed because it is assumed to be constant})$$

$$\Delta Y_s = \sigma \Delta K \quad (\text{change in real output will be equal to the product if change in real capital.}$$

$\Delta K$ , multiplied by productivity of capital,  $\sigma$ , which is assumed to be constant).

If we substitute  $I$  in place of  $\Delta K$ , then

$$Y_s = \sigma I$$

**Equilibrium:** In Equilibrium,

$$\Delta Y_d = \Delta Y_s$$

$$\text{or } \Delta I/d = \sigma I$$

Cross multiplication will give us:

$$\Delta I/I = \sigma d$$

This is the equation for **Maintaining Steady Growth** that growth rate of investment should be equal to product of MPC ( $d$ ), and Productivity of Capital ( $\sigma$ ).

Notes

**Numerical Example:** Let  $\sigma$  be 20% per year,

$$d = 10\%$$

$$Y = \$ 200 \text{ billion a year}$$

Then we need an investment of

$$I = d \sigma k$$

to maintain a level of full employment steady economic growth rate.

$$I = 200 * 10 / 100 \text{ (because } \sigma k = Ys)$$

$$= 20 \text{ billions}$$

This will raise output by  $\sigma$ .

$$20 * 20\% = 4 \text{ billion.}$$

The relative rise in income will be equal to

$$\frac{Y^* \sigma^* d}{Y} = 200 * 20\% * 10\% / 200$$

$$= 20\% * 10\% = 2\%$$

Therefore, in order to maintain full employment in the economy, real output must increase by 2% p.a.

**Assumption of the Model**

The assumptions of the Domar Model are as follows:

1. MPC is constant; hence, income is determined by investment.
2. Employment is a function of utilization ratio i.e. the ratio between actual output and productive capacity.
3. Productive capacity can be increased by at a given ratio via past and present investment.



*Did u know?* Investment depends upon output growth and entrepreneur confidence.

**Policy Implication of the Model**

Sufficient investment is required to attain dual objective:

- (a) To utilize the resources of the economy fully.
- (b) To ensure that economy will be able to produce more in the future according to increased demand.

**Self-Assessment**

2. Multiple choice questions:

*Choose the correct option*

(i) The first fundamental equation of Harrod model is

- (a)  $GC = S$                       (b)  $GC = b$                       (c)  $GC = K$                       (d)  $GC = d$

(ii) The equation for warranted growth can be stated as

- (a)  $G = Gw$                       (b)  $GwCr = s$                       (c)  $Gw > Gn$                       (d)  $C > Cr$

(iii) ..... is the maximum growth rate that can be attained by an economy given the natural resources.

- (a) Natural growth rate    (b) Trade growth rate  
 (c) Critical growth    (d) Steady growth rate



**Notes**

2. With the increase in capacity the economy can produce greater output and greater employment, depending on the level of MPS.
3. There are three growth rates: Actual Warranted and Natural; the equality amongst the three ensures full employment of labour and capital stock.
4. The theory also explains trade cycles. When there is  $G > G_n$ , then there will be unemployed resources in the economy, hence, the economy will be in the recovery phase.  
When  $G = G_n$ , there will be full employment of resources.  
When  $G < G_n$ , there will be slump in the economy.
5. Business cycles are taken as deviations from the path of steady growth. These deviations cannot go on infinitely. There are constraints on 'upper' and 'lower' limit. Effective demand can't be more than full employment level, hence, full employment ceiling is the upper limit and effective demand can't be less than autonomous consumption. It acts as a lower limit. The actual growth rate fluctuates between these two limits.

**Limitations of the Model**

This model has been criticized on the following grounds:

1. Assumption of constant propensity to save and capital-output ratio is questioned by many economists. If these parameters change, there would be change in requirements of steady growth.
2. It is well known aspect that as an economy grows, there is change in the relative importance of the three sectors, namely, primary, secondary and tertiary.
3. HDM assumes the requirements of capital and labour per unit of output are constant i.e. capital-output ratio and labour-output ratios are constant. Actually, different factors of productions are not perfect substitutes but can be substituted for each other to a limited extent.
4. The HDM is worried about steady growth but is neglecting the rate of growth. However, the aim of developing countries is to increase rate of growth. Developed countries might take steady growth as an important objective but developing countries are not as bothered for stability as they are for the rate of growth.  
Rather, they would get willing to compromise stability to attain a higher rate of growth.
5. HDM model is nowhere incorporating the role of government in influencing the growth process in the economy as it is based on laissez-faire policy. Hence, it is not relevant for developing economies particularly those in which government is playing a dominating role like India and China.



Notes

HDM is constructed on basis of aggregates and can not show the inter-relations between the sectors and hence does not demonstrate structural changes.

**Self-Assessment**

3. State whether the following statements are 'true' or 'false'.
  - (i) The two models start differently but reach at similar conclusions.
  - (ii) In HDM, investment in the economy plays a single role.
  - (iii) There are three growth rates: Actual, warranted and natural
  - (iv) It is relevant for developing economies particularly those in which government is playing a dominating role like India and China.
  - (v) Effective demand Can't be more than full employment level.

## 4.6 Summary

- Two economists R.F. Harrod and E.D. Domar worked almost concurrently to develop this model of economic growth.
- HDM considered demand as well as supply side of the investment process and hence, integrated the classical and Keynesian analysis.
- If there is increase in productive capacity of the economy without parallel increase in real national income, it may lead to under-utilization of new capital, there may be lack of other factors of production or the new capital may be substituted for labour.
- R.F. Harrod showed through his model that steady growth rate may be achieved with fixed capital-output ratio and fixed propensity to save. He also explained the conditions that need to be fulfilled to maintain this steady growth rate.
- Warranted Growth Rate ( $G_w$ ): It is the growth rate which is attainable at full employment level.
- Investment in the economy affects AD as well as AS because on the one hand, investments increases productive capacity, and at the same time it generates income through multiplier effect.
- Equation derived above is the equation to be satisfied for steady rate of economic growth.

## 4.7 Key-words

- Growth : An increase in economic activity.
- Economic : Connected with the trade, industry and development of wealth of a country.
- Steady : Developing growing gradually and in an even and regular way.
- Equilibrium : a state of balance.

## 4.8 Review Questions

1. What is Harrod-Domar Growth model
2. How does the Harrod model explain the occurrence of trade cycles?
3. State the Conditions necessary for steady growth.
4. State the difference between Harrod Model and Domar model
5. What are the basic features of Harrod Domar Model of growth? Also state the limitations of the model.
6. What are policy implications of the HDM?

### Answer: Self Assessment

1. (i) E.D. Domar (ii) HDM (iii) growth (iv) employment  
(v) ratio
2. (i)  $a$  (ii)  $b$  (iii)  $c$  (iv)  $a$
3. (i) T (ii) F (iii) T (iv) F  
(v) T

Notes

## **4.9 Further Readings**



*Books*

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 5: Neo-Classical Growth Models

Notes

### CONTENTS

Objectives

Introduction

- 5.1 Production and Investment
- 5.2 A Basic Version
- 5.3 Fiscal Policy in the Neoclassical Growth Model
- 5.4 Generalizations of the Basic Neoclassical Growth Model
- 5.5 The Solow Model
- 5.6 Some Applications of the Neo-classical Model
- 5.7 Money in the Neo-classical Growth Model
- 5.8 Convergence and Poverty Traps
- 5.9 Summary
- 5.10 Keywords
- 5.11 Review Questions
- 5.12 Further Readings

### Objectives

The objectives of this unit can be summarized as below:

- to know about the solow model.
- to describe applications of the Neo-classical growth model money in the Neo-classical growth model.
- to understand the convergence and poverty traps.

### Introduction

Following the Lucas critique, macroeconomists have become much increasingly concerned with the microfoundations for their models and, in particular, with the **intrinsic dynamics** of consumption and investment decisions. One motivation for this is that, under rational expectations the short-run AS-AD model displays very little persistence in response to shocks and therefore does not provide a complete explanation for business cycles. Thus, microeconomic models of dynamics consumption choices and investment started to be built into the mainstream macroeconomic framework. In these notes, I will lay out the basics of these models but I will try to keep things as simple as possible. The cost to doing this is perhaps a loss in the degree of realism, but additional features (*e.g.* heterogeneity, borrowing constraints, etc.) can and have been added to address many of these concerns.

To start with it is useful to develop a simple, discrete time version of the neoclassical growth (Ramsey-Cass-Koopmans) model. This effectively extends the Solow growth model (which you should have come across before) by allowing for endogenous consumption-savings choices along the lines described earlier.

## 5.1 Production and Investment

There are three key assumptions :

- Output,  $Y_t$ , is produced using capital,  $K_t$ , and labour,  $L_t$ , according to a production function given by

$$Y_t = F(K_t, L_t)$$

It is assumed that the production function is increasing and concave in both  $K$  and  $L$ , and that it exhibits **constant returns to scale**. This means that if both inputs are doubled, output doubles. More generally, for any number  $\lambda > 0$ ,

$$F(\lambda K_t, \lambda L_t) = \lambda F(K_t, L_t) = \lambda Y_t.$$

One important example of such a production function is the Cobb-Douglas production function

$$Y_t = K_t^\alpha L_t^{1-\alpha},$$

where  $0 < \alpha < 1$ .

- Capital is subject to a constant rate of depreciation  $\delta$  per period, so that capital accumulates according to the process

$$\Delta K_t = K_{t+1} - K_t = I_t - \delta K_t.$$

Here  $I_t$  represents total new investment in fixed capital.

- The markets for labour and capital inputs are competitive, with all firms and factor owners being paid their marginal product. Given a wage per unit of labour,  $w_t$ , and a real rate of interest  $r_t$ , this implies that

$$\frac{\partial F}{\partial L} = w_t$$

and

$$\frac{\partial F}{\partial K} = r_t + \delta.$$

The second condition states that the marginal product of capital equal the **user cost of capital**. This is the opportunity cost of financing the capital investments of the firm rather than investing in the bond market, say, plus the depreciation of that capital. In the Cobb-Douglas case, these conditions are

$$(1-\alpha)K_t^\alpha L_t^{1-\alpha} = w$$

$$\alpha K_t^{\alpha-1} L_t^{1-\alpha} = r_t + \delta.$$

Notice that multiplying the first condition by  $L_t$  and the second by  $K_t$  gives

$$(1-\alpha)K_t^\alpha L_t^{1-\alpha} = wL_t$$

$$\alpha K_t^\alpha L_t^{1-\alpha} = (r_t + \delta)K_t.$$

Since  $Y_t = K_t^\alpha L_t^{1-\alpha}$ , it follows that  $\alpha$  is equal to the share of total output that is earned by capital owners and  $1-\alpha$  is the share going to labour. Both factors are owned by households (but the distribution of ownership need not be equal).

## Intensive Form

Notes

It is convenient to express things in “per worker” terms : this is often referred to as the intensive form. If we let  $\lambda = \frac{1}{L_t}$  then with constant returns to scale we have

$$F\left(\frac{K_t}{L_t}, 1\right) = \frac{1}{L_t} F(K_t, L_t) = \frac{Y_t}{L_t}$$

Now let  $y_t = Y_t/L_t$  and  $k_t = K_t/L_t$  and we can write this as

$$y_t = f(k_t) = F(k_t, 1).$$

In the Cobb-Douglas case we have

$$\frac{Y_t}{L_t} = \frac{K_t^\alpha L_t^{1-\alpha}}{L_t} = \left(\frac{K_t}{L_t}\right)^\alpha$$

or 
$$y_t = k_t^\alpha.$$

We can also express the input pricing conditions in per worker terms. In the Cobb-Douglas case these are

$$(1-\alpha)k_t^\alpha = w_t$$

$$\alpha k_t^{\alpha-1} = r_t + \delta$$

Note that the marginal product of capital is decreasing with the capital-worker ratio since  $\alpha - 1 < 0$ . Finally, we can express the capital accumulation process in per worker terms. If population and labour force growth is zero then this is just

$$\Delta k_t = k_{t+1} - k_t = i_t - \delta k_t.$$

where  $i_t = I_t/L_t$ .

## 5.2 A Basic Version

Here I will lay out a basic version of the model in discrete time which makes the following assumptions :

- The number of households,  $N_t$  is equal to the number of workers,  $L_t$ .
- Zero population growth so that the potential supply of workers is fixed at  $N$ .
- Labour and capital markets are competitive and clear every period. This means that  $L_t = N$  and that investment equals savings :  $i_t = y_t - c_t$ .
- There is no technical change.
- Households have identical CES utility functions
- Production is described by the Cobb-Douglas production function
- Household's are assumed to exist indefinitely, so that  $T \rightarrow \infty$
- The market discount factor from the perspective of time 0 is given by

$$D_t = \prod_{s=0}^t \left( \frac{1}{1+r_s} \right)$$

**Notes** Given these assumption, the competitive equilibrium can be described by a system of 7 equations:

$$y_t = c_t + i_t \quad \dots (1)$$

$$y_t = k_t^\alpha \quad \dots (2)$$

$$\Delta k_t = i_t + \delta k_t \quad \dots (3)$$

$$\frac{c_t}{c_{t-1}} = [\beta(1+r_t)]^\sigma \quad \dots (4)$$

$$\sum_{t=1}^{\infty} D_t c_t = k_1 + \sum_{t=1}^{\infty} D_t w_t \quad \dots (5)$$

$$r_t = \alpha k_t^{\alpha-1} - \delta \quad \dots (6)$$

$$w_t = (1-\alpha)k_t^\alpha \quad \dots (7)$$

This looks complicated, but notice that we can combine equation (1), (2) and (3) to get

$$\Delta k_t = k_t^\alpha - c_t - \delta k_t \quad \dots (8)$$

This equation shows how the change in the capital stock depends on the current stock and consumption. Also, we can combine (5) and (6) to get

$$\frac{c_t}{c_{t-1}} = [\beta(1+\alpha k_t^{\alpha-1} - \delta)]^\sigma$$

Subtracting 1 from both side gives

$$\frac{\Delta c_t}{c_{t-1}} = [\beta(1+\alpha k_t^{\alpha-1} - \delta)]^\sigma - 1 \quad \dots (9)$$

This equation shows how the growth in consumption depends on the time  $t$  capital stock. Notice that since  $\alpha - 1 < 0$ , consumption growth decreases with  $k_t$ . This is because when  $k_t$  increases, the interest rate falls due to diminishing returns to capital per worker, which induces households to raise their consumption today relative to tomorrow.

Equations (14) and (15) can be represented on a **phase diagram**. To do this we need to plot the combinations of consumption and capital such that  $\Delta k = 0$  and those for which  $\Delta c = 0$ .

- **The ( $\Delta k_t = 0$ ) locus** is given by

$$c_t = k_t^\alpha - \delta k_t$$

This relationship is illustrated in Figure 3 (where  $\dot{k} = \Delta k$ ). To understand its shape, note that the slope of this locus is given by

$$\frac{dc_t}{dk_t} = \alpha k_t^{\alpha-1} - \delta = \frac{\alpha}{k_t^{1-\alpha}} - \delta$$

When  $k_t$  is close to zero, the first term (the MP of capital) is very large, so the slope must be steep and positive. As  $k_t$  increases, the first term decreases, so that the slope declines and eventually

turns negative. The peak of this locus occurs where  $\frac{dc_t}{dk_t} = 0$ . That is where

$$\hat{k} = \left(\frac{\alpha}{\delta}\right)^{\frac{1}{1-\alpha}}$$

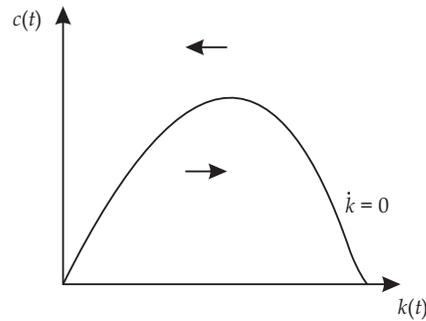


Figure 5.1:  $\Delta k = 0$  locus

What are the implied dynamics above and below this curve? Look at equation (14). Starting from values of  $c_t$  and  $k_t$  such that  $\Delta k_t = 0$ , suppose we increase  $c_t$ , holding  $k_t$  fixed. Then it must be the case that  $\Delta k_t < 0$ . This implication is illustrated by the leftward pointing arrow in Figure 1. Similarly, if we are below the curve,  $\Delta k_t > 0$ .

- The  $(\Delta c_t = 0)$  locus is given by

$$\beta(1 + \alpha k^{\alpha-1} - \delta) = 1$$

Solving for  $k_t$  this is

$$\alpha k_t^{\alpha-1} = 1/\beta - 1 + \delta$$

$$k^* = \left(\frac{\alpha}{1/\beta - 1 + \delta}\right)^{\frac{1}{1-\alpha}}$$

Thus, this locus can be represented as a vertical line at  $k^*$ . Note that since  $\beta = \frac{1}{1+\rho}$  (see above) we can also write this as

$$k^* = \left(\frac{\alpha}{\rho + \delta}\right)^{\frac{1}{1-\alpha}}$$

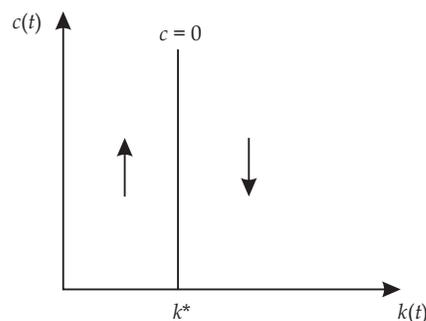


Figure 5.2:  $\Delta c = 0$  locus

Notes

What are the implied dynamics to the left and right of this curve? Look at equation (15). Starting from  $k^*$ , where  $\Delta c = 0$ , suppose we increase  $k_t$ . Since  $\alpha - 1 < 0$ , it follows that  $\Delta c_t < 0$ . This implication is illustrated by the downward pointing arrow in Figure 2. Intuitively, an increase in  $k$  causes the interest rate and hence consumption growth to fall. Similarly, to the left of  $k^*$ ,  $\Delta c_t > 0$ .

Figure 3 depicts the complete **phase diagram** for this neoclassical growth model. The arrows depict the combined forces on consumption and capital per worker implied by the Euler equation and the capital accumulation process. The intersection of the  $(\Delta c = 0)$  locus and the  $(\Delta k = 0)$  locus, S, represents the only combination of  $c_t$  and  $k_t$  such that there is no tendency for either to change over time. This is the unique **steady state** of the economy it is given by the combination  $(c^*, k^*)$  which satisfies

$$k^* = \left( \frac{\alpha}{\rho + \delta} \right)^{\frac{1}{1-\alpha}}$$

$$c^* = k^{*\alpha} - \delta k^*$$

Note that as shown in Figure 3 the  $(\Delta c = 0)$  intersects the  $(\Delta k = 0)$  locus to the left of the peak.

Note that this must be the case since  $k^* < \hat{k}$ . Consequently, long run optimal consumption in the steady state is below its feasible maximum. How can this be optimal if utility is increasing in consumption? The reason is that households discount the future (at rate  $\rho$ ) and therefore always want to consume more in the short-run. In doing so, they invest less and accumulate less capital, which restricts their long run consumption.

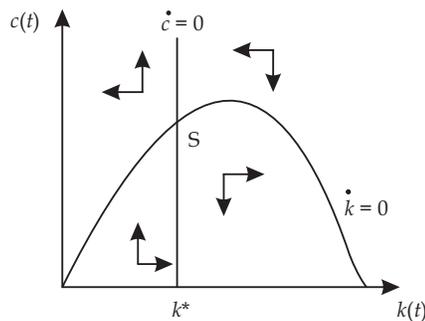


Figure 5.3 : Phase Diagram

**Transitional Dynamics**

Is it the case that if we start away from this steady state, that the economy will converge back to it? To determine this we need to explore the economy's **transitional dynamics**. To understand these dynamics it is important to note a key distinction between consumption and capital. Capital,  $k_t$  is a **state variable** – although it can be accumulated or decumulated over time, at any point in time it is **pre-determined** by past investments. Consumption  $c_t$  on the other hand is a **jump variable** – it is not restricted to any particular value by things that have been done in the past, and can always be adjusted immediately to reflect new information regarding a household's future wealth (whereas  $k_t$  can't). Suppose we start with some capital stock,  $k_0$ . While the Euler equation tells us how consumption should optimally

grow from period to period, it does not pin down the initial level,  $c_0$ . So what value of  $c_0$  should households choose ?

Notes

So far, we have not imposed the **intertemporal budget constraint** (11) on the household. However, we know that this must be satisfied, and it is this additional equation which pins down the initial value of  $c_0$ . If consumption levels are too high, the household will be consuming more than its wealth, if they are too low, it will be consuming too little. In fact, given the Euler equation and the capital accumulation process, there is *only one* value of  $c_0$  that satisfies the budget constraint and it is the one that places the economy on a trajectory towards the steady state. To understand this, consider Figure 4.

Given  $k_0$ , suppose that households were to choose an initial consumption level like that at A. From this point, according to the implied dynamics, consumption would grow and capital would decumulate over time. Eventually, it would become negative and consumption would grow indefinitely. This makes no sense. It implies that the households present value of consumption exceeds its wealth and so is inconsistent with the household budget constraint. Similarly, from a point like B, although  $k$  would initially rise eventually we enter the same dynamic region as A and the budget constraint is violated. At the opposite extreme, suppose we start with a very low level of consumption like that at C. Eventually, as shown, this economy crosses the  $\Delta c = 0$  locus and the implied dynamics push it away from the steady state. The economy eventually would reach a situation with zero consumption, even though the capital stock (and output) is positive. This corresponds to households being well inside their budget constraint, and cannot be optimal.

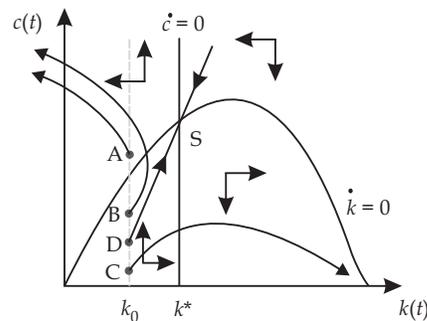


Figure 5.4: Transitional Dynamics

There is however, a unique level of consumption that places the economy at D. From this point, the implied dynamics push the economy towards the steady state. This is the only situation which is consistent with the budget constraint because it implies that in the long run consumption is exactly equal to output (less depreciation). Any other initial consumption level will imply a violation of the budget constraint. The unique path towards the steady state is known as the **saddlepath trajectory**, and the economy must always be on it. Note that we can make similar arguments starting from a capital stock above  $k^*$  to derive a similar saddlepath above and to the right of S.

### Formal Analysis of Log-Linearized Model

The non-linear system describing the dynamics of the model can be expressed as

$$c_t = k_t^\alpha + (1 - \delta)k_t - k_{t+1} \quad \dots (10)$$

$$\left( \frac{c_t}{c_{t-1}} \right)^{\frac{1}{\sigma}} = \beta (1 + \alpha k_t^{\alpha-1} - \delta) \quad \dots (11)$$

**Notes** Recall that the steady state is described by

$$c^* = k^{*\alpha} - \delta k^*$$

$$1 = \beta [\alpha k^{*\alpha-1} + (1-\delta)]$$

We want to express the model in terms of log-deviations around the steady state

$$\hat{c}_t = \ln c_t - \ln c^*$$

$$\hat{k}_t = \ln K_t - \ln k^*$$

Note that if the log-deviation for any variable  $x$  is small, we can linearize using the rule :

$$x_t = e^{\hat{x}_t} x^* \approx (1 + \hat{x}_t) x^*$$

We can now proceed to linearize the system :

Aggregate resource constraint

$$(1 + \hat{c}_t) c^* = (1 + \alpha \hat{k}_t) k^{*\alpha} + (1 - \delta)(1 + \hat{k}_t) k^* - (1 + \hat{k}_{t+1}) k^*$$

$$\hat{c}_t c^* = \alpha \hat{k}_t k^{*\alpha} + (1 - \delta) \hat{k}_t k^* - \hat{k}_{t+1} k^*$$

$$\hat{c}_t c^* = (\alpha k^{*\alpha-1} + 1 - \delta) k^* \hat{k}_t - k^* \hat{k}_{t+1}$$

$$\hat{c}_t = \frac{k^*}{\beta c^*} \hat{k}_t - \frac{k^*}{c^*} \hat{k}_{t+1}$$

Euler equation :

$$1 + \frac{1}{\sigma} (\hat{c}_t - \hat{c}_{t-1}) = \beta \left( (1 + (\alpha - 1) \hat{k}_t) \alpha k^{*\alpha-1} + 1 - \delta \right)$$

$$\frac{1}{\sigma} (\hat{c}_t - \hat{c}_{t-1}) = \beta \left( (\alpha - 1) \hat{k}_t \right) \alpha k^{*\alpha-1}$$

$$\hat{c}_t - \hat{c}_{t-1} = -\sigma (1 - \beta(1 - \delta)) (1 - \alpha) \hat{k}_t$$

The log-linearized system is then :

$$\hat{c}_t = \frac{k^*}{\beta c^*} \hat{k}_t - \frac{k^*}{c^*} \hat{k}_{t+1} \quad \dots (1')$$

$$\hat{c}_t - \hat{c}_{t-1} = -\sigma (1 - \beta(1 - \delta)) (1 - \alpha) \hat{k}_t \quad \dots (2')$$

**Solution : The Method of Undetermined Coefficients**

The solution to this linear system of equations must take the form :

$$\hat{k}_{t+1} = a_1 \hat{k}_t$$

$$\hat{c}_t = a_2 \hat{k}_t$$

That is, each endogenous variable in time  $t$  is a linear function of the state variable  $\hat{k}_t$ . Note in particular, that for this system to satisfy the transversality condition (*i.e.* converge to the steady state),

$\hat{k}_t$  must converge to zero. That is, we must have  $a_1 < 1$  (this is the way the intertemporal budget constraint is imposed). We need to solve for the 2 unknown parameters ( $a_1, a_2$ ).

Substituting these posited solutions into the resource constraint we get

$$a_2 k_t = \frac{k^*}{\beta c^*} k_t - \frac{k^*}{c^*} a_1 k_t$$

This implies the unknown parameters must satisfy :

$$a_2 = \frac{k^*}{\beta c^*} - \frac{k^*}{c^*} a_1 \quad \dots (12)$$

From the Euler equation we have

$$a_2 \hat{k}_t - a_2 \hat{k}_{t-1} = -\sigma(1 - \beta(1 - \delta))(1 - \alpha) \hat{k}_t$$

$$a_2 \hat{k}_t - \frac{a_2}{a_1} \hat{k}_t = -\sigma(1 - \beta(1 - \delta))(1 - \alpha) \hat{k}_t$$

This tells us that the unknown parameters must satisfy :

$$a_2 - \frac{a_2}{a_1} = -\sigma(1 - \beta(1 - \delta))(1 - \alpha) \quad \dots (13)$$

This gives us 2 equations in 2 unknowns (12) and (13). Substituting out  $a_2$  we get

$$\frac{k^*}{\beta c^*} - \frac{k^*}{c^*} a_1 - \frac{1}{a_1} \frac{k^*}{\beta c^*} + \frac{k^*}{c^*} = -\sigma(1 - \beta(1 - \delta))(1 - \alpha) \quad \dots (14)$$

Multiplying through by  $a_1 \frac{c^*}{k^*}$  and re-arranging, this can be written as

$$a_1^2 - \gamma a_1 + \frac{1}{\beta} = 0$$

where

$$\gamma = 1 + \frac{1}{\beta} + \sigma \left( \frac{1}{\beta} - (1 - \delta) \right) (1 - \alpha) \frac{c^*}{k^*} > 1$$

Solving the quadratic equation for  $a_1$  yields

$$a_1 = \frac{\gamma \pm \sqrt{\gamma^2 - \frac{4}{\beta}}}{2}$$

$$a_1 = \frac{\gamma}{2} \pm \sqrt{\left(\frac{\gamma}{2}\right)^2 - \frac{1}{\beta}}$$

Note that the product of these two (positive) roots is  $\frac{1}{\beta} > 1$ . It follows that the larger one must exceed

1, and so only the smaller one can possibly satisfy the convergence condition that  $a_1 < 1$ .

It follows that

Notes

$$\hat{a}_1 = \frac{\gamma}{2} - \sqrt{\left(\frac{\gamma}{2}\right)^2 - \frac{1}{\beta}}$$

Given this value of  $\hat{a}_1$  we can go back and solve for  $\hat{a}_2$  :

$$\hat{a}_2 = \frac{k^*}{\beta c^*} - \frac{k^*}{c^*} \hat{a}_1$$

Note that the value of  $\hat{a}_1$  dictates the rate at which  $k$  converges to the steady state. The closer it is to 1 the more slowly the system converges.

**A Simple Parameterization**

For annual data, typical parameter values are  $\alpha = 0.36$ ,  $\delta = 0.08$ ,  $\beta = 0.96$  and  $\sigma = 1$ . It follows that

$$k^* = \left(\frac{0.36}{0.04 + 0.08}\right)^{1.56} = 3^{1.56} = 5.55$$

$$c^* = (5.55)^{0.36} - 0.44 = 1.41$$

and so

$$\gamma = 1 + 1.04 + (1.04 - 0.92) (0.64) \frac{1.41}{5.55} = 2.06$$

Thus

$$\hat{a}_1 = \frac{2.06}{2} - \sqrt{\left(\frac{2.06}{2}\right)^2 - 1.04} = 0.88$$

and

$$\hat{a}_2 = \frac{5.55}{1.41} (1.04 - 0.88) = 0.63$$

**5.3 Fiscal Policy in the Neoclassical Growth Model**

**A Balanced – Budget Increase in Government Consumption**

Suppose the government buys output of  $g_t$  per capital at time  $t$ . Assume that this government spending does not affect utility from private consumption nor does it affect future output (these are simplifying assumption, which could in principle be relaxed). The purchases are financed by **lump – sum** taxes equal to  $T_t$  – these taxes are independent of how much the household saves and do not affect labour supply conditions.<sup>1</sup> For now, we will assume that the government balances its budget every period and has no outstanding debt. It follows that

$$T_t = g_t.$$

Investment is then the difference between output,  $k_t^\alpha$ , and the sum of private consumption,  $c_t$ , and government spending,  $g_t$ . It follows that the capital accumulation equation becomes

$$\Delta k_t = k_t^\alpha - c_t - g_t - \delta k_t.$$

Consequently, the ( $\Delta k = 0$ ) locus becomes

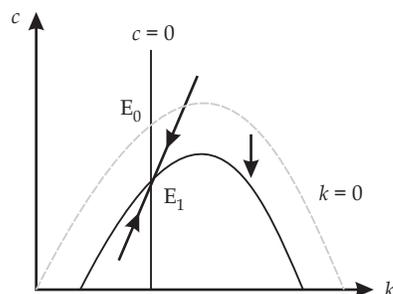
$$c_t = k_t^\alpha - g_t - \delta k_t.$$

Because these taxes are not imposed on the returns to saving (see below), the Euler equation will be unaffected, but the household's intertemporal budget constraint becomes

$$\sum_{t=1}^T D_t c_t = A_1 + \sum_{t=1}^T D_t (w_t - g_t).$$

That is household wealth falls by an amount equal to the present value of future government spending (equal to taxes).

To understand the consequences of this, suppose that  $g_t$  is initially zero and then increases permanently to a constant level  $g$ . Then the ( $\Delta k = 0$ ) locus shifts down by amount equal to  $g$  (for a given value of  $k$ ,  $c_t$  must fall by  $g$  in order for  $\Delta k$  to stay equal to zero.) This is illustrated in Figure 5. Clearly, the steady state of the economy shifts down from  $S_1$  to  $S_2$ , implying a lower long run consumption level. But what does the transition path look like? We know that, in order to satisfy the intertemporal budget constraint, households **must** be on the saddlepath through  $S_2$  once  $g_t$  has increased. However, at the time when the policy is changed,  $k$  is predetermined (it is a state variable), so the only way to get to the saddlepath is if consumption falls immediately by the full amount of the increase in government spending. In other words, there is no gradual transition and private consumption is **completely crowded out** by public consumption.



**Figure 5.5** : Permanent Increase in Government Spending

Note that, in contrast to the static Classical model, the real interest rate remains the same since  $k$  does not change. Here, private consumption falls due to a pure wealth effect – the increase in  $g$  causes wealth to fall and the optimal way for households to respond is by lowering consumption immediately in proportion. The reason this is optimal is because with no change in  $r$ , consumption growth should remain unchanged (according to the Euler equation), so the initial level must fall in exact proportion to the fall in wealth.

### Debt versus Tax Financing

Suppose now that the government can issue bonds (and thereby incur a debt) in order to finance any shortfall between  $g_t$  and  $T_t$ . Correspondingly whenever its **primary surplus**,  $T_t - g_t$ , exceeds the interest payments on its debt the government can pay down its existing debt,  $B_t$  (*i.e.* buy back bonds). It follows that the dynamic budget constraint faced by the government is given by

$$B_{t+1} = (1 + r) B_t + g_t + T_t.$$

Notes

We will impose the constraint that the public debt is **sustainable**. This amounts to saying that future surpluses must be sufficient to payoff the current debt load and the interest accruing on it.

Alternatively, this implies that there should be no debt beyond the planning horizon, *i.e.* the boundary condition  $B_{T+1} = 0$  must hold. As we did with the households budget constraints, we can summarize this in the form of an **intertemporal budget constraint** :

$$\sum_{t=1}^T D_t g_t = -B_1 + \sum_{t=1}^T D_t T_t .$$

where  $D_t$  is the market discount factor. This can also be written as

$$\sum_{t=1}^T D_t (T_t - g_t) = B_1. \quad \dots (15)$$

Bonds are an asset from the perspective of private households. If they are to hold them then they must at least pay the same rate of return as capital. Thus, the best the government can do is set the interest rate on bonds equal to  $r_t$ . Since  $A_t = k_t + B_t$ , it follows that the household's budget constraint can be expressed as

$$\sum_{t=1}^T D_t c_t = k_1 + B_1 + \sum_{t=1}^T D_t (w_t - T_t)$$

Substituting for the initial debt level,  $B_1$ , using (16) we can write this as

$$\begin{aligned} \sum_{t=1}^T D_t c_t &= k_1 + \sum_{t=1}^T D_t (T_t - g_t) + \sum_{t=1}^T D_t (w_t - T_t) \\ \sum_{t=1}^T D_t c_t &= k_1 + \sum_{t=1}^T D_t (w_t - g_t) \end{aligned}$$

But this is identical to the household budget constraint under period-by-period balanced budgets. In other words whether or not a given path of government consumption is financed by taxation or debt, as long as the government's intertemporal budget constraint is satisfied, the household's wealth is identical. That is, along as the debt is sustainable (and the rate of interest on debt is the same as on capital), the timing of taxation is irrelevant and the size of the debt is of no consequence. This implication was first hypothesized by the classical economist David Ricardo and is known as **Ricardian equivalence**. Consequently, the effect of an increase in  $g$  is identical to that illustrated in Figure 5.

It should be recognized that pure Ricardian equivalence is rather extreme and rests upon some very strong assumptions, such as the indefinite planning horizons of households, no uncertainty, perfect capital markets and full information. It is possible to generalize the basic model to account for some of these factors. Nevertheless, the basic qualitative nature of the result is still important : that due to the wealth effects of the implied future taxation, debt-financed increments in expenditure may reduce current consumption, even if current disposable income is unchanged.

**Distortionary Taxation of Capital**

Suppose that, instead of a lump-sum taxation, the government finances its spending through a proportional capital income tax at rate  $\tau$ . In order to focus, exclusively on the effects of the distortion, assume that the revenue from the tax is remitted back to households in lump-sum fashion. This implies that their overall income remains unchanged, so that the ( $\Delta k = 0$ ) locus does not shift down. The impact of the distortionary tax is then to lower the after-tax return earned by households on their savings, for a given capital stock. The after tax interest rate (assuming depreciation is tax-deductible) is then

$$\tilde{r}_t = (1-\tau)\alpha k_t^{\alpha-1} - \delta$$

Substituting this into the household's Euler equation therefore gives

$$\frac{\Delta c_t}{c_{t-1}} = \left[ \beta(1-\delta + (1-\tau)\alpha k_t^{\alpha-1}) \right]^\sigma - 1.$$

Setting this equal to zero yields the ( $\Delta c = 0$ ) locus give by

$$\beta(1-\delta + (1-\tau)\alpha k_t^{\alpha-1}) = 1$$

$$\Rightarrow k^* = \left( \frac{\alpha(1-\tau)}{1/\beta - 1 + \delta} \right)^{\frac{1}{1-\alpha}}.$$

Clearly, from this equation, an increase in the tax rate causes the long-run capital stock to decrease, shifting the ( $\Delta c = 0$ ) locus to the left.

The effect of the tax is illustrated in Figure 6. The steady state shifts from  $E_1$  to  $E_2$ , so that in the long run, the increased tax results in a lower capital stock and lower consumption per capita. However, since capital cannot adjust instantaneously, the initial impact will be to cause consumption to rise to A on the saddlepath towards  $E_2$ . As we have seen, this must be the case if the household satisfies its budget constraint. This short-run impact occurs because households start to save less of their income in response to the tax on the returns to saving. With a the resulting lower level of investment, over time both capital and consumption decline along the saddlepath until we reach the new steady state.

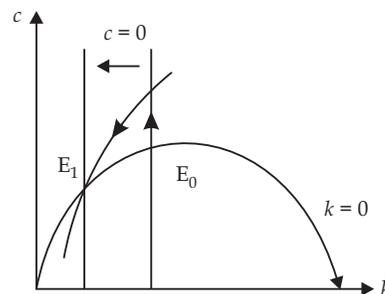


Figure 5.6: A Tax on Capital Income

## 5.4 Generalizations of the Basic Neoclassical Growth Model

It is straightforward to generalize the basic neoclassical growth model discussed above to allow for population growth and ongoing technical change. We have abstracted from these forces because our focus in this course is on short-run fluctuations. However, once the model has been adapted in the ways described below, it can also be used to think about issues of long-run growth.



*Did u know?* Productivity of physical capital which is measured by profit, remains constant in the long run.

Notes

### 5.5 The Solow Model

*Assumptions of the Solow Model*

1. The simplifying assumption of the model is that the economy produces one composite good which can either be consumed or accumulated as a stock of capital. No denial to the fact that many goods are produced in the economy but only for simplicity sake, it has been assumed that one composite or aggregate good is produced.
2. All labour is assumed to be homogeneous.
3. Stock which is accumulated in the past (referred to as capital) and labour are the factors of production in the production function.
4. Constant returns to scale are assumed to prevail, i.e. any given percentage change in inputs brings forth equal increase in output.
5. MPS is constant. And Savings =  $sY$ , where  $s$  is MPC.
6. Labour force is increasing at a growth rate which is exogenously determined.
7. It is a closed economy.
8. It is a laissez faire economy with no interference of the government.

*Structure of the Model*

Aggregate output function is given by :

$$Y = F(K,L)$$

We have assumed constant returns to scale, then if  $K$  and  $L$  are increased by  $a$ ,

$$\therefore Y = F [aK, aL] \text{ for } a > 1$$

Then, 
$$\frac{Y}{L} = F \left[ \frac{K}{L}, \frac{L}{L} \right]$$

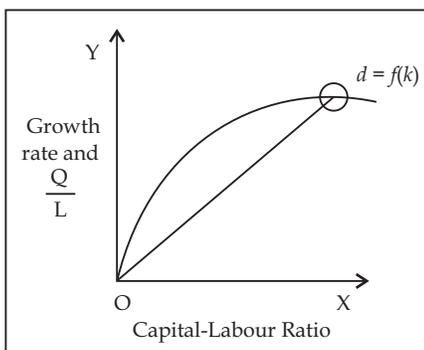
$$\frac{Y}{L} = F \left[ \frac{K}{L}, 1 \right]$$

If  $\frac{Y}{L}$  is denoted by  $Y$  and  $\frac{K}{L}$  by  $K$  then

$$Y = f(k,1)$$

$$Y = f(k)$$

The above relationship can also be depicted graphically.



The slope of the curve is  $OD = \frac{Q/L}{K/L} = \frac{Q}{K}$

This is capital output ratio denoted by.

### Equilibrium Growth

$K = K/L$  Using logarithms

$$\ln(k) = \ln\left(\frac{K}{L}\right)$$

$$\ln k = \ln \frac{K}{L}$$

or  $\ln k = \ln k - \ln L$

Differentiating the eqn. w.r.t. time

$$\frac{d}{dt} (\ln k) = \frac{d}{dt} (\ln k) - \frac{d}{dt} \cdot \frac{1}{L} (\ln L)$$

$$\frac{dk}{dt} \cdot \frac{1}{k} = \frac{dk}{dt} \cdot \frac{1}{k} - \frac{dL}{dt} \cdot \frac{1}{L} (\ln L)$$

or  $k = K-L$

...(2)

$$\left[ \frac{dk}{dt} = \text{Investment} \right]$$

### At Equilibrium Level

Savings = Investment

$$s = sy$$

$$l = \frac{dk}{dt}$$

$$\therefore \frac{dk}{dt} = sy$$

The second term in eqn. (2) on R.H.S shows the proportional growth rate of labour. If we denote it by  $n$  then,

$$\hat{k} = \frac{sY}{K} - n$$

Dividing  $Q$  and  $k$  by  $L$ . we get

$$K = \frac{sf(k)}{k} - n \quad \dots(A)$$

Equation A is fundamental equation of the Solow Model

When  $\hat{k} = 0$ , then there is equation in the economy

Notes

$$\dot{k} = \frac{sf(k^*)}{k^*} - n$$

Putting

$$K = 0$$

$$0 = \frac{sf(k^*)}{k^*} - n$$

$$\frac{sf(k^*)}{k^*} = n$$

Where an \* above  $k$  denotes its equilibrium value. Which is here

$$\frac{dk}{dt} \cdot \frac{1}{k} = 0$$

or

$$\frac{dk}{dt} = 0$$

The equilibrium  $q$  value is obtained as:

$$q^* = f(k^*) = \frac{nk^*}{s}$$

or

$$sq(k^*) = NK^*$$

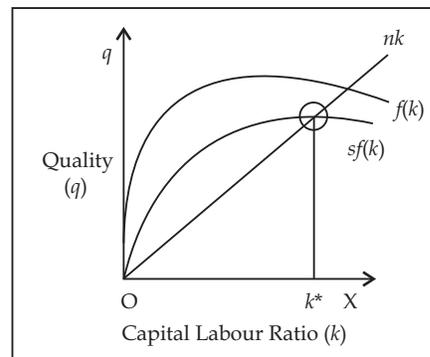
It is shown with the help of following diagram.

At any point to the left of  $k^*$

$$\frac{sf(k)}{k} > n$$

and at any point to the right of  $k^*$

$$\frac{sf(k)}{k} < n$$



Hence, the equilibrium condition in the Solow Model are

$$\frac{f(q)}{Q} = \frac{q}{Q} = \frac{Q/L}{K/L} \cdot \frac{Q}{K} = \frac{1}{V^*}$$

where  $V$  is capital-output ratio

**Consumption in the Solow Model**

In a two sector economy, National income is in equilibrium

where  $AD = AS$

$$C + I = Y$$

(1)

Where

$$Y = \text{National Income}$$

$$C = \text{Consumption}$$

$$I = \text{Investment}$$

Dividing both sides by  $L$

$$\frac{Y}{L} = \frac{C}{L} + \frac{I}{L}$$

It is explained before that  $\frac{Y}{L} = y = f(k)$

So  $f(k) = \frac{C}{L} + \frac{1}{L}$

Since we are assuming

$$K = I$$

Where  $K = \text{Net investment}$

$$I = \text{Gross Investment}$$

i.e. Depreciation = 0

$$\therefore \frac{Y}{L} = \frac{C}{L} + \frac{K}{L} \quad \dots(1)$$

Let us assume  $k = \frac{K}{L}$  where  $k$  is capital-labour ratio

$$\Rightarrow \frac{dk}{dt} \cdot \frac{1}{k} = \frac{dk}{dt} \cdot \frac{1}{k} - \frac{dl}{dt} \cdot \frac{1}{L}$$

$$\text{or} \quad \hat{k} = \hat{k} - L$$

when  $\hat{\phantom{x}}$  denotes proportional growth rate.

Dividing both sides by  $L$

$$\frac{\hat{K}}{L} = \frac{\hat{K}}{L} - \frac{\hat{L}}{L}$$

$$\frac{K}{L} = k + nk$$

$$\dots(2)$$

Putting equations (2) in (1)

$$\therefore F(k) = \frac{C}{L} + k + nk$$

## Self-Assessment

1. Fill in the blanks

- (i) All labour is assumed to be .....
- (ii) Constant returns to scale are assumed to prevail, any given percentage change in ..... brings forth equal increase in output.
- (iii) In Harrod domar model capital output ratio is an ..... variable.
- (iv) In solow model there is along ..... that capital output ratio can take.
- (v) The simplifying assumption of the model is that the economy produces one ..... good which can either be consumed or accumulated as a stock of capital.

Notes

## 5.6 Some Applications of the Neo-classical Model

### Depreciation of Capital Stock

If there is no depreciation at all,

Gross Investment = Net Investment

$$\text{or } I = K$$

If capital depreciates at say

a%, we can say

$$I = K + aK$$

where I = Gross Investment

$k$  = Net Investment

$a$  = Rate of depreciation

Dividing both sides by  $L$ , we get

$$\frac{I}{L} = \frac{K}{L} + \frac{ak}{L}$$

$$\frac{I}{L} = \frac{K}{L}(1 + a)$$

(2)

We know that

$$\frac{K}{L} = k + nk. \text{ (divided in the structure of Solow Model)}$$

Substituting this equation (2)

$$\frac{I}{L} = k + nk + ak$$

$$\frac{I}{L} = k + (n + a)k$$

...(3)

Since in equilibrium,

$$S = I$$

$\frac{I}{L}$  can be written as  $\frac{S}{L}$  which is denoted as  $sf(k)$

∴ Putting these values in equation (3), we get

$$sf(k) = k + (n + a)k$$

$$\text{or } k = \frac{sf(k)}{k} - (n + a)k$$

$$\text{or } \frac{k = sf(k)}{k} - (n + a)$$

This is equation for depreciation of capital stock. Actually, it is only the modification of fundamental equation of the Solow Model.

### Variable Savings Rate

Solow Model does not assume saving rate to be constant. In Solow model, as savings increase from  $s_1$ , to  $s_2$ , it leads to increase in  $sf(k)$  and hence  $sf(k)$  curve shifts upward. It causes a newer point of

intersection between  $sf(k)$  and  $nk$ . At new equilibrium point,  $k$  and  $y$  both will increase. At higher rates of savings, the economy will have a large capital stock and output. But increase in savings will increase the output per person only temporarily.

Many economists have emphasized that nations should raise their savings to stimulate the rate of economic growth. This is called Solowian Paradox of Thrift. In order to bring a permanent increase in growth rate, we need to work on improvement of technology.

Notes



Notes

Solow's Model is indicating that a permanent change in savings rate i.e. MPC has only temporary effect on the economy's Growth Rate.

### Population Growth

Population is an asset as well as a liability. Solowian model is also used to explain the effect of increase in population on growth rate.

If in an economy, population is increasing, at a rate denoted by  $n$ , it will increase the number of workers available and hence, capital per worker i.e.  $k$  will fall.

We know that

$$\Delta k = sf(k) - nk$$

So, an increase in population ( $n$ , the level, not rate) reduces  $k$ .

Now if there is change in the rate of population itself, say, population increases from  $n_0$  to  $n_1$  then  $n_k$  line will tilt upwards. New equilibrium will be at to the left of previous equilibrium point. This will cause  $k$  to fall. As it has been explained earlier,  $y = f(k)$ , a reduction in  $k$  will reduce  $y$  as well. Therefore, a developing country must take care that population does not increase too much in order to maintain full employment equilibrium.

### Self-Assessment

2. Multiple choice questions:

Choose the correct option.

(i)  $\frac{K = sf(k)}{k} - (n + a)$  is the equation for depreciation of.

(a) Capital stock (b) fundamental stock (c) basic stock (d) Free stock

(ii) ..... is an asset as well as a liability.

(a) Economy (b) population (c) equilibrium (d) productivity

(iii) Many economists have emphasized that nations should raise their savings to stimulate the rate to .....

(a) economic stability (b) economic balance  
(c) economic growth (d) economic structure

## 5.7 Money in the Neo-classical Growth Model

The role of money in neoclassical growth model is explained by James Tobin in his paper published in 1965.

He made use of Fisher's Simple Quantity Theory of money Equation  $MV = PY$  and made following assumptions:

(a) Velocity of money is constant.

Notes

- (b) Growth in money = inflation rate - growth in nominal GDP

M = money stock;

Y is growth of output

According to Tobin, if A is real wealth to be held in the form of two assets, real money (M/P), and physical capital (K) M/P is real money balances in such a proportion that

$$A = \alpha (M/P) + (1 - \alpha)K$$

Where  $0 < \alpha < 1$

Tobin exclaimed that people make a comparison between R (real rate of return) and Marginal productivity of capital. So, during inflation, people hold less of real money and more of K, opposite will happen during recession.

## 5.8 Convergence and Poverty Traps

### Convergence

Solow Model claims that over a long period of time, all nations of the world would tend to converge towards same rate of growth. It is referred to as convergence.

Following reasons are given for convergence:

- (a) Since rate of return on capital is higher in countries where capital is relatively scarcer, hence, capital will flow from the developed countries to developing and under-developed countries.
- (b) As capital will move from developed countries to developing and under-developed countries, the incomes of poorer countries will also increase.



Notes

Solow model claims that all countries attain balanced growth path in the long run, it would converge.

### Types of Convergence

- (a) **Absolute Convergence:** It states that if  $n$  number of countries have access to same technology, have same saving ratio, same population growth rate but different capital output ratio, then all countries would converge to same level of equilibrium steady growth rate. It is so because capital output ratio will be higher in poor country and hence, capital and output in poor country will grow at a rate faster than the rate of growth of population. While, capital and output in rich country will grow at a rate slower than the rate of growth of population. It implies that the poor country will grow at a faster rate than rich country. The gap between two countries will narrow down.

Empirical evidence has not supported the existence of absolute convergence. So, the concept of conditional convergence came into the picture.

- (b) **Conditional Convergence:** Conditional convergence states that if  $n$  number of countries has access to same technology, same population growth rate but different saving ratios and capital labour ratio, then there will still be convergence at same growth rate but equilibrium capital-output may or may not be equal. This is so because of paradox of savings which states that a permanent change in savings rate i.e. MPC has only temporary effect on the economy's growth rate. In real life scenario, even conditional convergence is not observed because different countries have different population growth rates.

In order to examine the validity of the unconditional convergence, a well known study was conducted by Baumol, which should have shown inverse relationship between initial per capita level and growth rate of per capita income to prove that conditional convergence actually

operates. But, Baumol found a regression which showed almost perfect convergence.

Baumol's findings were challenged by Bradford De Long on two grounds: (a) Sample selection was biased; (b) there was measurement error in the findings.

Notes

### *Poverty Traps*

A poverty trap is "any self-reinforcing mechanism which causes poverty to persist." If it persists from generation to generation, the trap begins to reinforce itself if steps are not taken to break the cycle.

A mechanism which makes it very difficult for people to escape poverty. A poverty trap is created when an economic system requires a significant amount of various forms of capital in order to earn enough to escape poverty. When individuals lack this capital, they may also find it difficult to acquire it, creating a self-reinforcing cycle of poverty.

In the developing world, many factors can contribute to a poverty trap, including: limited access to credit and capital markets, extreme environmental degradation (which depletes agricultural production potential), corrupt governance, capital flight, poor education systems, disease ecology, lack of public health care, war and poor infrastructure.

Jeffrey Sachs, in his book *The End of Poverty*, discusses the poverty trap and prescribes a set of policy initiatives intended to end the trap. He recommends that aid agencies behave as venture capitalists funding start-up companies. Venture capitalists, once they choose to invest in a venture, do not give only half or a third of the amount they feel the venture needs in order to become profitable; if they did, their money would be wasted. If all goes as planned, the venture will eventually become profitable and the venture capitalist will experience an adequate rate of return on investment. Likewise, Sachs proposes, developed countries cannot give only a fraction of what is needed in aid and expect to reverse the poverty trap in Africa. Just like any other start-up, developing nations absolutely must receive the amount of aid necessary (and promised at the G-8 Summit in 2005) for them to begin to reverse the poverty trap. The problem is that unlike start-ups, which simply go bankrupt if they fail to receive funding, in Africa people continue to die at a high rate due in large part to lack of sufficient aid.

Sachs points out that the extreme poor lack six major kinds of capital: human capital, business capital, infrastructure, natural capital, public institutional capital, and knowledge capital. He then details the poverty trap:

The poor start with a very low level of capital per person, and then find themselves trapped in poverty because the ratio of capital per person actually falls from generation to generation. The amount of capital per person declines when the population is growing faster than capital is being accumulated ... The question for growth in per capita income is whether the net capital accumulation is large enough to keep up with population growth.

Sachs argues that sufficient foreign aid can make up for the lack of capital in poor countries, maintaining that, "If the foreign assistance is substantial enough, and lasts long enough, the capital stock rises sufficiently to lift households above subsistence."

Sachs believes the public sector should focus mainly on investments in human capital (health, education, nutrition), infrastructure (roads, power, water and sanitation, environmental conservation), natural capital (conservation of biodiversity and ecosystems), public institutional capital (a well-run public administration, judicial system, police force), and parts of knowledge capital (scientific research for health, energy, agriculture, climate, ecology). Sachs leaves business capital investments to the private sector, which he claims would more efficiently use funding to develop the profitable enterprises necessary to sustain growth. In this sense, Sachs views public institutions as useful in providing the public goods necessary to begin the Rostovian take-off model, but maintains that private goods are more efficiently produced and distributed by private enterprise. This is a widespread view in neoclassical economics.

Several other forms of poverty trap are discussed in the literature, including nations being landlocked with bad neighbors; a vicious cycle of violent conflict; subsistence traps in which farmers wait for middlemen before they specialize but middlemen wait for a region to specialize first; working capital traps in which petty sellers have inventories too sparse to earn enough money to get a bigger inventory;

Notes

and low skill traps in which workers wait for jobs using special skill but firms wait for workers to get such skills.



Task What is poverty traps.

**Self-Assessment**

1. State whether the following statements are ‘true’ or ‘false’.
  - (i) The role of money in neoclassical growth model is explained by James Tobin in his paper published in 1965.
  - (ii) Trbin made use of Fisher’s simple quantity theory of money equation  $Mv = PX$
  - (iii) Empirical evidence has supported the existence of absolute convergence.
  - (iv) In real life scenario, even conditional convergence is not observed because different countries have same population growth rates.
  - (v) Neo-classical Model assumes that population is a factor which is exogenously determined at a rate denoted by  $n$ .

**5.9 Summary**

- Population is an asset as well as a liability. Solowian model is also used to explain the effect of increase in population on growth rate.
- The role of money in neoclassical growth model is explained by James Tobin in his paper published in 1965.
- Tobin exclaimed that people make a comparison between R (real rate of return) and Marginal productivity of capital. So, during inflation, people hold less of real money and more of K, opposite will happen during recession.
- **Absolute Convergence:** It states that if  $n$  number of countries have access to same technology, have same saving ratio, same population growth rate but different capital output ratio, then all countries would converge to same level of equilibrium steady growth rate.
- **Conditional Convergence:** Conditional convergence states that if  $n$  number of countries has access to same technology, same population growth rate but different saving ratios and capital labour ratio, then there will still be convergence at same growth rate but equilibrium capital-output may or may not be equal.
- Baumol’s findings were challenged by Bradford De Long on two grounds: (a) Sample selection was biased; (b) there was measurement error in the findings.
- Neo-classical model exclaimed that in the long run, all nations of the world would tend to converge towards same rate of growth. But the hypothesis did not hold true in real scenario. This was claimed that poor nations will grow at a higher rate and gradually the gap between nations will disappear. But the poor nations were actually caught up in a situation where they could not come out of the vicious circle of poverty. This is called poverty traps.

**5.10 Keywords**

- Productivity : The rate at which a worker a company or a country produces goods.
- Capital : A large amount of money that is invested.
- Proportion : The relationship of one thing to another in size, amount etc.
- Consumption : The act of buying and using products.
- Depreciation : The process to become less valuable over a period of time.

### 5.11 Review Questions

Notes

1. Describe the structure of solow model
2. State and discuss the assumptions of the solow model
3. Compare the solow model with the Harrod Domar Model.
4. Discuss the effect of a change in the savings rate using the solow model.
5. Briefly state how Tobin brings in money in a growth model.

### Answers: Self Assessment

1. (i) homogeneous (ii) input (iii) exogenous (iv) range of values  
(v) composite
2. (i) (a) (ii) (b) (iii) (c)
3. (i) T (ii) F (iii) T (iv) F  
(v) T

### 5.12 Further Readings



Books

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 6: Economic Growth Models-II: Growth and Distribution

### CONTENTS

Objectives

Introduction

- 6.1 John Robinson's Model of Economic growth and Capital Accumulation.
- 6.2 Kalecki's theory of Distribution Under Monopolistic capitalism
- 6.3 Kaldor's Model of Economic Growth
- 6.4 Pasinetti's Theory of Growth and Distribution
- 6.5 Reformulating the Kaldorian Model
- 6.6 Summary
- 6.7 Key-Words
- 6.8 Review Questions
- 6.9 Further Readings

### Objectives

After reading this unit students will be able to:

- Know about Joan Robinson's Model of economic growth and capital accumulation.
- Describe Kalecki's theory of Distribution under monopolistic capitalism.
- Explain Kaldor's model of economic growth.
- Understand Pasinetti's theory of growth and distribution.
- Learn about reformulating the Kaldorian model.

### Introduction

The theories of economic growth that were developed after Keynes are known as Modern Theories of Growth and Development. Broadly, there are three branches of Modern Theory. First is Harrod-Domar model that was discussed in chapter two. The other is neo-classical model of economic growth explained in chapter three. This chapter explains the third branch of modern growth theory given by Joan Robinson and Nicholas Kaldor of Cambridge University and hence is also called Cambridge Theory. This theory is extremely critical of Neo-Classical theory. It criticizes classical approach to savings and investments. It also criticizes production function and marginal productivity theory of income distribution. Cambridge school gives both a theory of income distribution and economic growth.

### 6.1 Joan Robinson's Model of Economic Growth and Capital Accumulation

This theory was provided by Mrs. Joan Robinson in 1956 in her book 'The Accumulation of Capital'.

#### *Assumptions*

1. There is no foreign trade or it is a three sector economy.
2. There is laissez faire competition in the market.

3. There are two factors of production; labour and capital.
4. Technology remains unchanged.
5. Production function is given and fixed.
6. Labour is abundant.
7. National product is divided between entrepreneurs (owners of capital) and workers (owners of labour).
8. General Price level remains unchanged.
9. Saving-investment function is performed by entrepreneurs and workers are spending their entire income in consumption.

### The Model

The formal version of the verbal model of Mrs. Joan Robinson has been given by Prof. K K Kurihara. According to him, since we assumed that there are two factors of production; labour and capital; and hence National product is divided between entrepreneurs (owners of capital) and workers (owners of labour) in the form of wage bill and profits, the distribution of income is represented in the following way:

$$pY = wN + \pi pK$$

Where,

$p$  = Average price of output

$Y$  = Net National Product

$w$  = Nominal Wage rate

$N$  = Workers employed rate

$\pi$  = Gross Profit rate (Inclusive of interest)

$K$  = Amount of Capital Stock

On re-arranging the above equation, we get-

$$\pi pK = pY - wn$$

$$\pi K = Y - wpN$$

$$\pi = Y/K - w/p * K/N$$

$$\pi = \frac{Y/N - w/p}{K/N}$$

$$\pi = \frac{p - w/p}{Q}$$

Where  $p = Y/N$  is labour productivity and  $Q = K/N$ , capital-labour ratio.

The equation above shows that profit rate is a positive function of labour productivity, and a negative function of wage rate ( $w/p$ ) and capital labour ratio ( $K/N$ ).

Thus, in order to increase the profits either we must increase labour productivity or decrease wage rate ( $w/p$ ) and capital labour ratio ( $K/N$ ).

Mrs. Joan Robinson's growth model proves the circular relationship between the rate of accumulation of capital and rate of profit. This is done by incorporating Keynesian theory of income and employment.

According to Keynesian identity

$$Y = C + I$$



rate, the rate of capital accumulation goes up. With increase in the rate of capital accumulation, equilibrium will get established once again. However, it will happen only if money wage rates are flexible.

- (b) When  $\Delta N/N < \Delta K/K$ , the rate of growth of labour is less than the rate of accumulation then there will be deficiency of labour in the economy. It will create a situation of excess capital accumulation. If the price level remains same, real wage rate will rise. Changes in capital labour ratio and the productivity of labour would also help in restoring equilibrium level.

**Limping Golden Age:** It is a situation in which the steady rate of capital accumulation is happening but there is unemployment of labour with it. On the contrary, if rise in level of employment is more than the rate of increase in population, the limp would get mild.

**Leaden Age:** It is a special case of limping golden age in which unemployment is not increasing because of increase in population but lack of accumulation of capital.

**Restrained Golden Age:** It is an age in which there is full employment of resources but the 'desired rate of accumulation' is more than 'possible rate of accumulation'.

**Bastard Golden Age:** It is a situation in which unemployment prevails but the real wage rates remain rigid towards downwards. Inflation acts as a barrier in capital accumulation.



*Did u know?* The intensity of the limp may be different in different situations. When rise in level of employment is less than the rate of increase in population, the limp would get worsened.

### Criticism

Some loopholes of the model are as follows:

- Wage rates are not as flexible as assumed in the model. The assumption that rate of capital accumulation gets adjusted according to the level of population growth by making changes in wage rate, profit rate and labour productivity but it does not happen so easily. It can better be achieved by making use of fiscal and monetary measures.
- The model neglects the role of state and thereby the role of monetary and fiscal tools in determining growth rate. State plays an important role in ensuring steady growth rates.
- Assumption of a given and constant technique is unrealistic. When there will be increased pressure on labour supply there will be inducements to introducing labour saving technologies.
- It does not consider socio-cultural-institutional factors in economic growth.



*Notes* The inter-connecting straits have not been explained in the model. It seems to be an isolated island. The model can not predict the possibility of the coming phases of development.

### Self Assessment

- Fill in the blanks
  - According to theory provided Mrs. Joan Robinson there is no ..... trade or it is a three sector economy.
  - ..... product is divided between entrepreneurs and workers.
  - Saving-investment function is performed by entrepreneurs and workers are spending their entire income in .....

- Notes**
- (iv) The equilibrium indicates that the rate of ..... is positively dependent on the rate of accumulation going on.
  - (v) ..... is a situation in which the steady rate of capital accumulation is happening.

## 6.2 Kalecki's Theory of Distribution under Monopolistic Capitalism

Kalecki was a polished economist who has written the diverse aspects of economics.

Kalecki gave his theory in his essay in 1969 titled 'Introduction to the Theory of Growth in a Socialist Economy'.

### Assumptions

1. Short Run Marginal Cost coincides with Short Run Average Cost to a certain point corresponding to practical capacity.
2. Excess capacity does exist in the economy or the economy operates below maximum practical capacity.
3. There is monopoly power in factor as well as commodity market.

### The Model

Kalecki theory of distribution is dependent on Lerner's measure of degree of monopoly of a single firm

$$M = \frac{P - m}{P}$$

Where, M is degree of monopoly, P is price and  $m$  is marginal cost.

Since, Kalecki assumes that  $MC = AC$ , thereo fore

$$M = \frac{P - a}{P}$$

Or  $PM = P - a$

Multiplying both sides by  $x$ , we get-

$$xPM = x(P - a)$$

to get gross capitalist's income for the economy, the gross capitalist income of all the firms is added.

$$\sum xPM = \sum x(P - a)$$

$\sum xP$  is equal to total turnover in the economy, thus;

$$T = \sum xP$$

Dividing both sides by T, we get,

$$\sum xPM/T = \sum x(P - a)/T$$

Putting  $T = \sum xP$

$$\sum xPM/\sum xP = \sum x(P - a)/T$$

$$M = \sum x(P - a)/T$$

Or Macro Degree of Monopoly = Gross Profits/Aggregate Turnover.

### Labour Share and Degree of Monopoly

More is the share of labour in total aggregate output; less will be the degree of monopoly at macro level and *vice-versa*.

It is so because when during boom period competition increases, it will decrease the degree of monopoly. It will increase the share of labour in national income.

Notes

**A Critical Appraisal**

1. The model is based on unreal assumptions that  $MC = AC$ .
2. The model ignores the role of other factors affecting distribution of income amongst different factors of production and considers only the shares of profits.
3. Role of trade unions is also ignored.
4. What is golden age?

**Self Assessment**

2. State whether the following statements are 'true' or 'false'.
  - (i) Kalecki was a polished economist who has written the diverse aspects of economics.
  - (ii) Kalecki gave his theory in his essay in 1969 titled "Introduction to the theory of growth in a socialist economy."
  - (iii) Excess capacity does not exist in the economy or the economy operator below maximum practical capacity.
  - (iv) Macro degree of Monopoly  $\neq$  Gross profits/Aggregate turnover.
  - (v) Kalecki theory of distribution is dependent on Learner's measure of degree of monopoly of a single firm.

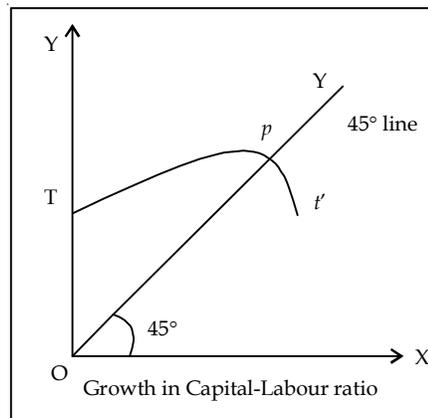
$$M = \frac{P - m}{P}$$

**6.3 Kaldor's Model of Economic Growth**

Prof. Kaldor provided a model of economic growth in which he related technical progress to capital accumulation. Unlike classical models, in his model technical progress is an endogenous variable.

**Assumptions**

1. He assumed full employment in the economy and hence AS curve is perfectly inelastic.
2. National Income consists of wages (includes wages as well as salaries) and profits (includes income of entrepreneurs as well as property owners).
3. Both wage earners and profit earners save and hence total savings dependent on wages as well as profits.
4. Profits depend on the level of investment.
5. General price level is constant.
6. Technology keeps changing as per the level of capital accumulation.
7. Kaldor assumes technical progress function which is a joint product of growth of capital and growth of productivity. Therefore, technical progress function is shown by  $Tt'$  in figure below. As shown in the diagram,  $Tt'$  is the technical progress function which is convex upwards but flattens out beyond a certain point such as A when capital per worker starts diminishing.



Notes

Working of the Model

The model can be explained for two situations:

(a) **When there is constant population growth:** Kadlor has assumed saving function, investment function and technical progress function as follows:

(i) **Saving Function :**  $S_t = aPt + b(Y_t - Pt)$

Where,  $P_t$  = Profit in time period  $t$

$S_t$  is saving in time period  $t$

$Y_t$  is income in time period  $t$

$a$  and  $b$  are MPSs of profit and wages and lie between 0 and 1.

(ii) **Investment Function**

$$K_t = a'Y_{t-1} + b'(P_{t-1}/K_{t-1})Y_{t-1}$$

$$\Delta K_t = K_t - K_{t-1}$$

Where  $K_t$  is stock of capital in time period  $t$

$Y_{t-1}$  is the output of previous period,

$(P_{t-1}/K_{t-1})$  is rate of profit on capital

$a'$  and  $b'$  are coefficients of output and rate of profit respectively such that  $a'$  and  $b'$  are greater than 0.

(iii) **Technical Progress Function**

$$[Y(t-1) - Y_t] / Y_t = a'' + b'' \Delta K_t / K_t$$

where,  $Y(t-1) - Y_t$  is rate of growth of income,

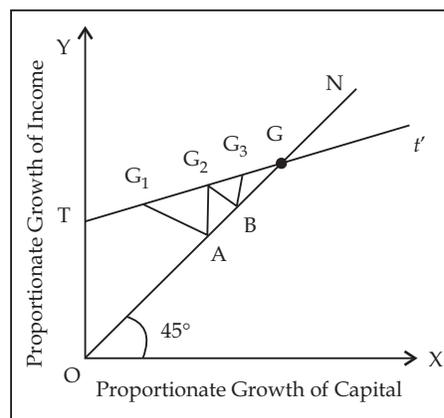
$\Delta K_t / K_t$  is rate of net investment;

$a''$  is coefficient of technical progress

$b''$  capital per labour  $C/L$  and  $a''$  is greater than one and  $b''$  lie between 0 and 1.

Given these three functions the rate of growth of income can be shown with the help of diagram given on next page. In the diagram, proportionate growth of capital is measured on  $x$ -axis and proportionate growth of income is shown on  $y$ -axis. The point where technical progress function  $tt'$  intersects the  $45^\circ$  line is a point of steady economic growth because at this point proportional growth of capital is equal to proportional growth of national income.

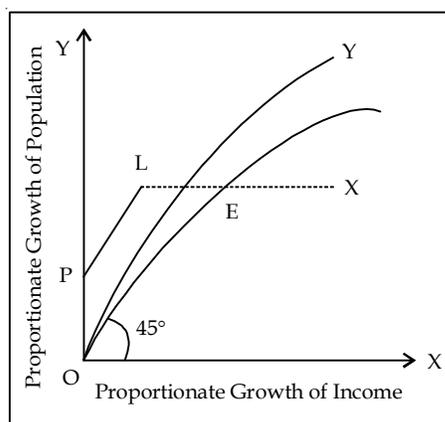
If the economy is operating on any other point, there is a tendency for it to move towards point G. suppose the economy is operating at some point like  $G_1$ , where growth of output is more than growth of capital, it will induce investors to invest more in the subsequent period say equal to  $G_2$ , which in turn will increase output to  $O_1$  and the process will go on until the economy reaches at point G.



(b) **When there is Expanding Population:** By dropping the assumption of constant population, Kadlor expressed the relationship between population growth and growth of income algebraically as :

$$\Delta K_t = g_1 (g_1 \geq \lambda)$$

If  $\lambda > g$  or to say the rate of increase in population ( $\lambda$ ) is more than rate of increase in income i.e. growth rate ( $g$ ), then rates of population and growth will continue to rise until growth rate of population equals  $\lambda$ .



In the diagram above, proportional growth rate of income is measured on  $x$ -axis and proportional growth rate of population is measured on  $y$ -axis.  $O\lambda$  is the growth path of income.  $PL \lambda$  is the curve showing growth rate of population. As rate of growth of income grows, rate of growth of population also grows. In the long run, population will increase at its highest rate exhibited by  $L \lambda$ , in the diagram. It is assumed that technical progress function remains unaffected by changes in population. Let us take a case of a developing country where technical progress function will be lowered due to increase in population as it has a low capacity to absorb technical changes. In this situation, in order to maintain output per head at a constant level, a certain percentage of growth in capital per head is required.

Hence to conclude, growth in population will lead to long run equilibrium growth in income depending upon relative strength of :

- The highest rate at which population can grow.
- The rate of technical progress.

#### ***A Critical Appraisal***

##### ***Appreciations***

- Kadlor's model explains the steady path of growth not a steady state i.e. it is dynamic not static.
- The division of the model into two phases: with constant population and with expanding population; makes it extremely useful particularly for developing countries.
- Kadlor's technical progress function relates output per head to capital per head.

##### ***Criticism***

- This model does not explain the determination of the rate of growth of the economy in terms of the volume of investment, saving-income ratio and capital output ratio.
- It does not explain the reason for the stability or instability of a particular point of equilibrium.

## 6.4 Pasinetti's Theory of Growth and Distribution

Pasinetti's theory of growth and distribution is a refinement or a corrected reformulation of Kadlor's model. He criticized Kadlor's model for its formulation of existence of only one saving ratio that keeps system in equilibrium for any given rate of population growth and technical progress. In his words, "In any type of society, when any individual saves part of the income, he must also be allowed to own it; otherwise he would not save at all." Accordingly, he divided total profits into two parts one part accrues to the capitalists and other to the workers.

## 6.5 Reformulating the Kaldorian Model

As given above, he categorised profits into two parts, so:

$$P \equiv P_k + P_w$$

Where,  $P_k$  and  $P_w$  stand for the respective share of capitalists and workers in the profits.

Therefore, new saving functions are  $S_w = S_w (W + P_w)$  and  $S_k = S_k \cdot P_k$  and equilibrium condition is

$$I = S_w = S_w (W + P_w) \text{ and } S_k = S_k \cdot P_k$$

From this we can derive the following general equations. These two equations contain all the elements required to correct the post Keynesian theory of income distribution.

$$P/Y = 1/S_k - S_w \cdot I/Y - S_w/S_k - S_w + I$$

$$(S_w S_k / S_k - S_w \cdot K/I - S_w / S_k - S_w \cdot K/Y)$$

$$P/K = 1/S_k - S_w \cdot I/K - S_w / S_k - S_w + Y/K + iK_w / K$$

### Rate and Share of Profits in Relation to the Rate of Growth

Pasinetti maintains that in the long run model, rate of interest must be equal to rate of profits. In such a case one can substitute  $P/K$  for  $I$ , and we get:

$$\frac{P/K (S_k (1 - S_w \cdot Y))}{\Delta} = I - S_w \cdot Y/K$$

Hence, the result is that we do not need to make any assumptions about propensities to save of the workers. In the long run, MPS of workers influences the distribution of income between workers and entrepreneurs but does not influence the distribution between profits and wages and the rate of profits.

### Fundamental Relation between Profits and Savings

No matter how many categories of economic agents are there, the ratio of profits to savings will always be for all categories.

### Implications of the Model

Two conclusions given by the model are:

1. As the model gave conclusion without assuming a constant saving ratio, it has become much wider. The model does not demand to take any hypothesis about saving behaviour of the workers.
2. The relation between capitalists' savings and capital accumulation is based on simplifying and drastic assumption of negligible savings by the workers.

**Conditions of Stability**

1. Prices are flexible with respect to wages.
2. Full employment investments are carried out.
3.  $S_k > 0$ .

Notes



Notes

Pasinetti proved that in the long run profits will be distributed in proportion to the amount of savings that are contributed by workers and entrepreneurs respectively.

**Self Assessment**

3. Choose the correct option
  - (i) Profits depend on the level of.....
    - (a) investment
    - (b) wages
    - (c) progress
    - (d) employment
  - (ii) General price level is .....
    - (a) capital
    - (b) constant
    - (c) income
    - (d) progress
  - (iii) In the long run, ..... of workers influences the distribution of income between workers and entrepreneurs.
    - (a) BPS
    - (b) MPS
    - (c) DPS
    - (d) NPS

**6.6 Summary**

- This theory was provided by Mrs. Joan Robinson in 1956 in her book 'The Accumulation of Capital'.
- Mrs. Joan Robinson's growth model is based on the assumption that saving-investment function is performed by entrepreneurs and workers are spending their entire income in consumption.
- **Limping Golden Age:** It is a situation in which the steady rate of capital accumulation is happening but there is unemployment of labour with it.
- Kalecki was a polished economist who has written the diverse aspects of economics.
- Kalecki gave his theory in his essay in 1969 titled 'Introduction to the Theory of Growth in a Socialist Economy'.
- Pasinetti's theory of growth and distribution is a refinement or a corrected reformulation of Kadlor's model.

**6.7 Key-Words**

- Sector : A part of a particular area
- Investment : The act of investing money in something
- Intrepreneurs : A person who makes money be starting or running business
- Distribution : The system of transporting and delivering goods.
- Accumulation : To gradually increase in number or quality over a period of time.

**6.8 Review Questions**

1. Explain the concept of Golden Age equilibrium in Joan Robinson's Model.
2. State the main assumption and describe the Kaleckian model of distribution under monopolistic competition.

**Notes**

3. What are the main criticisms that can be made of Joan's Model?
4. Compare and contrast Koldar Model and Pasinetti model.
5. Give the assumptions of the kaldorian model and give a critical appraisal of the model.

**Answers: Self-Assessment**

1. (i) foreign (ii) national (iii) consumption (iv) profit  
(v) Limping golden age
2. (i) T (ii) T (iii) F (iv) F  
(v) T
3. (i) (a) (ii) (b) (iii) (b)

**6.9 Further Readings**



*Books*

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

# Unit 7: Total Factor Productivity and Growth Accounting

Notes

## CONTENTS

Objectives

Introduction

- 7.1 Total Factor Productivity
- 7.2 Estimates of the Production Function and Total Factor Productivity
- 7.3 Determinants of Total Factor Productivity
- 7.4 Factors Affecting Total Factor Productivity
- 7.5 Total Factor Productivity and Growth Accounting
- 7.6 Total Factor Productivity Measurement: Different Approaches
- 7.7 Issues and Debates Related to Total Factor Productivity
- 7.8 Summary
- 7.9 Key-Words
- 7.10 Review Questions
- 7.11 Further Readings

## Objectives

After reading this unit students will be able to:

- Know about the total factor productivity and factor affecting total.
- Learn total factor productivity and growth accounting.
- Describe the total factor productivity measurement different approach.
- Understand the issues and debate related to total factor productivity.

## Introduction

Productivity and growth are closely related concepts. Productivity refers to the rate at which resources are being utilized. Increase in productivity leads to more efficient utilization of resources and thereby development. Total factor productivity is a concept which is used in many branches of economics. The TFP approach not only analysis the changes in productivity but also enquires into 'whys' of these changes. When we analyse the factors that affect productivity, we get better understanding of the sustainability of growth. With the advancement of technology, increased expenditure on R and D, improvement is quality of labour *via* education and health, TFP has gained popularity and is considered by most of the economist a cause as well as an effect of growth.

### 7.1 Total Factor Productivity

Students of international trade commonly believe that international trade policies making a country more open to world trade and stimulating human capital accumulation promote a higher standard of living. That is, greater outward orientation increases efficiency in the use of resources, and encourages production specialization in some industries, in accordance with the principle of comparative advantage. The expansion of exports relaxes the foreign exchange constraint and accommodates larger imports of key inputs in the production process. Countries that pursue greater outward orientation, therefore, can experience faster economic growth. Among the external factors that affect growth, improvements in the terms of trade can exogenously increase output as well. In addition, the higher the human capital stock within a country, the better that country is at adopting the newer technology that promotes economic growth.

**Notes**

The macroeconomic growth literature identifies both factor accumulation and total factor productivity as principal determinants of growth. The relative influence of these broad causal factors provides a large area of research. In this paper, we separate the contribution of the basic inputs in production that directly affect output growth from factors that indirectly influence growth, that is, the factors that change the efficiency of those basic inputs. Put differently, those other factors in fact determine total factor productivity (TFP). We estimate a series of models, using a relatively large dataset, to calculate TFP and to examine a set of external as well as domestic factors that affect TFP.

Most cross-section and panel studies of economic growth put all countries into the same basket to estimate the elasticities of output with respect to capital and labor, or to calculate returns to scale. Those studies presume that all countries in the sample follow the same overall

technology. A cursory examination of the wide disparities in per capita income and growth rates across countries, however, raises serious doubts on such a presumption. Countries that occupy different rungs of the development ladder probably also occupy different rungs of the technological ladder. Geographical and cultural differences can constrain the rate at which countries adopt modern technology. Our paper examines whether countries in different income groups and geographical locations display similar output elasticities with respect to inputs, and/or similar returns to scale.

Expanded versions of the neo-classical growth model importantly assume that human capital directly enters the production function along with labor and physical capital (Mankiw, Romer, and Weil, 1992; Mankiw, 1005, and Miller and Upadhyay, 2000). Earlier attempts generally fail to uncover a significant contribution of human capital to output in large samples of countries, most likely due to severe measurement problems of human capital. In this paper, we calculate TFP employing only physical capital and labor in the production function and consider how human capital, along with variables capturing outward orientation, influences TFP.

Our main findings include the following. For low-income countries, output responds much more to labor than to capital. That is, the output elasticity with respect to labor exceeds that with respect to capital. The total elasticity of output with respect to capital and labor for the low-income countries implies increasing returns to scale. That result, however, reverses itself for the middle- and high-income countries that display decreasing returns to scale. Thus, the returns to scale for different income groups or regions depends on the level of development.

When we classify countries by geographic regions instead, our previous results based on income categories extend only to Africa. African economies exhibit increasing returns to scale, while Asia, Europe, and Latin America show nearly constant returns to scale. That is, returns to scale for Asia, Europe, and Latin America all cluster around 1, indicating that constant returns may adequately approximate all regions except Africa.

We also find that countries in the middle-income group display elasticity characteristics closer to those for high-income countries than for low-income countries. Apart from relatively similar returns to scale estimate, the middle-income countries also possess a labor elasticity of output nearly equal to that for the high-income group. On the other hand, the elasticity of output with respect to capital is the highest in the middle-income countries, followed by low-income and high-income countries. If middle-income countries match high-income countries in the rate of technological progress, but accumulate capital more quickly, then their output should respond more rapidly to both those sources of growth. Our findings support such a story.

We find similar results for African and low-income countries despite the fact that 5 out of 19 countries in Africa do not belong to the low-income group, and 8 out of 22 countries in the low-income category do not belong to the African group.

Our assertion that all countries do not use the same technology also finds support from our estimates of total factor productivity. Our first set of total factor productivity estimates employs a panel-data fixed-effect regression for all countries with no control for regional or income differences. The second and third sets of total factor productivity estimates come from the composite series of TFP that use separate regressions for income groups and for geographic regions. The results differ markedly.

While middle- and high-income countries show small coefficients of variation in total factor productivity, around 7 percent of the mean, the corresponding coefficients for the low-income countries range from 55 percent to 125 percent. Similarly, regional regressions indicate that TFPs in Africa vary widely, up to 140 percent around the mean, whereas for all other regions such variation stays within 8 percent of the mean. Thus, including African and low-income countries with other countries in the world under the assumption that individual country intercepts summarize most of the nonrandom differences may grossly misrepresent reality.

The following section provides details of the production function estimates and a description of our calculated series for total factor productivity. Section 7.3 explains total factor productivity for each country group and geographic location and considers how important external and internal factors may influence the growth of total factor productivity around the world.

## 7.2 Estimates of the Production Function and Total Factor Productivity

### The Production Function

We estimate important parameters of production functions and calculate our series for total factor productivity from the Cobb-Douglas function specification on three sets of data—panel data for all countries, panel data separated by income category (low, middle and high), and panel data on geographic regions (Africa, Asia+, Europe+, and Latin America).

The Cobb-Douglas production function is written as follows:

$$1. \quad Y = A K^\alpha L^\beta, 0 < \alpha < 1 \text{ and } 0 < \beta < 1,$$

where  $Y$  equals real GDP,  $K$  equals the total physical capital stock,  $L$  equals the number of workers (labor force), and  $A$  equals an index of total factor productivity. We allow for the possibility of non-constant returns to scale by not restricting  $(\alpha + \beta)$  to equal one.

Dividing equation (1) by the labor force ( $L$ ) expresses output, and the physical capital stock on a per worker basis. That is,

$$2. \quad y = A k^\alpha L^{\alpha-1},$$

where  $y$  equals real GDP per worker, and  $k$  equals the per worker stock of physical capital. Those production functions display increasing, constant, or decreasing returns to scale as  $\alpha + \beta$  is greater than, equal to, or less than one, respectively.

Rewriting equation (2) in natural logarithms yields the following:

$$3. \quad \ln y = \ln A + \alpha \ln k + (\alpha + \beta - 1) \ln L.$$

Thus, the tests for constant returns to scale involve whether the coefficient of  $\ln L$  equals zero.

Including human capital as an input in the production function proves controversial. Mankiw, Romer, and Weil (1992) advocate such an approach on both theoretical and empirical grounds. In a model that is more comparable to our framework because of the use of panel data, however, Islam (1995) finds that human capital does not contribute significantly to explaining output in the Mankiw-Romer-Weil specification. Miller and Upadhyay (2000), however, do find a significant role for human capital in their estimations. In what follows, we include human capital in a second-stage model that studies total factor productivity.

### Panel Data and Fixed-Effects Estimation

Our panel data cover the 1960 to 1989 time period (1959 to 1989 for any growth rate) for a sample of 83 countries in the full data set. The Data Appendix, Table A, lists the countries included in our sample. Our panel combines data in five-year blocks as follows: 1960-64, 1965-69, 1970-74, 1975-79, 1980-84, and 1985-89. Usually, data series reflect averages of the information over five years in each block. Our data encompasses 498 observations (83 countries and 6 time blocks). Our estimating equation emerges by adding a random error to equation (3). This error term incorporates the effects of omitted variables. Classical regression analysis assumes that the omitted variables are independent of the included right-hand-side variables and are independently, identically distributed.

Notes

When using panel data, however, we can further classify the omitted variables into three groups -- country-varying and time-invariant, time-varying and country-invariant, and country- and time-varying variables (see Hsiao, 1986 or Greene, 1997). The country-varying time-invariant variables differ across countries, but are constant within a country over time. The time-varying, country-invariant variables, such as technological shocks, differ over time but are constant at a point in time across countries. Finally, country- and time-varying variables differ across both countries and time.

The estimation of equation (3) without consideration of possible country-specific or time-specific effects can generate misleading results for ordinary-least-squares regressions. Problems emerge when either the unobservable country-specific or time-specific variables correlate with the included right-hand-side variables. Two alternative, but related, procedures exist for addressing these problems -- fixed-effect and random-effect models. We restrict our attention to fixed-effect estimation since the random-effects estimation requires that the omitted variables are uncorrelated with the included right-hand-side variables -- an unrealistic assumption in the context of our model.

If the problem omits country-specific variables, we perform the regression after adjusting all variables by subtracting their respective means over time. Since the unobserved country-specific variables and the intercept do not change over time, such an adjustment drops these variables out of the regression equations. On the other hand, if the problem omits time-specific variables that correlate with the included right-hand-side variables, subtracting the mean over countries drops the intercept and the time-specific effects out of the regression. The revised regression equation in each case provides unbiased and consistent estimates.

Finally, when both country- and time-specific effects correlate with the included right-hand-side variables, we adjust for the means over countries and time. We adopt this last approach and consider fixed effects over countries and time. Our problem, however, has few elements in the time dimension. Thus, we directly include the six time-specific dummy variables, one for each period, and only adjust the data to avoid using 83 country dummy variables.

The estimating equation is as follows:

$$4. \quad \ln y = \ln A + \alpha \ln k + (\alpha + \beta - 1) \ln L + \sum_{i=1}^6 \theta_i \text{time}_i + \varepsilon$$

where  $\text{time}_i$  ( $i = 1, \dots, 6$ ) represent the time dummy variables and the variables for each country measure deviations from their country means over time. We then calculate the country-specific fixed effects of intercepts ( $\text{cint}_j$ ) as follows:

$$5. \quad \text{cint}_j = \overline{\ln y_j} - \hat{\alpha} \overline{\ln y_j} - \hat{\delta}_1 \overline{\ln L_j},$$

where " $\bar{\cdot}$ " over a variable implies the mean of that variable, " $\hat{\cdot}$ " over a parameter means the estimate of that parameter,  $\hat{\delta}_1 = (\alpha + \beta - 1)$  in (4), and  $j = \{1,2,3,\dots\}$  is the index across countries. Note that the time-specific fixed effects appear directly as the respective coefficients of the time dummy variables.

**Production Function Estimates: All Countries**

The estimate of the Cobb-Douglas function (equation 4) for the full-panel data set yields the following results:

$$6. \quad \ln y = 0.4756 \ln k - 0.0988 \ln L_{it} + \sum_{i=1}^6 \theta_i \text{time}_i + \varepsilon_i.$$

$$(18.86) \quad (-1.32)$$

$$R^2 = .7860 \quad \text{SEE} = .1269 \quad F(7,407) = 218.26 \quad N = 498$$

The coefficient of  $\ln L$  (i.e., -0.0988), although only significant at the 20-percent level, indicates that the production function exhibits slightly decreasing returns to scale. The coefficient of  $\ln k$  assigns a value of 0.4756 to the elasticity of output with respect to the physical capital stock. These two coefficients

combine to generate the implied elasticity of output with respect to the labor force of 0.4256. Thus, after accounting for country- and time-specific effects, the output elasticities with respect to labor and physical capital sum to a value of 0.9012, indicating a slightly decreasing returns to scale.

Our dataset includes observations for 30 years for each country. Each data point, however, averages 5 yearly observations. Thus, we only have a short panel on the time dimension (six 5-year periods for each country), and hence autocorrelation is not of much concern. On the other hand, heterogeneity of countries in the panel along both the income and locational scales can cause the residual terms to be heteroscedastic. Using the Lagrange multiplier test for the Cobb-Douglas function, however, we find that the statistic equals only 0.021 with a high significance level of 0.88. Thus, the test fails to reject the null hypothesis of constant variances across countries.

### Production Function Estimates: Income Levels and Geographic Regions

Another way to test for possible differences in technology divides the sample into groups of countries in different ways. We use two methods to create sub-samples for more intensive study. First, we divide our sample into low-, middle-, and high-income countries based on real GDP per worker for two different periods: 1960-64, and 1970s. The categorization based on 1960-64 incomes allows one to study subsequent growth in originally similarly placed economies and convergence during the sample period. Technological differences among income groups for the entire 30-year period, however, can perhaps better discriminate, if we classify countries according to their income levels during the 1970s, the middle of the three decades in our sample. That is especially desirable if rapid growth elevates countries from low- to middle-income or from middle- to the high-income groups over our entire sample period.

The World Bank divides countries into low-, middle-, and high-income groups based on real GDP per capita. Using a number in the range of 2 to 2.5 to measure the ratio of population to labor force, we convert these ranges into ranges based on real GDP per worker. Thus, our classification based on 1960-64 incomes fixes \$3,000 (in constant 1985 international prices) as the threshold GDP per worker between low- and middle-income countries and \$10,000 per worker between middle- and high-income countries. For the classification based on incomes during the 1970s, an analogous exercise leads to \$4,000 and \$13,500 as the respective cutoffs for GDP per worker.

Second, geography provides another important dimension along which to split our sample. Countries in Africa may use a level of technology that significantly differs from that used in Europe. Our regional sub-samples mostly follow continental divisions, except that we include Australia, Canada, New Zealand, and the U.S. in Europe+, and Fiji and Papua New Guinea in Asia+.

In sum, we divide the full-sample into three different subsamples. The first subsample segregates countries based on real GDP per capita - low-, medium-, and high-income -- using 1960-64 data. The second subsample also segregates based on real GDP per capita, but now using 1970s data. The third subsample segregates based on geography - Africa, Asia+, Europe+, and Latin America. Table 1 reports F-tests of the null-hypothesis that we can pool the data across income groups or geography. Those F-tests clearly reject the null-hypothesis, indicating that the subsample production function estimates differ significantly from each other.

The results for the estimation of the Cobb-Douglas production functions appear in Table 1. Several noteworthy points emerge. Starting with income categories, we find that the elasticity of output with respect to capital in high-income countries falls substantially below that in other countries. This elasticity equals 0.17 for high-income countries when grouped by incomes for 1960-64, and rises to 0.31 for the same subset when we reclassify countries according to the 1970s' incomes. That increase traces to the movement of Japan and Ireland from the middle- to high-income group. We also find significantly decreasing returns to scale for high-income countries, as the output elasticities with respect to capital and labor sum to only about 0.5.

Second, we find a close similarity of results for middle- and low-income groups across our two income classifications. In particular, the middle-income group fairly well represents the entire sample in terms of key results. The returns to scale for the middle-income countries matches closely that for the

**Notes**

whole set of countries. The combined elasticity of output with respect to capital and labor equals 0.82 for the middle-income group and equals 0.91 for all 83 countries. That comparability of the middle-income group with the world as a whole reflects a higher output elasticity with respect to capital (0.57 versus 0.48 for the entire sample) largely offset by a lower elasticity with respect to labor (0.25 versus 0.43).

The similarity of results, however, does not carry through to countries on either side of the income scale. Although the capital elasticity of output does not change that much (0.46 versus 0.48), the labor elasticity of output is much higher for the low-income countries (1.34 versus 0.43). Those values indicate that the production function exhibits significantly increasing returns to scale for low-income countries in sharp contrast, as discussed above, to the decreasing returns to scale for the high-income subset. That result, therefore, highlights the potential for convergence in income per worker between rich and poor countries. Focusing on our division of countries into income groups based on incomes for 1960-64, if low-income countries, on average, experience increasing returns to scale in production during the next 25-30 years, we expect incomes to converge and a number of countries in the sample possibly to move up the income distribution.

Another way to explore for possible differences in technology separates countries into geographic regions (Frankel and Romer, 1999). The findings for our four regions show significant similarity in key parameters, except for Africa. The scale elasticity for Asia, Europe, and Latin America lies between 0.95 (Europe) and 1.08 (Latin America) whereas the elasticity for Africa equals 1.70, and closely follows the elasticity of 1.80 for low-income countries in our earlier analysis. The elasticities of output with respect to capital alone are, however, more comparable for all groups since they range between 0.37 for Asia and 0.54 for Europe with the intermediate values assumed of 0.45 for Africa and 0.51 for Latin America.

In sum, we find evidence of increasing returns to scale for low-income and African countries, although these two sub-samples do not exactly overlap. Several Asian and Latin American countries appear in the low-income category, and several African countries appear in the middle-income category. Middle- and high-income countries display decreasing returns to scale whereas countries from Asia, Europe, and Latin America indicate a scale elasticity close to unity, ranging from slightly decreasing (0.95) for Europe to slightly increasing (1.08) for Latin America. Thus, we do find evidence of technological differences across groups of countries despite the fact that we limit our attention to a single Cobb-Douglas specification of the production function.

As a final check, we calculate the correlation coefficient between the series for total factor productivity based on the pooled regression for the entire sample and the combined series for total factor productivity based on the separate estimates for income groups. The rank correlation coefficient between these two estimates of total factor productivity equals 0.74, which is far from perfect but not so low as to suggest no relationship.

The findings from our sub-sample Cobb-Douglas production function regressions for the income and geographic groups raises at least two important questions that deserve further discussion. First, if low-income and African countries exhibit increasing returns to scale, then why do we not observe the convergence of real GDP per capita? Several points relate to this question. The low-income and African countries did not experience the growth in their capital stocks that other country groups experienced. For example, capital stock per worker rose annually during 1960-64 - 1985-89 by only 2.6 percent per year (25 years) for Africa as compared to 2.9 percent for Latin America, 3.8 percent for Europe, and 4.3 percent for Asia. The slower growth rate is all the more unfortunate because of the small capital base that they started with in 1960. Thus, lack of convergence significantly relates to lack of capital accumulation along the production frontier. If low-income and African economies could accumulate capital faster, then the convergence process could start. In the 1990s, although not addressed in our paper, non-convergence between Africa and rest of the world was even more striking due to civil wars, lack of institution building, and limited foreign direct investment in many countries of our sample. In other words, we argue that the lack of growth of factors of production helped to retard progress in the low-income and African countries.

The negative movement in total factor productivity in many low-income and African countries for most periods also provided an important further drag on growth and convergence. On average, total factor productivity decreased monotonically over our sample period for low-income and African countries. Further, the previously mentioned propensity for civil wars and lack of institution building probably plays a dramatic role in total factor productivity movements. Thus, the slow growth of capital in Africa and negative total factor productivity movements did not allow those countries to exploit higher returns to scale in production and to induce convergence of per capita income.

Second, given that high-income countries exhibit decreasing returns to scale, how did those countries continue to increase real GDP per capita? Here, the conventional wisdom holds that the growth in total factor productivity provides a most important contribution to economic growth (e.g., Islam, 1995; Hall and Jones, 1999; Easterly and Levine, 2001). But, Young (1994) offers a contrarian view that factor accumulation and not total factor productivity growth explained economic growth in East-Asian countries.

### 7.3 Determinants of Total Factor Productivity

The basic characteristics of the different total factor productivity estimates from our model in the last section appear in Table 2. We find that for the low-income group, the mean of the natural logarithm of TFP per worker is negative and the coefficients of variation show a high degree of dispersion. In the regional classification, Africa displays similar characteristics, with a negative mean and high dispersion in the natural logarithm of TFP. For the middle- and high-income countries and those outside Africa, the natural logarithm of TFPs more closely cluster around their respective means.

#### The Basic Equation

In this section, we examine the role of both domestic and external variables in influencing total factor productivity. Our estimate proceeds with the following equation for total factor productivity:

$$7. \quad \ln tfp = a_1 + a_2 \ln H + a_3 \ln open + a_4 \ln tot + a_5 \ln pd + a_6 \ln (1+\pi) +$$

$$+ a_7 \ln \sigma_x + a_8 \ln \sigma_{tot} + a_9 \ln \sigma_{pd} + a_{10} \ln \sigma_\pi + a_{10} + in \Rightarrow \sum_{i=1}^6 a_{10+i} time_i + \varepsilon,$$

where *open* equals the ratio of exports to GDP or total trade to GDP, *tot* equals the terms of trade, *pd* equals local price deviation from purchasing power parity,  $\pi$  equals the inflation rate, and  $\sigma_i$  equals the standard deviation of  $i$  ( $= x, tot, pd, \text{ and } \pi$ ) over the five-year sub-periods.

Once again, we estimate equation (7) using the fixed-effects method.

Our main goal in this section considers how variables representing the performance of the external sector relate to total factor productivity, and how our results for countries in different income and locational groups compare with the results for the entire sample. The results of our estimates of equation (7) for the pooled sample and for countries at different levels of development based on the 1960-64 average incomes. The values for the TFP variable come from the Cobb-Douglas production function discussed in the last section. Starting with the external sector of the economy, the variables related to trade show a generally positive effect on total factor productivity. Openness exhibits a significant positive effect generally at the 1-percent level for all samples. Greater openness enhances growth of the economy through a larger total factor productivity.

The local price deviation from purchasing power parity displays a significant negative effect at the 5-percent level in the full sample. Here, larger deviations from purchasing power parity associate with lower total factor productivity. To the extent that local deviations from purchasing power parity imply a more-restricted, less-open domestic economy, the coefficient on this variable captures another aspect of the openness of the economy to trade, reinforcing our finding on the export-GDP ratio. The price deviation variable, however, loses its statistical significance in income sub-samples and only retains its negative sign for the middle-income group.

The terms of trade possesses the expected positive effect in the full sample, but is only significant at the 20-percent level. So improvements in the terms of trade weakly associate with higher total factor productivity. Once again, however, this result seems driven solely by countries in the middle-income range. For other groups, the coefficients exhibit a statistically insignificant negative sign, even at the 20-percent level.

**Notes**

For the domestic variables, human capital exerts an insignificant, albeit positive, effect on TFP while inflation exerts a significant negative effect at the 1-percent level. Human capital turns significant for the middle-income group alone, and that too at the 10-percent level. We get greater consistency for the inflation effect, as most income classifications indicate a highly significant negative effects of inflation on total factor productivity. For the high-income countries, however, it loses its statistical significance and reverses sign. On average, the inflation rate for the high-income group falls well below the 20 percent or so beyond which, according to some studies, inflation begins impinging on growth (Bruno and Easterly, 1998 and Gylfason and Herbertsson, 2001). That finding that higher inflation associates with lower total factor productivity may explain the observed empirical regularity between higher inflation and lower economic growth. That is, higher inflation leads to lower economic growth through its effect on total factor productivity.

The volatility variables (as measured by standard deviations) have, on average, much less significance in explaining total factor productivity. The one exception, the standard deviation of exports to GDP, exhibits a significant negative effect at the 1-percent level. That is, lower export instability associates with higher total factor productivity. This is true of the overall sample and of the low-, middle-, and high-income countries, although the coefficients are much less significant or insignificant for low-income countries. For the low-income group, the volatility coefficients are unexpectedly positive and statistically significant.

In sum, higher and more stable openness and a lower inflation rate associate with higher total factor productivity. The results for the whole sample do not in general extend to component income groups. In particular, the price deviation from purchasing power parity and the terms of trade do not behave in a predictable fashion across country classifications. This suggests that lumping countries at various levels of development together in an empirical growth study may not succeed in uncovering important policy implications.

### **Human Capital-Openness Interaction**

Human capital effects do not emerge in our simple specification of the determinants of total factor productivity. Human capital may affect total factor productivity through its interaction with trade orientation. Greater openness fosters competition, encourages the use of modern technology, increases the demand for high-skilled labor, and promotes learning by doing.

#### **Countries Grouped by Income**

Columns 2, 4, 6 and 8 in Table 3 add the interaction term between the human capital and openness variables. We find that markedly different results between two identical TFP regressions but for different TFP series---one estimated using a production function for the entire sample of countries as in Miller and Upadhyay (2000, p.416) and the other based on a production function for each sub-sample as explained in the last section.

Human capital now exerts a significantly positive direct effect on total factor productivity at 10 percent level for middle- and high-income countries and a significantly negative direct effect for the low-income countries. In another major change, openness exhibits a significant negative effect on total factor productivity in low-income countries. Only the interaction term's coefficient is both positive and significant at the 1 percent level, indicating that low-income economies benefit from a concerted growth of human capital and openness but not necessarily from the development of one or the other in isolation. For middle-income countries, the direct effects of openness and human capital are positive but openness fails to interact with human capital to exert a positive influence on total factor productivity. For high-income countries, the direct effects of openness and human capital are positive and now openness interacts with human capital to reduce total factor productivity.

Other factors including the terms of trade, local price deviation, and domestic inflation do not discernibly change in the way they affect total factor productivity in the specification that includes the interaction term.

The findings for total factor productivity regressions classified by income during the 1970s yield no remarkable differences in results from those for countries grouped by 1960-64 income.

Table 1: Production Function Estimates by Income Level and Region (Cobb-Douglas)

Notes

	Coef. of ln k	Coef. of ln L	RTS	2R
All Countries	0.4756* (18.86)	-0.0988‡‡ (-1.32)	0.912: DRS	0.786
Countries Grouped by 1960-64 Income Per Worker: F(16, 391) = 9.45*				
High-Income	0.1683** (2.30)	-0.5114* (-5.43)	0.489: DRS	0.816
Middle-Income	0.5694* (12.72)	-0.1719‡‡ (-1.49)	0.822: DRS	0.827
Low-Income	0.4604* (13.68)	0.7953* (3.62)	1.795: IRS	0.779
Countries Grouped by 1970s Income Per Worker: F(16, 391) = 4.52*				
High-Income	0.3096* (5.14)	-0.4824* (-5.12)	0.518: DRS	0.839
Middle-Income	0.6068* (13.48)	-0.1785‡‡ (-1.45)	0.821: DRS	0.830
Low-Income	0.4309* (12.56)	0.6548 (3.01)	1.655: IRS	0.748
Countries Grouped by Geographic Region: F(24, 383) = 11.66*				
Africa	0.4452* (12.06)	0.7041* (2.52)	1.7041: IRS	0.763
Asia+	0.3657* (5.70)	0.0124 (0.05)	1.0124: IRS	0.783
Europe+	0.5408* (8.43)	-0.0486 (-0.33)	0.951: DRS	0.908
Latin America	0.5112* (7.93)	0.0807 (0.54)	1.081: IRS	0.916

**Note:** All regressions employ the fixed-effect technique for countries. The regressions explicitly include 6 time dummies to capture the fixed effects over time (not reported here). RTS indicates the returns to scale (constant, increasing, or decreasing).  $\bar{R}^2$  equals the adjusted coefficient of determination. The F-test considers the null-hypothesis that each subgrouping possesses the same production function.

\* means significant at the 1-percent level.

\*\* means significant at the 5-percent level.

‡ means significant at the 10-percent level.

‡‡ means significant at the 20-percent level.

Notes

Table 2: Basic Statistics on Real GDP Per Worker and TFP Per Worker by Country Groups

Logarithm of Real GDP Per Worker				Logarithm of TFP Per Worker			
Countries Grouped by 1960-64 Income				Countries Grouped by 1960-64 Income			
	Mean	Std. Dev.	Coef.Var.		Mean	Std. Dev.	Coef.Var.
Low	7.662	0.522	6.809	Low	-2.182	1.212	55.550
Middle	8.948	0.427	4.769	Middle	5.223	0.369	7.062
High	9.934	0.279	2.812	High	12.578	0.822	6.532
All	8.880	0.939	10.570	All: Separatea	5.298	5.497	103.743
All: Pooledb	5.536	0.434	7.840				

Countries Grouped by 1970s Income				Countries Grouped by 1970s Income			
	Mean	Std. Dev.	Coef.Var.		Mean	Std. Dev.	Coef.Var.
Low	7.645	0.482	6.303	Low	-0.789	0.988	125.183
Middle	8.928	0.406	4.545	Middle	4.946	0.369	7.454
High	9.899	0.310	3.135	High	10.882	0.778	7.145
All	8.880	0.939	10.570	All: Separatea	5.214	4.449	85.340
All: Pooledb	5.536	0.434	7.840				

Countries Grouped by Geographic Region				Countries Grouped by Geographic Region			
	Mean	Std. Dev.	Coef.Var.		Mean	Std. Dev.	Coef.Var.
Africa	7.826	0.756	9.661	Africa	-0.630	0.880	139.727
Asia+	8.692	0.711	8.180	Asia+	5.509	0.441	7.997
Europe+	9.732	0.506	5.198	Europe+	4.702	0.221	4.700
L. Amer.	8.969	0.578	6.448	L. Amer.	3.889	0.229	5.891
All	8.880	0.939	10.570	All: Separatea	3.431	2.336	68.079
All: Pooledb	5.536	0.434	7.840				

a Results for all countries are combined after performing regressions separately.

b Results for all countries are from the single pooled regression.

### 7.4 Factors Affecting Total Factor Productivity

In economics, total-factor productivity (TFP), also called multi-factor productivity, is a variable which accounts for effects in total output not caused by traditionally measured inputs. If all inputs are accounted for, then total factor productivity (TFP) can be taken as a measure of an economy's long-term technological change or technological dynamism. TFP cannot be measured directly. Instead it is a residual, often called the Solow residual, which accounts for effects in total output not caused by inputs.

The equation below (in Cobb-Douglas form) represents total output (Y) as a function of total-factor productivity (A), capital input (K), labor input (L), and the two inputs' respective shares of output (?).

and  $\alpha$  are the capital input share of contribution for K and L respectively). An increase in either A, K or L will lead to an increase in output. While capital and labor input are tangible, total-factor productivity appears to be more intangible as it can range from technology to knowledge of worker (human capital).

Technology Growth and Efficiency are regarded as two of the biggest sub-sections of Total Factor Productivity, the former possessing "special" inherent features such as positive externalities and non-rivalness which enhance its position as a driver of economic growth.

Total Factor Productivity is often seen as the real driver of growth within an economy and studies reveal that whilst labour and investment are important contributors, Total Factor Productivity may account for up to 60% of growth within economies.

It has been shown that there is a historical correlation between TFP and energy conversion efficiency.

These are the factors that affect total factor productivity:

Technological Progress:

With technological progress, the inputs (R&D) are utilised efficiently and there is an increase in Total Factor Productivity. Thus inventions and discoveries in the fields of information, communication, medicine, and other areas of science & technology lead to an increase in Total Factor Productivity.

Skill levels of the workers:

Skill levels of workers in a particular country cause increase in the Total Factor Productivity. Countries and also some industries with higher level of education and skills have higher Total Factor Productivity as these workers are able to produce better outputs.

Foreign Investment:

Studies on TFP show that an increase in foreign investment in a country would increase total factor productivity as inputs increase provided this investment is used to promote efficiency of industry.

Natural Calamities:

Natural calamities like droughts, floods, fires, etc. could lead to a decrease in Total Factor Productivity as they might lead to lesser outputs for the same inputs. This is especially true of developing countries and the countries that depend a lot on agriculture as a part GDP.

Level of Competition:

Literature on productivity also refers to the level of competition as an important factor determining productivity. A country with competitive markets and a strong economy would have a higher Total Factor Productivity than others that are not free market economies.

Political Stability:

Factors like corruption, bureaucracy and instability lead to a decrease in the level of output. The more stable a country is, the more it increases Total Factor Productivity.



Notes

Hence, in nutshell, the only gateway to long term steady growth is total factor productivity.

## Self Assessment

1. Fill in the blanks

- (i) ..... and ..... are closely relates concepts.
- (ii) ..... refers to the rate at which resources are being utilized.
- (iii) ..... is increase in output over a period of tie.
- (iv) An increase in ..... increases total factor productivity and promotes efficiency of the economy.
- (v) Improvement in the number if skilled and trained work force ..... total factor productivity.

## 7.5 Total Factor Productivity and Growth Accounting

### *Productivity and growth*

- (a) The main reason for some countries performing better than others is difference in their relative productivities.
- (b) More productive nations can produce high quality goods at low cost. It makes them more competitive in world market.
- (c) High productivity brings about higher standards of living.

Hence, there is a strong logic to believe that total factor productivity is the main cause of economic growth. Growth accounting is one such framework that enables us to obtain different perspectives on growth and conduct such an analysis. By referring to Cobb-Douglas production function, we can prove that any change in output is the result of either change in capital stock ( $K_t$ ) or change in labour force ( $L_t$ ) or total factor productivity ( $A_t$ ).

$$Y_t = A_t \cdot K_t^{1/4} \cdot L_t^{3/4} \text{ On taking logs, } \ln Y = \ln A + .25 \ln K + .75 \ln L$$

This equation can also be used to estimate increase in labour productivity i.e.  $Y/L$ . This can be written as :

$$Y/L = A(K/L)^{1/4}$$

When we apply the growth in output formula in this equation, it becomes,

$$\ln Y/L = \ln A + .25 \ln K/L$$

Let us now analyse the effect of change in each component.

**Changes in Capital:** When capital is raised by  $\alpha$ , the proportional growth rate of a quantity raised will be equal to :

$$\ln Y = \alpha \ln K$$

Therefore, if  $\alpha$  is .75 then a 5% increase in capital stock will increase output by:

$$\ln Y = .75 \ln K = .75 * 5\% = 3.75\%$$

**Changes in Labour:** When labour is raised by  $\beta$ , the proportional growth rate of a quantity raised will be equal to:

$$\ln Y = \beta \ln L$$

Therefore, if  $\beta$  is 0.25 then a 1% increase in labour force will increase output by

$$\ln Y = 0.25 \ln L = 0.25 * 1\% = 0.25\%$$

**Changes in Total Factor Productivity:** In Cobb-Douglas production function, a proportional increase in total factor productivity produces the same proportional increase in output.

$$\ln Y = \ln A$$

Hence, if proportional increase in TFP 4% then output will also increase by 4% labour and capital stock remaining unchanged.

### *Putting Together*

If all the three factors change simultaneously, capital stock, labour stock and total productivity factor then proportional change in output will be given by:

$$\ln Y = \ln A + \alpha \ln K + \beta \ln L \text{ where } \alpha \text{ and } \beta \text{ coefficients of K and L; and } \alpha + \beta = 1.$$

Growth accounting equation can be broken into components that can be attributed to the observable factors of the growth of capital the labour force and total factor productivity.

Total factor productivity is called the Solow residual or measure of ignorance. It is that portion of growth which is left unaccounted for by increase in factors of production.

Economists generally refer to Solow residual as technology. But it is technology in the widest sense. It means not only newer ways of production or newer machinery or newer sources of power supply but also betterment in work organization, more efficient government regulation, degree of monopoly, educational level of labour force, better social institutional factors etc.

In growth accounting TFP does not have any sense without influence of capital of labour. If no capital and labour is there, no technological change can bring about change in output.



*Did u know?* On isolating the influence of production factors, there remains the influence of all other factors.

## 7.6 Total Factor Productivity Measurement: Different Approaches

There are five methods of measuring total factor productivity. The first two are growth accounting techniques and the other three are econometric tools.

1. **Data Envelopment Analysis (DEA):** This approach to productivity measurement is completely non-parametric and makes use of linear programming. This technique was first used by Farrell in 1957 and later it was operationalised by Charnes, Cooper and Rhodes in 1978. This approach compares the ratio of linear combinations of outputs over linear combinations of inputs. It defines that a firm is efficient which has highest output-input ratio for any combination of outputs and inputs. In some situation no firm may be efficient.
2. **Index Numbers (TFP):** In this approach, under a number of assumptions, it is possible to calculate A, the technology coefficient or TFP coefficient without a specified exact production function or rigidly assuming it to be uniform across observations. There are two indices: Solow Index (developed by Solow in 1957) and Translog index (developed by Diewert in 1976).

**Solow Index:** Solow index assumes that elasticity of substitution between labour and capital to be equal to one. In other words if interest goes up by 5% employment of labour will increase by 5%, it has an important implication that income shares of labour and capital remain constant. Solow index of TFP is equal to:

$$\ln A = \ln Y - (1 - \alpha) \ln L - \alpha \ln K$$

**Translog Index:** The translog index of TFP is equal to:

$$\Delta \ln TFP_t = \Delta \ln Y_t - \left[ (SL_t + SL_{t-1}) / 2 * \Delta \ln L_t \right] - \left[ (SK_t + SK_{t-1}) / 2 * \Delta \ln K_t \right]$$



*Caution* Where, Y is output, L and K are labour and capital respectively, SL and SK are shares of income of labour and capital respectively, TFP is total factor productivity.

### Advantages of the index

1. It does not take rigid assumptions about elasticity of substitution.
2. It does not require technology progress to be Hicks neutral.
3. Specification of technology is flexible.
4. Method can easily handle multiple outputs and a large number of inputs.

### Disadvantages of the index

1. It requires quality and reliable data.
2. It is impossible to account for measurement error.

Notes

**Econometric methods:** In econometrics, we apply regression analysis to estimate a production function and from estimated production function we get the rate of technical progress. Generally, Cobb-Douglas Production function is used. There are also Semi parametric procedures to address the issue of productivity.

*Limitations of Total Factor Productivity Measures*

- (a) Certain rigid assumptions make it unrealistic and hence limit its use in real life.
- (b) Econometric models do not take such rigid assumption and hence are appreciated but it assumes that same rate of technological progress for all the years under study. It is not so.



*Task* What is solow index?

### 7.7 Issues and Debates Related to Total Factor Productivity

Some issues and debates total factor productivity are:

1. Dichotomy between technology and capital;
2. The slow down in productivity;
3. Productivity and information technology;
4. Productivity and environment.

**Dichotomy between technology and capital:** the dichotomy is about which is the cause of productivity: is it capital or technology ? There is empirical evidence for both.

**The slow down in productivity:** Another issue that is debated is the slow down in productivity in 1960s and 1970s. There is no satisfactory explanation for the reasons for such happenings.

**Productivity and information technology:** There is a strong correlation exhibited by empirical evidence between productivity and IT but there are no models to give a specific explanation.

**Productivity and environment:** Many environmentalists argue that the growth that is taking place at the cost of environment is doing more harm than good as the opportunity cost of environmental degradation are too high.

#### **Self-Assessment**

2. Multiple choice questions:  
*Choose the correct option*
  - (i) High productivity brings about ..... standard of living.  
 (a) higher                      (b) lower                      (c) middle                      (d) none of these
  - (ii) When labour is raised by  $\beta$ , the proportional growth rate of a quality raised will be equal to.  
 (a)  $\ln y = \alpha \ln L$               (b)  $\ln y = \beta \ln L$               (c)  $\ln y = (\alpha + \beta) \ln L$               (d) None of these
  - (iii) In the DEA technique was first used by Farral.  
 (a) 1950                      (b) 1955                      (c) 1957                      (d) 1960

### 7.8 Summary

- Productivity and growth are closely related concepts. Productivity refers to the rate at which resources are being utilized.
- Growth is increase in output over a period of tie. Output is the return of inputs which can be clubbed into labour and capital.

- Better technology can increase the efficiency of existing inputs.
- The main reason for some countries performing better than others is difference in their relative productivities.
- Economists generally refer to Solow residual as technology. But it is technology in the widest sense.
- Solow index assumes that elasticity of substitution between labour and capital to be equal to one.
- There is a strong correlation exhibited by empirical evidence between productivity and IT but there are no models to give a specific explanation.

### 7.9 Key-Words

- simultaneous : happening or done at the same time as something else.
- assumptions : a belief or feeling that something is true or that something will happen.
- attribute : to say or believe that something is the result of a particular thing.

### 7.10 Review Questions

1. Define and explain the concept of total factor productivity.
2. What are the factors that affect total factor productivity growth?
3. Taking a Cobb-Douglas production function, explain how you will explain change in output resulting from changes in capital, changes in labour and overall change in productivity?
4. What do you understand by "Solow Residual"? Explain how total factor productivity is increased using the growth activity method?
5. Discuss the various approaches to measuring total factor productivity.

### **Answers: Self Assessment**

1. (i) productivity, growth (ii) productivity (iii) growth  
(iv) FDI (v) increases
2. (i) (a) (ii) (b) (iii) (c)

### 7.11 Further Readings



*Books*

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 8: Technological Change and Progress

### CONTENTS

Objectives

Introduction

8.1 Technical Change and the Production Process

8.2 Classification of Technical Change

8.3 The Neo-classical Model with Technical Change

8.4 Some Issues Related to Technical Change

8.5 Summary

8.6 Keywords

8.7 Review Questions

8.8 Further Readings

### Objectives

After reading this unit students will be able to:

- Describe the technical change and the production process and classification of technical change.
- Understand the Neo-classical model with technical change.
- Know about the some issue related to technical change.

### Introduction

Harrod-Domar model as well as Solow model did not consider the role of technology in growth and both are criticized also for it. This unit explains the meaning of technical progress; difference between technical progress and technical change; role of technical progress in growth and development. The unit also explains neo-classical growth model in the presence of technical change and relationship between technical change and total factor productivity. All economists have a consensus that technology plays a dominating role in determining the rate of growth and development of an economy. But here we are trying to develop a model that gives a precise and quantitative relationship between the two.

### 8.1 Technical Change and the Production Process

Technical change means improvement in production process. In other words, it means being able to produce more output with the same amount of inputs. With the technical progress, production function shifts upward. It makes production function superior to the one that existed before technical change. With the introduction of technology as an endogenous variable in production function, the production function becomes

$$Q = F(K, L, t)$$

Where, Q is quantity produced; K is capital employed; L is labour employed,  $t$  is technology. If we take  $k = K/L$  and  $Y$  as  $Q/L$ , then we can write the per worker production function as:

$$Y = f(k, t)$$

There is another way to represent technological progress:

$$Y = F \{ J(t) K, Z(t) L \}$$

With the introduction of coefficients  $J(t)$  and  $Z(t)$ , the production is dependent not only the total amount of labour and capital employed. The expressions  $J(t)$  and  $Z(t)$  are called effective capital and effective labour respectively. If  $dZ/dt$  is more than zero, it shows that effective labour is increasing even though the actual labour force remains unchanged. Similarly, if  $dJ/dt$  is more than zero, it shows that effective capital is increasing even though the actual capital stock remains unchanged.

If  $dJ/dt$  is positive and  $Z(t) = 1$  then it is purely capital augmenting technical progress. On the contrary, if  $dZ/dt$  is positive and  $J(t) = 1$  then it is purely labour augmenting technical progress. If  $dJ/dt$  and  $dZ/dt$  both are positive, then it is called equally capital augmenting and labour augmenting. But the limitation is that it is silent on the cause and source of technical change.

If in an economy both effective labour and effective capital are growing at  $x\%$ , the factor augmenting technical progress is said to be taking place at  $x\%$ . If only effective labour is growing at  $x\%$ , then it is said to be purely labour augmenting technical progress at  $x\%$ . If effective capital is increasing at  $x\%$ , then it is said to be purely capital augmenting technical progress at  $x\%$ .



Notes

If the production process is experiencing constant returns to scale; then production function can be written as:

$$Y = A(t) F(K, L)$$

However, it is not at all necessary that technical change would be taking place at a constant rate.

## 8.2 Classification of Technical Change

Most of the technical changes either make production process more labour intensive or more capital intensive. And by changing the intensity of factors of production, these technical changes bring about a change in the relative share of these factors of production in total product. Certainly, if any technological progress makes production process more labour intensive, it will increase the share of labour in TP and *vice versa*. These technical changes affect the demand and supply of factors of production and thereby wage rate and interest.

To take a simple production function,

$$Y = F(K, L)$$

If capital per worker is denoted by  $k$ , output per worker by  $1$ , and worker output ratio by  $m = 1/1$  and capital-output ratio by  $n$

Then Capital-output ratio = capital-labour ratio \* labour-output ratio

$$n = k * m$$

Or

$$k = n/m$$

$m$  and  $n$  in the above equation are called technical coefficients. In other words, worker output ratio and capital-output ratio are called technical coefficients.  $k$  is called capital intensity. If  $k$  increases, it is called capital deepening; if  $k$  decreases, it is called labour deepening.

In order to get marginal product of capital and marginal product of labour, we can differentiate the production function with respect to capital and labour. Let us call it  $F_k$  and  $F_l$  then we can calculate second derivative to know the rate of change in their marginal products. Let us denote it by  $F_{kk}$  and  $F_{ll}$ .

Generally speaking,  $F_k > 0$ ,  $F_l > 0$  showing MP of labour and capital to be positive

And,  $F_k < 0$ ,  $F_{kk} < 0$  showing that both MP of labour and capital is increasing at a decreasing rate.

Along an isoquant,  $Q = F(K, L)$  is constant. Hence for any change along an isoquant.

Loss in MP of one factor = gain in MP of other factor

Notes

Therefore,  $F_k dk + F_L dL = 0$

With the help of these functions, we can also estimate Marginal rate of substitution between factors of production. If labour is substituted for capital then MRS<sub>kl</sub> is equal to

$$- dK/dL = F_k/F_L$$

**Product Exhaustion Theorem:** It states that if the production function is exhibiting constant returns to scale, then sum total of products of marginal products of different factors and their price is equal to Total Product.  $(\delta Y / \delta L)w + (\delta Y / \delta K)r = Y$ .

where,  $\delta Y / \delta L$  is MP of labour,  $w$  is wage rate,  $\delta Y / \delta K$  is MP of capital and  $r$  is rate of interest. Therefore, if constant returns to scale prevail, total product gets exhausted in the shares of capital and labour.

**Elasticity of Substitution:** Elasticity of substitution is measured as a proportionate change in the ratio of the quantities of the two goods consumed divided by the proportionate change in marginal rate of substitution (MRS<sub>xy</sub>) between the two goods along a given curve.

$$\sigma = \frac{\text{Proportionate change in ratio of two goods consumed}}{\text{Proportionate change in MRS}_{xy}}$$



*Did u know?* Elasticity of substitution is a relative measure of the degree of substitution between two goods for the consumption by the consumers.

**Embodied and Disembodied Technical Change**

Embodied capital change is the change that occurs due to the change in type of factor of production, usually capital. It involves introduction of new machines, new process of production, new product. On the other hand, disembodied capital change occurs when same amount and type of factors of production can produce more. It will happen when isoquant shift inwards showing the production of same output with lesser inputs. It is factor augmenting technical change.

**Neutrality of Technical Change:** Neutrality broadly means that technical change is neither labour saving nor capital saving. It means it reduces the usage of inputs in same ratio and does not affect the relative demand and supply of factors of production and hence, does not affect the prices of inputs. It must be clear from above that disembodies technical change is neutral.

**Hicks's Classification of Technical Change**

Sir John Hicks gave a classification of technical progress in terms of its effect on the ratio of marginal product of capital to marginal product of labour.

If after introduction of technology, MPK/MPL falls, it is capital saving. If it remains same, it is neutral. If it increases, it is labour saving.

Since at producer's equilibrium isoquant is tangent to iso-cost line i.e. MPK/MPL = PK/PL =  $r/w$ , where  $r$  is rate of interest and  $w$  is real wage rate. Therefore, Hicks's classification can also be expressed as follows:

If a technology increases  $r/w$ , it is labour saving, while if it decreases  $r/w$ , it is capital saving. If  $r/w$  remains unchanged the technological progress is unchanged.

In terms of production function, Hicks's classification of technological progress can be expressed as follows: A technical change is labour saving if it shifts the per worker production function upward or at any given value of capital-labour ratio, the ratio of marginal product of capital to marginal product of labour has increased. A technical change is capital saving if it shifts per unit of capital production

function upward or at any given value of capital-labour ratio, the ratio of marginal product of capital to marginal product of labour has decreased. If the ratio is unchanged, it is neutral.

It is proved by Uzawa that Hicks' neutral technical change is same equal to factor augmenting technical progress. Hence, Hicks's neutral technical change is equal to:

$$Y = A(t) F(K, L)$$

The version given by Hicks is based on marginal product of factors and their prices. Hence, it can be used to represent technical change in terms of relative shares of factors in total product.

The ratio of relative shares of factor inputs is  $[rK/Y]/[wL/Y] = rK/wL$ .

Keeping,  $K/L$  constant i.e. assuming capital-labour ratio to be constant, relative shares will be affected by changes in  $r/w$ . If for a constant  $K/L$ , relative shares of  $r/w$  are increasing, it is said to be labour saving. If for a constant  $K/L$ , relative shares of  $r/w$  are decreasing, it is said to be capital saving. If for a constant  $K/L$ , relative shares of  $r/w$  are unaffected, it is said to be neutral technical change.

### Harrod's Classification of Technical Change

Sir Roy Harrod put forward his classification of technical change in an article in 1937 and expanded on it in his book which was published in 1948. He defined neutral technical change as one in which capital-output ratio remains constant in the presence of a constant interest rate. In other words, neutral technical change implies that given a constant rate of interest, the distribution of the total national product between capital and labour remains constant.

Mrs. Robinson provided a geometric proof that Harrod-neutral technical progress is equivalent to Hicks's Labour augmenting progress. She claimed that if technical progress is Harrod-Neutral, and is proceeding at a constant rate  $u$ , then the aggregate production function can be written as :

$$Y = F(K, Z(t) L) \text{ with } [dZ(t)/dt]/Z(t) = u$$

In Harrod's Model, a technical change is said to be labour saving if at a given capital-output ratio, the ratio of relative shares  $S = rK/wL$  is increasing. In other words, if  $K/L$  is constant, and  $dS/dt$  is more than zero, then it is labour saving technical change. If  $K/L$  is constant, and  $dS/dt$  is less than zero, then it is capital saving technical change. If  $K/L$  is constant, and  $dS/dt$  is equal to zero, then it is Harrod neutral technical change.

The Harrod's neutrality can coincide with Hicks's neutrality if the distribution of income is same at all levels of capital-labour ratio. And, capital-labour ratio can be same at all levels if and only if elasticity of substitution between labour and capital is one.



**Caution** In a Cobb-Douglas production function unitary elasticity of substitution is exhibited by a function in which the sum of the coefficients of labor and capital is one.

$$Y = K^a L^{1-a}$$

### Solow's Classification of Technical Change

Solow compared technical change by comparing points on old and new per worker production at which the labour-output ratio is constant. Hence, Solow said technological progress to be neutral when at points where labour-output ratio is constant, and  $dS/dt$  is zero. In other words, when the relative shares of capital and labour in total product remains constant. Solow neutral technical progress is Hicks's capital augmenting.

### Self Assessment

1. Fill in the blanks

- (i) With the technical program, production function shift .....
- (ii) Technical changes effect the demand and supply of ..... and there by wage rate and .....

**Notes**

- (iii) ..... states that if the production function : exhibiting constant reforms to scale, then sum total of products of marginal products of different factors and then price is equal to total product.
- (iv) ..... means that technical change is neither labour saving nor capital saving.
- (v) Sir John Hick gave a classification of technical program in terms of its effect on the ratio of marginal product of ..... to marginal product of .....

**8.3 The Neo-classical Model with Technical Change**

A simplified Neo-classical model without technical change has already been explained in chapter 3. But we know that in the model, the key to growth was not capital accumulation but technical progress. The concept of Solow residual clarified that even after accounting for capital accumulation and growth in labour force, some part is left over. It is attributed to technical change.

Before we introduce technical change into neo classical model, we need to analyse, which classification of technical change is going to serve our purpose better.

**With Hicks’s Scheme:** If labour force increases at tt a constant rate,  $g$ , and MPS is also constant, then the economy will reach at an equilibrium level of output per worker and an equilibrium level of capital per worker. If the economy is on balanced growth path, then with given fixed rate of growth of the labour and saving rate, any rightward shift in production per worker will mean that capital per worker has changed. It will give us new capital-labour ratio. But Hicksian approach assumes a constant capital labour ratio; therefore Hicksian classification of technical progress is not of much use.

It is clear from above explanation, that if we want our economy to grow steadily in the long run with technical progress, this technical progress has to be of Harrod neutral. The model is not talking about the complete schema of Harrod’s classification of technical change but technical progress must be specifically, Harrod-neutral or labour augmenting.

If we consider Solow model of growth with labour being measured in terms of efficiency rather than natural units, it can be represented as :

$$Y = F(k, Z(t)L) \text{ where } Z(t)L \text{ is effective labour force.}$$

Now output per effective labour will be equal to:

$$y = Y/Z(t)L$$

and capital per worker in efficient units,  $k = K/Z(t) L$ .

if  $Z(t) L$  is growing at a constant rate  $u$ , this means Harrod - neutral technical change is happening @ $u$ . in this case, equation of the Solow model will be equal to :

$$k = sf(k) - (n + u) k$$

where ,  $sf(k)$  is savings per effective labour,  $n + u$  is rate fo growth of capital stock.

The steady growth rate occurs where this curve intersects the line  $(n + u)k$ .

**8.4 Some Issues Related to Technical Change**

There are some issues related to technical changes that are controversial and need to be discussed in detail to reach at an exhaustive solutions to the controversies associated with them but in this chapter we are limiting our presentation only to the issues and not to their solutions. In subsequent units, some of them will be answered.

**What about Embodied Technical Progress?**

It has been clarified that embodied capital change is the change that occurs due to the change in type of factor of production, usually capital. It involves introduction of new machines, new process of

production, new product. On the other hand, disembodied capital change occurs when same amount and type of factors of production can produce more. Disembodied technical change is exogenous for many growth models and it is not explained how does it happen. It seems to be a miraculous event.

Solow provided an index of effective capital in his paper 'Investment and Technical progress' published in 1960. Assuming embodied technical progress as an exogenous factor that too without any supporting theory for its explanation, makes it very difficult to understand the determinateness of embodied capital. Moreover, capital goods or machines may be of different vintages.

Therefore, we need to develop a model that gives a satisfactory explanation of the factors that determine the level of embodied progress and the process by which it takes place.

### Nature of Capital

While discussing technical change attention has not been paid to the nature of capital. Machines are of different ages and types. It is difficult to give a precise value to the capital stock as there may be an index number problem. Kaldor was strongly against the idea of representing technical change by a shift in per worker production function. He opined that many a times, it becomes difficult to distinguish between the effect of capital accumulation and the effect of technical change. While the former will lead to movement along the curve; latter will shift the curve upward.



*Task* What do you mean by Embodied Technical progress?

### Self-Assessment

2. State whether the following statements are 'true' or 'false'.
  - (i) If any technological program makes production process more labour intensive, it will increase the share of labour in TP and vice versa.
  - (ii) To get marginal product of capital and marginal product of labour, we can differentiate the production function with respect to capital and labour.
  - (iii) Hicks' neutral technical change is not equal to:
 
$$Y = (A) (\epsilon) F(K, L)$$
  - (iv) Sir Roy Harrod put forward his classification of technical change in an article in 1935.
  - (v) Embodied capital change is the change that occurs due to the change in type of factor of production, usually capitals.

### 8.5 Summary

- This unit explains the meaning of technical progress; difference between technical progress and technical change; role of technical progress in growth and development.
- Technical change means improvement in production process. Production function superior to the one that existed before technical change.
- by changing the intensity of factors of production, these technical changes bring about a change in the relative share of these factors of production in total product.
- In order to get marginal product of capital and marginal product of labour, we can differentiate the production function with respect to capital and labour.
- The version given by Hicks is based on marginal product of factors and their prices.
- If labour force increases at a constant rate,  $g$ , and MPS is also constant, then the economy will reach at an equilibrium level of output per worker and an equilibrium level of capital per worker.

Notes

### **8.6 Key-Words**

- co-efficient : a human which is placed before another quantity and which multiplies it.
- Substitute : a person or thing that you use or have instead of the one you normally use or have.
- disembodied : (of soundx) coming from a person or place that cannot be seen or identified
- aggregate : a total number or amoutn made up of smallen amounts that are collected together.

### **8.7 Review Questions**

1. Enhance the concept of effective capital and effective labour in aggregate production function.
2. Describe the classification of technical change.
3. Explain the concept of elasticity of substitution.
4. Bring out the difference between harrod Newtraity and solow Neutrality.
5. Discuss the neo-classical growth model in the pressure of Harrod-neutral technical change.

### **Answers: Self-Assessment**

1. (i) upward (ii) factory of production, interest  
(iii) product exhaustion theorem (iv) Newtrality  
(v) capital, labour
2. (i) T (ii) T (iii) F (iv) F  
(v) T

### **8.8 Further Readings**



*Books*

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 9: Economic Growth Model – III : Models of Optimal Economic Growth

### CONTENTS

Objectives

Introduction

- 9.1 Optimization Over Time
- 9.2 The Ramsey Model of Growth
- 9.3 The Golden Rule of Accumulation
- 9.4 The Cass Koopman Model of Growth
- 9.5 Summary
- 9.6 Key-Words
- 9.7 Review Questions
- 9.8 Further Readings

### Objectives

After reading this unit students will be able to:

- Know about the optimization over time and Ramsey model of growth.
- Understand the golden rule of accumulation.
- Describe the cass Koopman model of growth.

### Introduction

The growth process of an economy with the economic agents taking decisions. The unit focusses on the consumption and saving decisions. Since economic agents try to attain such a combination of consumption and savings that optimizes their utility hence these models are called optimal growth models. Such as this unit explains some new techniques of optimization. Temporal techniques of optimization followed by Ramsey model of growth. Optimal level of savings is explained under the golden rule of accumulation. At last, the Cass Koopman's model which is an extension of Ramsey model has been explained.

### 9.1 Optimization Over Time

We have already learnt about static optimization techniques i.e. optimization at a given point of time with or without constraints. We have also learnt about some dynamic processes but have not understood how to optimize over the time?

There are situations which call for optimization over a period of time. Optimization over time can be explained differently for two situations. One, when he takes decision at  $t = 1$  for all periods 1, 2, 3, 4, 5..... $n$ . and second, when he optimizes subsequently for each time period. It is possible when each period is separable and separate decisions can be made in different periods.

Let there is a consumer who makes a choice between two time periods  $p$  and  $f$ .  $p$  can be called present and  $f$  can be called future. Let the consumer's consumption is  $c_1$  and  $c_2$  in two periods respectively.

**Notes**

Let he has income  $m_1$  and  $m_2$  for the two periods respectively.

Consumer is assumed to be free to borrow and lend. If he chooses to borrow, he has to pay a rate of interest equal to  $r$  and if he saves a part of income and lends it out, he can earn an interest equal to  $r$ . If he decides to lend a part of her income, then his budget constraint in the period  $f$  would be:

$$c_2 = m_2 + (m_2 - c_1) + r(m_1 - c_1)$$

$c_2$  is consumption that he can afford in period  $f$ ;

$m_2$  is income in period  $f$ ;

$m_1 - c_1$  is income saved in period  $p$ ;

$r(m_1 - c_1)$  is interest on income saved in period  $p$ .

If the consumer might have decided to borrow in period  $p$ , then his budget constraint in the period  $f$  would be :

$$c_2 = m_2 - (c_1 - m_1) - r(c_1 - m_1)$$

This equation can be written as :

$$c_1 + \frac{c_2}{(1+r)} = m_1 + \frac{m_2}{1+r}$$

If we invest Rs.  $x$  for a period of time, then interest rate compounded annually will become equal to  $P(1+r)^n$

In this case, the present value of stream of payments can be written as:

$$\frac{c_1}{1+r} + \frac{c_2}{(1+r)^2} + \frac{c_3}{(1+r)^3} + \dots + \frac{c_n}{(1+r)^n}$$

$$= \sum_{i=1}^n \left[ \frac{c_i}{(1+r)^i} \right]$$

If  $1+r$  is denoted by a :

$$\sum_{i=1}^n \left[ \frac{c_i}{(ac)^i} \right]$$

**Meaning of Functional:** A quantity that is dependent on a variable function is called functional. Question arises, what a variable function is ? A variable function is one which does not choose a single optimal value of a variable quantity but a function i.e. a pattern of relationship. When we optimize at a point of time, (it is called static optimization) a single optimal magnitude for every chosen variable is sought to be obtained. On the contrary, in dynamic optimization i.e. when we optimize over a period of time, the problem is to reach at the optimal magnitude of the chosen variable in each period of time in the given time horizon of the optimization problem.

Time period may be discrete or continuous. However, in both time periods, a dynamic optimization problem would contain following ingredients:

- (a) A given starting point and a given termination point which can be infinity;
- (b) A set of admissible from starting to termination point;

- (c) A set of path values, and
- (d) A specified objective to maximize or minimize the path value by choosing the optimal path.

The relationship between path and path values is shown by a special type of mapping from entire paths curves to real numbers. Let us assume we have a variable  $x$  that depends on time. Let  $x$  also depends on many other variables such that  $x = f(t)$ ;  $x = g(t)$ ; and  $x = h(t)$ . Let the value associated with three functions is  $v_1$ ,  $v_2$  and  $v_3$  respectively. This relationship between the various types of functions which can be generally denoted by  $x(t)$  and the  $v$  values are called functional. It can be expressed as :

$$v = [x(t)]$$

In differential standard calculus, if we have  $y = f[h(x)]$ , it means that some variable is a function of  $x$  and  $y$  in turn is a variable of this function. Therefore,  $y$  is indirectly a function of  $x$ . Such functions is called composite function.

There are three methods to solve dynamic optimization problems :

- (a) Calculus of Variations;
- (b) Optimal Control; and
- (c) Dynamic Programming.



*Task* What is the meaning of functional?

## 9.2 The Ramsey Model of Growth

Economists like Pigou identified that people tend to underestimate future utility and hence, do not save enough for the future. This implies that actual savings fall short of the optimal savings. Frank Ramsey tried to answer the question: What should be optimal saving ? And how can it be calculated?

Ramsey’s model is prescriptive in nature and not predictive. The society has to choose optimal economic growth. If we assume society is being represented by a ‘Representative Agent’ or a central planning agency, which aims at maximizing utility function which depends on consumption, we can show it as follows:

$$U = F(C)$$

Utility in each time period depends on the utility in that time period.

$$U = F(C_t)$$

If labour and capital are denoted by L and K respectively, we can say:

$$U = U(C, K)$$

$$U = U(C/L)$$

$$U = LU(C/L)$$

if  $C_t = c$  then

$$U = U(c)$$



*Notes* Hence, it proves Keynesian version that consumption is the sole end and object of all economic activity.

**Notes**

Suppose the time periods be 0, 1, 2, 3, .....T. There is a stream of consumption over time periods 0.....T, that can be denoted as  $[C_1, C_2, C_3, \dots, C^T]$ . This is sequence of consumption. A sequence is a quantity arranged in order. The optimization problem is to choose such a sequence of consumption that maximizes utility. The idea is to optimize the utility function over entire path so the maximization problem is:

Maximize 
$$J = \sum_{t=0}^T U[c(t)]$$

Several points that need to be paid attention regarding objective function :

- (a) J is the value of sum total of the utility function, since the particular utility function here is additive separable. It means that utility in period 1 is not dependent on utility in period 2.
- (b) Time is a discrete variable and appears as an argument of the consumption function.
- (c) If time would have been taken as continuous, the objective function would have been like :

$$J = \int_0^T U[c(t)] dt$$

- (d) The term J is functional. Utility depends on the whole path or the whole function c. If c changes U will change. Similarly if c changes, J will change. Therefore, in optimization problem, what is being maximized is functional.

Ramsey used a mathematical technique called calculus of variations to solve the optimization problem above. He thought of an ideal level of utility and called it bliss point and assumed it to be same for all time periods. He saw how much actual utility falls short of bliss point. Let B shows the ideal utility i.e. bliss point. It is same in all time periods! Let  $U(ct)$  be the actual utility from per worker consumption level c. Then we can define a function.

Maximize 
$$J = \sum B - U(ct)$$

Certainly, this optimization is subject to the constraint of growth of capital stock of the economy.

Now, let us come to the question of choice of time horizon. If we take time to be finite, and we find that we are left with some capital stock at the termination of time period T, then optimum has not been reached and the optimization function given above would not have been optimized. Therefore, it is desirable to specify a terminal condition that some capital is retained at time T, or the other option is to take time horizon till infinity.

Then there comes a problem of discounting. Given that people value present more than the future, should we discount future values? Ramsey opposed it.



*Did u know?* Social welfare should not only depend only on the current members of the society, but of all members of the society who will live in the society in future.

**Self-Assessment**

1. Fill in the blanks:
  - (i) There are situations which call for ..... over a period of time.
  - (ii) Economists like ..... indentified that people tend to underestimate future utility and hence do not save enough for the future.
  - (iii) ..... model is prescriptive in nature and not predictive.

- (iv) Ramsey used a mathematical technique called ..... of variations to solve the optimization problem.
- (v) Time is discrete variable and appears as an argument of the ..... function.

### 9.3 The Golden Rule of Accumulation

The equation for “Golden Rule of Accumulation” was put forward by Edmund Phelps in 1961. The concept started with a question in context of optimal growth: what is the saving rate that gives rise to the steady path with the highest levels of  $c$  i.e. consumption per labour ? Answer is that the highest steady path for  $c$ , is the one that is equivalent to the highest steady state value of  $c$ . Therefore, we need to find out the highest rate of savings that generates the highest steady state value of  $c$ , given the values of  $n$  and  $d$  where  $n$  is exogenously given rate of growth of population and  $d$  is the rate of depreciation.

In National income identity

$$Y = C + I \text{ where } C \text{ is consumption and } I \text{ is investment}$$

Therefore,

$$C = Y - I$$

If we divide both sides by population we can get per capita values. Let us denote it by small letter

$$c = y - i$$

It can be written as :

$$c_t = f(k_t) - sf(k_t)$$

It implies that saving equal investment and saving equals  $sY$ .  $s$  stands for MPC.

$y = f(k_t)$  is the consumption function that is to be maximized given a constraint that the rate of growth of capital should be equal to zero. Therefore, the objective function is :

$$c_t = y_t - i_t$$

Subject to  $k = 0$ .

Therefore, the function can be written as :

Maximize  $c_t = f(k_t) - sf(k_t)$

Subject to  $sf(k_t) = (n + d)k_t$

On substituting the constraint in the objective function,

Maximize  $ct = f(k_t) - (n + d)k_t$

So the first order condition for solution to this problem is :

$$dc / dk_t = f(k_t) - (n + d) = 0$$

It implies that :

$$f(k_t) = (n + d)$$

This equation is known as Golden Rule of Accumulation. The solution to the equation will give us the steady state value of  $k$  : which in turn will steady path for  $c_t$  that can be attained given the values of  $n$  and  $d$ .

It is called a golden rule as it takes care of the interest of present as well as future generation. The idea communicates that our previous generations saved as so that we could enjoy optimal levels of consumption. Now we should also save as so that our future generations can also enjoy optimal consumption paths.

### 9.4 The Cass Koopmans Model of Growth

This model was developed by David Cass and Tjalling Kopsman. The model is an extension of Ramsey model. Ramsey opined that discounting future is morally and ethically undesirable as equal importance should be given to present as well as future. But David Cass and Tjalling, Kopsman believed that it is necessary to discount future values when it is clearly known that the society attaches greater value to the present than future. The reasoning put forward for discounting future values is mathematical and logical in nature.



*Caution* They also criticized Golden Rule of Accumulation and claimed that objective function should aim at maximization of utility and not consumption.

The David Cass and Tjalling Kopsman formulation can be explained as follows:

If we assume that the society has a utility function equal to  $U(c_t)$  and the stream of utility accruing to society  $\{U_1, U_2, U_3, \dots, U_t\}$  then the total utility can be derived by simply adding up utilities in different time periods as per Ramsey Model. In other words, Ramsey model would give us total utility which is equal to :

$$U_0 + U_1 + U_2 + \dots + U_t.$$

But David Cass and Tjalling Kopsman model does not accept it. Following arguments are given for it :

- (a) The society is not indifferent to timings of utility. It values present more than the future and therefore attaches greater value to present utility than future utility. Therefore the society has a time preference. It implies that total utility of the society can  $n$  to be determined by simply adding up the utilities in different time periods but it needs to be discounted. Therefore, David Cass and Tjalling Kopsman advocated that total utility should be calculated by computing the present discounted value of the utility stream which is equal to :

$$U = U_0 + \frac{U_1}{(1 + \alpha)} + \frac{U_2}{(1 + \alpha)^2} \dots$$

Where  $\alpha$  is the rate of time preference or discount rate. If we denote  $1/(1 + \alpha)$  by  $a$ , and call  $a$  as discount factor, then

$$U = U_0 + aU_1 + a^2U_2 \dots$$

Hence, the first reason put forward for inculcating the discounting of future utility is simple that the social planner has a preference for present utility to future utility.

- (b) The second argument put forward for using discounting is that we are not as concerned for the future generations as we are for our own dynasties. Each individual is concerned the most about his own family members which include his children and thereby future generation but not for the future generations at large. Therefore each person's utility in the current period is also a function of the utility of his or her children in the future.
- (c) Robert Becker has put forward still another argument for discounting future utilities. He advocates that inter-temporal optimization must not be understood in a normative perspective. It does not involve value judgments. If it is a fact that society values present more than the future, it is not desirable to attach a value judgment that the society should not do so.

After having explained the rationale for discounting, let us explain how optimization is attained with discounting of future utilities.

Cass Koopman’s Model assumes that there is a representative agent of the society who aims at maximizing an inter-temporal utility function:

$$U = U_0 + aU_1 + a^2U_2.....$$

Where  $a$  is the discount factor and  $0 < a < 1$

The utility function given above is additively separable over time.

Let us now understand with the help of Sidrauski Model the impact of money on optimization equations and conditions.

The basic idea in the Sidrauski Model is to introduce real money balances into the utility functions. He claims that a consumer gets utility not only from consumption but also from, holding real the money balances money balances. But he talked about real money balances i.e. that have been adjusted for the price rise in the economy. Therefore, the utility function put forward by Sidrauski is :

$$U = F(c_t, m_t)$$

$m_t = M_t/P_t$ . In other words,  $m$ , is the real money balances which are derived by dividing  $M_t$ , the nominal money balances by  $P_t$  i.e. price levels.

Sidrauski Model also faces the same constraint as Cass Koopman’s Model.

$$c_t + k_t = f(k_t) + (1 - d)k_t$$

Rather it has an additional constraint due to introduction of money. So we introduce :

$$V_t = \frac{\bar{M}_{t+1} - \bar{M}_t}{P_t}$$

Where  $\bar{M}$  denotes money supplied from outside by the government. It is different from  $\bar{M}_t$  which means the money balances chosen by an individual. New Budget equation will be :

$$P_t(c_t + k_t) + M_{t+1} = P_t[F(k_t) + (1 - d)k_t] + M_t + P_t V_t$$

If we take inflation rate as  $x$  then:

$$\frac{M_{t+1}}{P_t} = \frac{M_{t+1}}{P_t} \left( \frac{M_{t-1}}{P_{t+1}} \right) \left( \frac{P_{t+1}}{P_t} \right) = M_t + (1 + x_t)$$

The above equation can be used to solve optimization exercise and find out whether economy is in stationery state or is growing.

### Self-Assessment

2. State whether the following statements are ‘true’ or ‘false’.
  - (i) The equation for “golden rule of accumulation” was put forward by Edmund Phelps in 1961.
  - (ii) The model is not an extension of Ramsey model.
  - (iii) Robert Becker has put forward still another argument for discounting future utilities.

### 9.5 Summary

- Since economic agents try to attain such a combination of consumption and savings that optimizes their utility hence these models are called optimal growth models.
- A quantity that is dependent on a variable function is called functional. A variable function is

**Notes**

one which does not choose a single optimal value of a variable quantity but a function i.e. a pattern of relationship.

- The relationship between path and path values is shown by a special type of mapping from entire paths curves to real numbers.
- Economists like Pigou identified that people tend to underestimate future utility and hence, do not save enough for the future.
- Ramsey's model is prescriptive in nature and not predictive. The society has to choose optimal economic growth.
- Ramsey used a mathematical technique called calculus of variations to solve the optimization problem.
- The equation for "Golden Rule of Accumulation" was put forward by Edmund Phelps in 1961.

### **9.6 Key-Words**

- optimal : the best possible
- extension : the act of increasing the area of activity, group of people, etc.
- Magnitude : the great size or importance of something.

### **9.7 Review Questions**

1. What are the basic elements or ingredients of a dynamic optimization problems.
2. Explain the concept of a functions
3. Describe the basic structure of optimization in the Ramsey growth model.
4. What do you understand by the "Golden Rule of Accumudation"?
5. Suppose there is a technical change in Neo-classical models How would then the golden rule need to be modified?
6. What are the reasons for the use of discounting in the cars-koopmans model?

### **Answers: Self-Assessment**

1. (i) optimization (ii) pigon (iii) Ramsey's  
(iv) calculus (v) consumption
2. (i) T (ii) F (iii) T

### **9.8 Further Readings**



*Books*

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 10: Multi-Sector Models of Growth

Notes

### CONTENTS

Objectives

Introduction

10.1 Two-Sector Growth Models

10.2 Multi-Sector Growth Models

10.3 Summary

10.4 Key-Words

10.5 Review Questions

10.6 Further Readings

### Objectives

After reading this unit students will be able to:

- Explain the two-sector growth models.
- Describe the multi-sector growth models.

### Introduction

The assumption that we had taken in one sector growth model that there is one good that is used both as capital as well as consumer good is very unrealistic and is criticized for the same. The multi-sector growth models are a class of growth models that reject this assumption. These models have a two-sector model as a special case. It recognizes that consumption and capital goods are inherently different commodities and are produced in different sectors of the economy. Multi-sector models explain the situation where many durable goods are produced with fixed coefficient or a neo-classical type production function. The theory was popular during 1950-1970 but lost its image and many supporters when endogenous theories came into the picture.

### 10.1 Two-Sector Growth Models

**Introduction and Assumptions:** All two sector models assume that a single homogenous good is produced using homogenous capital and labour. Capital and labour are also assumed to be homogenous. This homogenous capital good is also produced in a sector using homogenous factors of production. Hence, there are some common assumptions of all two sector models :

- There is one single capital good which is used in both the sectors as an input. Say for example the economy produces 'Wheat' in one sector using tractors and labour and 'tractors' in other sector using tractors and labour.
- All labour is homogenous which implies there are no differences in skills that they have and it grows at a constant rate and this growth rate is an exogenous variable.
- Both labour and capital are shiftable from one sector to another without any cost as such and instantaneously.
- Physical capital depreciates at a constant exponential rate  $\delta$ .
- The conditions of competitive equilibrium are obtained.

Notes

*The Uzawa Model*

Hirofumi Uzawa put forward this growth model in 1961 and 1963 via his articles. Uzawa's model is a two sector extension of So low-Swan Neo-classical growth model.

Let us assume that there are two goods a consumer good say corn denoted by  $c$ , and a capital good tractor denoted by  $k$ . Both the goods are being produced under constant returns to scale. Therefore, the production function of both the goods are:

$$Y_k = F_k(K_k, L_k)$$

$$Y_c = F_c(K_c, L_c)$$

Where  $K_k$  and  $L_k$  are the amounts of capital and labour employed in the production of capital good and  $K_c$  and  $L_c$  are amounts of capital and labour employed in the production of consumer good. Let

$$k = K_k + K_c \text{ and}$$

$1 = L_k + L_c$  then since we have assumed that labour and capital are shiftable in the two sectors, therefore the production function of the two sectors can be written in per-worker form as :

$$y_k = F(k_k)$$

$$y_c = F(k_c) \text{ where } Y_k = Y_k/L_k; k_k = K_k/L_k; y_c = Y_c/L_c; k_c = K_c/L_c.$$

It is assumed that labour grows at a constant rate.

$$\frac{\dot{L}}{L} = n = g_L$$

On the basis of the assumptions that both the sectors are minimizing profits and the wage rate and the rental profile are same in both sectors therefore,

$$P_k = \frac{\partial Y_k}{\partial K_k} = r, \text{ and}$$

$$P_c = \frac{\partial Y_c}{\partial K_c} = r;$$

$$P_k = \frac{\partial Y_k}{\partial L_k} = w, \text{ and}$$

$$P_c = \frac{\partial Y_c}{\partial L_c} = w$$

where  $P_k$  is the price of capital good and  $P_c$  is the price of consumer good.

$\frac{w}{r}$  is the ratio of wage rate to rental capital.

Rental capital is a function of the physical marginal product of the capital in the capital goods sector and the consumer goods sector.

Euler's theorem will operate in both sectors because it is assumed that constant returns to scale are provided therefore wages in capital goods sector are  $w = P_k Y_k - k_k P_k F'(K_k)$

Notes

Similarly wages in consumer goods sector are:

$$w = P_c Y_c - K_c P_c F'(k_c)$$

It implies  $\frac{w}{r} = \frac{F(k_k)}{F'(k_k)} - K_k$  in capital goods sector;

and  $\frac{w}{r} = \frac{F(k_c)}{F'(k_c)} - K_c$  in consumer good sector,

Like Kaldor if we make on entre assumption that all profits are saved and all wages are communed given above facts, in the equilibrium the following conditions are satisfied:

$$Y_k = S_k(Y_k, L_k), Y_c = L_c(K_c, L_e)$$

$$P_k \frac{\partial Y_c}{\partial K_c} = r, P_c = \frac{\partial Y_k}{\partial L_k} = w$$

$$P_c \frac{\partial Y_c}{\partial K_c} = r, P_c = \frac{\partial Y_c}{\partial L_c} = w$$

$$K_c + K_k = K, L_c + L_k = L$$

$$P_c Y_c = w L, P_k Y = r k$$

If we assume that capital goods sector has two uses:

1. To replace net increases in the stock of capital goods.
2. To replace the depreciating capital goods then the rote of capital stock is:

$$K = Y_k - \delta K$$

Saving-Investment equation is:

$$Y_k = \frac{rk}{P_k}$$

Putting it in equation given above,

$$K = \frac{rk}{P_k} - \delta K$$

On solving the equation, we get

$$\delta'(K_k) = (n + \delta)$$

Therefore, if Kaldor's type of assumption about saving and investment is taken in Uzawa model then we can say that balanced growth path would be attained when the marginal product of capital in the capital goods industry is equal to the sum total of growth in the labour force and a constant rate of depreciation. Such a balanced growth path is possible to be attained if the capital-labour ratio in the consumer goods sector is never less than capital-labour ratio in the capital goods sector.



*Notes* If above condition is fulfilled, it would not make any difference what is the ratio of wages and profits.

Notes

*The Uzawa-Srinivasan Extension*

Uzawa and Srinivasan both extended initial Uzawa model to explain a model of optimal growth in a two sector economy. They based their model on the assumption that there is a decision-maker who aims to maximize the sum of per capita consumption subject to the different production conditions and the conditions about the use of the capital good in both the consumption good and capital goods industry. They postulated a maximization function as follows:

$$\text{Max} \int_0^{\infty} y_c e^{\beta t} dt$$

*Outcomes of the Model:*

- (a) The Uzawa-Srinivasan model investigates the situations in which the capital-labour ratio in the consumer goods sector is more than or equal to capital-labour ratio in the capital goods sector and also the situations in which the capital-labour ratio in the consumer goods sector is less than capital-labour ratio in the capita goods sector.
- (b) Unlike Uzawa model, it is not a condition for balanced growth that the capital-labour ratio in the consumer goods sector is never less than capital-labour ratio in the capita goods sector.
- (c) The objective in the model is not the balanced growth path but the optimization of growth path.
- (d) The model aims at maximization of consumption per capita and not the utility and therefore the law of diminishing marginal utility does not hold well.



*Did u know?* Optimization exercise may be carries out by the individuals or government and some public sector agency.

*The Feldman Model*

G. A. Fredman was a Russian economist who worked to solve the problems of planning in the newly formed Soviet State Planning Commission. The Fredman Model is very much different from the Uzawa two-sector model.

*Assumptions of the Model*

- (a) The Feldman Model assumes that the economy is divided into two sectors such that sector A produces capital goods and these capital goods can be used in either sector but once installed they can't be shifted form one sector to another.
- (b) The Fredman Model assumes that production of goods in sector 1 is independent of production of goods in sector 2.
- (c) The Model also assumes that the economy is a closed economy.
- (d) The Model claims that capital does not depreciate at all and hence capital is equal to investment.
- (e) The Feldman model assumes that production is carried out in both the sectors with fixed co-efficients technology.

Two implications of the Feldman model are as follows:

- (a) Generally speaking, in an economy the rate of consumption is not equal to rate of investment. With the time, the rate of the growth of the consumption increases until it reaches the long run growth rate of the economy. It is given by the rate of investment which is equal to  $a/w_1$ .
- (b) Another important fact revealed by the model is that the generally the rate of growth of the national income is not equal to the rate of growth of total investment. It will tend to be equal to  $a/w_1$  in the long run. Therefore, the model suggests that it is advisable for policy makers to increase the proportion of current capital goods engaged in producing more capital goods as this will increase the rates of growth of consumption, investment and output in the long run.

The Feldman Model influenced the model developed by P.C. Mahanalobis who divided the capital goods sector into two types of capital goods : C-Type capita goods that produce consumer goods and K type capital goods that are used to produce other capital goods.

Notes



**Caution** Hence, to conclude we can say that P.C. Mahanalobis gave a model which is an extension of Feldman's model when there is more than one type of capital goods.

### Self-Assessment

1. Fill in the blanks:
  - (i) All two sector models assume that a ..... homogenous good is produced using homogenous capital and labour.
  - (ii) The conditions of competitive equilibrium are .....
  - (iii) Hirofami Uzaura put forward this growth model in ..... and ..... via his articles.
  - (iv) Uzawa's model is a ..... extension.
  - (v) The rate of ..... of consumer goods sector is dependent or investment.

## 10.2 Multi-Sector Growth Models

We have three Multi-Sector Growth Models:

- (a) The General Multi-Sector Model
- (b) Dynamic Leontief Model
- (c) Von Neumann Model.
- (a) **The General Multi-Sector Model:** This model contends one sector or two sector models by adding more sectors, each denting an additional durable good product by Solow type production function.

#### Assumptions

1. There are 'N' distinct capital goods, each is being product in a different sector of the economy.
2. Labour is homogenous.
3. There is one consumer good sector.
4.  $k_1, k_2, k_3, \dots, k_n$  denote stocks of capital in different sectors.
5.  $k_{ij}$  denote  $i$ th capital good employed in  $j$ th sectors.
6.  $L_j$  denote labour employed in  $j$ th sector.
7. Production takes place under neo-classical production function.

$$Y_j = ff(L_j, k_{ij}, \dots, k_{nj})$$

Since these functions show constant returns to scale, on multiplying each teem by  $\frac{1}{y_j}$ , we get

$$1 = ff(a_{oj}, a_{ij}, \dots, a_{nj})$$

Notes

Where  $a_{0j} = \frac{L_j}{Y_j}, (j = 0, 1, \dots, n)$

$$a_{1j} = \frac{K_{ij}}{Y_j}, (j = 0, 1, \dots, n)$$

Given above facts, full employment equilibrium will be attained when following conditions are fulfilled.

$$\sum_{j=0}^n a_{0j} Y_j = L_i$$

and  $\sum_{j=0}^n a_{1j} Y_j = k_i$



Task

How many types of multi-sector growth models?

- (b) **Dynamic Leontief Model:** Dynamic Leontief Model is an extension of static input-output model of inter-industry analysis.

The model assumes that there is a single technology of production for the production of each good. In other words, it assumes a fixed coefficient of technology.

The model considers the following type of production function.

$$Y_j = \min \left[ \frac{L_j}{a_{0j}}, \frac{k_{1j}}{a_{1j}}, \dots, \frac{k_{nj}}{a_{nj}} \right]$$

$$(j = 0, 1, 2, \dots, n)$$

Physical structure of the model can be explained in the following words :

The total demand for the  $i$ th good in  $t$ th period is :

$$\sum_{j=1}^n a_{ij} x_j(t) + \sum_{j=1}^n b_{ij} [n_j(t+1) - n_j(t)] + c_i(t)$$

Where  $A = [a_{ij}]$  is a ' $n \times n$ ' matrix

$B = [b_{ij}]$  is also ' $n \times n$ ' matrix

$x_i(t)$  is the output of  $i$ th good in  $t$  period.

$c_i(t)$  is final demand.

$a_{ij}$  =  $i$ th good used per unit of  $j$ th good.

$b_{ij}$  = the quantity of  $i$ th good invested by the  $j$ th industry to increase the output in that industry by one unit.

$$K_i(t) = \sum_{j=1}^n K_{ij}(t) \quad \dots$$

(1)

Where  $K_i(t)$  is the total stock of  $i$ th good required as a capital good in period  $t$ .

If we consider

$b_{ij}$  = the amount of stock of  $i$ th good necessary as a capital good in the industry for the production of one unit of  $i$ th good, then

$$b_{ij}x_j(t) = k_{ij}(t) \quad \dots$$

(2)

Putting (2) in eqn (1), we get

$$k_i(t) = \sum_{j=1}^n b_{ij}x_j(t)$$

Further, let us assume that the capital is perfectly mobile from one sector to another and is fully employed, then

$$\begin{aligned} I_i(t) &= \Delta K_i(t) \\ &= K_i(t+1) - k_i(t) \\ &= \sum b_{ij} [x_j(t+1) - x_j(t)] \end{aligned}$$

Now, the basic equation of dynamic Leontief model can be written as :

$$x_i(t) = \sum_{j=1}^n a_{ij}x_j(t) + \sum_{j=1}^n b_{ij} [x_j(t+1) - x_j(t)] + c(t)$$

In matrix form, it can be written as:

$$x(t) = A \cdot x(t) + B \cdot [x(t+1) - x(t)] + c(t)$$

### (c) Von Neumann Model

*Assumptions*

1. The economy produces  $n$  commodities indexed by  $i, i = 1, \dots, n$ .
2. For every  $i$ , there is at least one  $j$  such that  $b_{ij} > 0$ . In other words, every commodity can be produced by some output.
3. With given technologies, production possibilities can be described by the transformation set  $T$  has as element pairs  $(x, y)$  of  $n$ -vectors such that the possible of output  $y = (y_1, \dots, y_n)$  is possible technically from the input  $x = (x_1, \dots, x_n)$  if only of  $(x, y)$  is a members of set  $T$ .
4. There are a finite number of production activities,  $M_1$  indexed by  $j$  such that  $J = 1, 2, \dots, n$
5. The  $j$ th activity's operation at unit level requires an input  $(a_{1j}, \dots, a_{nj})$  of the  $n$  commodities and produces an output  $(b_{1j}, \dots, b_{mj})$  given that  $a_{ij} \geq 0$  and  $b_{ij} \geq 0$

The model suggests that there is a transformation set which shows the relationship between activities and commodities  $T$ .

$$T = \{(n, y) : n \geq, A \cdot z, y, < B \cdot z\}$$

For some  $z \geq, 0, z = (z_1, \dots, z_m)$

$A_{ij}$  and  $B_{ij}$  are input and output coefficient respectively.

**Notes**

He claims that there exists an activity level  $z^*$  and a price level  $P^*$  such that

$$z^* \geq 0, P^* \geq 0, B_z^* \geq \lambda^* A_z^*, P^* \beta \leq \lambda^* A$$

$\lambda$  is an eigen vector  $\lambda^*$  is the growth rate of the slowest growing sector.

**Self-Assessment**

3. Multiple choice questions:

*Choose the correct option*

(i) There are types of multi-sector growth models.

- (a) one                      (b) two                      (c) three                      (d) four

(ii)  $\sum_{j=0}^n a_{oj} y_j = \dots\dots\dots$

- (a)  $L_j$                       (b)  $L_i$                       (c)  $L_k$                       (d)  $L_n$

(iii)  $\sum_{j=0}^n a_{ij} y_s = \dots\dots\dots$

- (a)  $L_i$                       (b)  $K_j$                       (c)  $K_i$                       (d)  $L_j$

**10.3 Summary**

- The assumption that we had taken in one sector growth model that there is one good that is used both as capital as well as consumer good is very unrealistic and is criticized for the same. The multi-sector growth models are a class of growth models that reject this assumption.
- All two sector models assume that a single homogenous good is produced using homogenous capital and labour.
- Hirofumi Uzawa put forward this growth model in 1961 and 1963 via his articles. Uzawa's model is a two sector extension of So low-Swan Neo-classical growth model.
- ental capital is a function of the physical marginal product of the capital in the capital goods sector and the consumer goods sector.
- Uzawa and Srinivasan both extended initial Uzawa model to explain a model of optimal growth in a two sector economy.
- The Uzawa-Srinivasan model investigates the situations in which the capital-labour ratio in the consumer goods sector is more than or equal to capital-labour ratio in the capital goods sector and also the situations in which the capital-labour ratio in the consumer goods sector is less than capital-labour ratio in the capita goods sector.
- G. A. Fredman was a Russian economist who worked to solve the problems of planning in the newly formed Soviet State Planning Commission. The Fredman Model is very much different from the Uzawa two-sector model.

**10.4 Key-Words**

- Assumption : the act of taking or beginning to have power or responsibility.
- Durable : likely to last for a long time without breaking or getting weaker.

## 10.5 Review Questions

Notes

1. What are the basic assumptions that are common to all types of two-sector growth models?
2. Describe the basic structure of the uzawa model.
3. In what basic way is the feldman model different from the uzawa model?
4. Describe the basic structure of the general multi-sector production process.
5. Bring out the basic dissimilarities between the dynamic leontief model and von neumann model.

### Answer: Self-Assessment

1. (i) single (ii) obtained (iii) 1961, 1963 (iv) two-sector  
(v) growth
2. (i) (c) (ii) (b) (iii) (c)

## 10.6 Further Readings



Books

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 11: Endogenous Growth Models

### CONTENTS

Objectives

Introduction

11.1 The Neo-classical Growth Model with Human Capital

11.2 Endogenous Technology, Increasing Returns and Monopolistic Competition

11.3 Some Issues Endogenous Growth Theory

11.4 Summary

11.5 Key-Words

11.6 Review Questions

11.7 Further Readings

### Objectives

After reading this unit students will be able to:

- Explain the neo-classical growth model with human capital.
- Describe the endogenous technology increasing returns and monopolistic competition.
- Understand the some issues in endogenous growth theory.

### Introduction

Endogenous growth theory began with the efforts of Paul Romer in 1986 and Robert Lucas in 1988. Endogenous growth models originated in two sources : a0 to give a coherent explanation of convergence controversy, and the other, to go beyond an unrealistic simple world of perfect competition and constant returns to scale in growth models. Their work differs from Neo-Classical economists who took economic growth is caused by factors that are exogenous. The endogenous growth theory is an extension of Solow Model in the sense that the latter introduced increasing and diminishing returns to the theories of economic growth but the latter al so included technical change as an endogenous variable in growth models.

### 11.1 The Neo-classical Growth Model with Human Capital

Solow growth model stated that if initial conditions were similar in different countries, eventually the levels of income of these countries would converge. In other words, it claimed that the growth rate will be faster in poor countries than in rich countries and gradually income inequalities amongst nations would disappear. But empirical study brought into light two facts :

- (a) Growth rate of almost all economies of the world has been faster than population growth.
- (b) The growth rate of different nations did not converge for a very long time as claimed by Solow.

Hence, a need was recognized to build models where there is infinitely rise in per capita income: This research continued to consider capital accumulation as one of most determining factor in economic growth but in this model the meaning of capital accumulation has been broadened by including human capital into it. Mankiw, Romer and Weil gave a marginal extension to the neo-classical model in their paper that published in 1992. They considered human capital not as part of labour but a distinct factor of production. The model maintains Solow's assumption of diminishing returns to the capital as a factor of production.

The structure of the Mankiw, Romer and Weil model can be presented by assuming an economy which produces output  $Y$  using physical capital in combination with human capital. According to constant returns to scale, Cobb-Douglas production function will be:

$$Y = K^a (AL)^{1-a}$$

Where  $A$  is coefficient of labour augmenting technology which is growing at an exogenous rate  $g$ .

### How do people accumulate Human Capital?

Different economists have varies views on how people accumulate human capital. According to Mankiw, Romer and Weil people sacrifice their present consumption to accumulate human capital.

Lucas opined that people spend on accumulating new and scarcer skills which enhances their economic worth. The idea was proposed first of all by Kenneth Arrow in his article, "The Economic Implications of Learning New Skills and Foregoing Working for that Period" in the year 1962.

We are explaining a type of presentation given by Lucas.

If  $q$  is the proportion of time spent in learning new skills and  $L$  be the total amount of raw labour used in production. When  $L$  amount of the unskilled labour spends  $q$  proportion of their time on in learning new skills then let us assume that  $H$  amount of skilled labour is produced as per following function:

$$H = e^{\phi q} L$$

Where  $\phi$  is a constant.

It claims that if in an economy,  $q = 0$ ,  $L = H$ , and all labour is unskilled then by raising  $q$ , the effective unit of  $H$  i.e. skilled labour can be increased.

Now let us see how does capital accumulation take place. Like in the solow model,

$$K = S_k y - \delta k$$

Dividing above eqn by stock of unstilled labour,  $L$

$$\frac{K}{L} = \frac{S_k Y}{L} - \frac{\delta k}{L}$$

The model assumes  $q$  to be constant and an endogenous variable,  $h = e^{\phi q}$  hence is a constant. Therefore, along a balanced growth path.

Rate of growth of  $K$  and  $L = g$  i.e. rate of technical progress.

$$\tilde{y} = \tilde{k}$$

Where

$$\tilde{k} = S_{ky} - (n + g + \delta) \tilde{k}$$

$$\frac{\tilde{k}}{\tilde{y}} = \frac{S_{ky}}{n + g + \delta}$$

Putting this eqn into the production function in terms of the equation involving  $y$ , we can find the steady state value of output technology ratio  $y^*$

$$y^* = \left( \frac{S_k}{n + g + \delta} \right)^{\frac{a}{1-a}}$$

Thus, the explanation and equations explain us the causes for the difference in the growth levels of different countries. The countries that spend highly on physical capital, have better technology and

Notes

spend a high proportion of time in accumulating new skills are relatively richer than those which do not give due importance to investment in physical and human capital.



*Notes* knowledge capital is the means to attain human capital which in turn is the means to increase the rate of growth.

### 11.2 Endogenous Technology, Increasing Returns and Monopolistic Competition

After understanding the implications for economic growth, of expanding the notion of capital to include human capital, the effects of human capital on economic growth were explained. Now let us discuss the nature of human capital and the way it is created. No doubt, human capital will aid the growth process. But the model will help us to quantify the relation between growth and human capital.

Let us look at a standard Cobb-Douglas production function in the human capital augmented neo-classical-growth model.

$$y = A e^{nt} K^a L^{1-a}$$

In such a model, savings will create growth for a while but it will not be steady and sustaining growth. As the ratio of labour to capital would rise, marginal product of capital will fall and the economy would revert back to the same level of growth. Growth in income per worker will continue to take place and grow and which is an indicator of increase in the level of human capital. Traditional neo-classical theory takes *m* as an exogenous variable but endogenous growth theory explains how is the value of *n* determined.



*Task* How do people accumulate human capital?

**AK Model of Endogenous Growth:** AK model of endogenous growth was presented by **Sergio Rebelo** through his article titled 'Long Run Policy Analysis and Long Run Growth' which was published in 1991. It is based on the work done by Romer and Lucas. The basic equation of the model is :

$$Y = AK$$

Where A is symbolic of factors affecting technology and K includes physical as well as human capital. The model rejects that proposition of diminishing returns. It claims that externalities or spillovers and increasing quality and variety of intermediate inputs do help to avoid diminishing returns.

Basic equation of of AK model is :

$$\dot{K} = sy - \delta k$$

Dividing both sides by K,

$$\frac{\dot{K}}{K} = s \frac{y}{K} - \delta$$

On substituting  $\Delta K = y$  in the equation

$$\frac{\Delta K}{k} = sA - \delta$$

$$Y = \Delta K$$

Taking natural logarithms.

$$\ln Y = \ln A - \ln k$$

Differentiating it w.r.t

$$\frac{\Delta Y}{Y} = \frac{\Delta K}{k}$$

Therefore, growth rate of output is equal to growth rate of investment.

Generally speaking, lesser importance has been given to technology because endogenous growth theory admits that technology does not explain much of the growth. Initially technology was given a high importance. But then some economists claimed that there is not much need to understand technology as it is a very small part of the contribution to growth process. They feel that it is so small that it can even be ignored. But it is not logical. Solow model as well as empirical evidence shows that even if capital formation directly contributes to growth, without technological advancement, growth would stop. It is so because it is technology that causes investment in the capital and indirectly causes all the growth. It is technological advancement that makes it possible to get increasing returns from all relevant inputs.

Technology connotes the way in which inputs are converted into output. Technology can be taken as a factor which stimulates the productivity of all factors of production. In a Cobb-Douglas production function, technology can be shown as :

$$Y = K^a (AL)^{1-a}, \text{ where } A \text{ is an index of technology.}$$

Paul Romer's views on technology and its impact on growth process :

Romer published his two papers in the year 1986 and 1990 in which he presented a way of modeling ideas as an engine of growth. Romer claimed that new ideas are non-rivalrous good and hence produce increasing returns to scale. He further claimed that increasing returns to scale with explicit presence of research can prevail if and only if there is imperfect competition in the market.

Most of the economic goods are non rivalrous in nature. This means that if good X is used by someone, everyone else is excluded from using same good X. Unlike economic goods, ideas are non rivalrous in nature. Once an idea is created, it is available for all. But ideas can be excludable particularly if they carry copyrights or patent rights. In such cases, the creator of the ideas can charge a price for their ideas. Goods that are excludable benefit their producers in the form of higher incomes. Goods that are non-excludable benefit the whole economy by producing externalities and spill overs.

Rivalrous goods need to be produced as many times as it is consumed. If say a book is sold once, we need to produce another book for next customer. But non excludable goods can be consumed by unlimited number of people once they are produced. Say for example, a road, it can be used by thousands of people in one day but do not have to be created again and again. It implies that non excludable goods have a fixed cost and zero marginal cost. It takes effort to create them in first go and then it can be used many times.



*Did u know?* The cost of knowledge capital is fixed and subsequent units can be produced under constant returns to scale.

Notes

**Notes**

Such cost structure implies increasing returns to scale and imperfect competition. Since, the units after the first unit are getting produced under constant returns to scale then the entire production takes place at increasing returns to scale therefore, AC curve is downward sloping.

Therefore, we have understood following facts :

- (a) Ideas are non-rivalrous in nature;
- (b) They produce increasing returns to scale;
- (c) Non-rivalrous goods have a fixed cost of production and zero marginal cost. It applies to ideas as well.

It implies that if we attain producer equilibrium by equalizing MR and MC, price will always be less than AC and thus losses. When someone produces a useful, idea, he is given a patent or a copyright on the same if he applies for it. It gives him monopoly powers and he is able to reap profits from their ideas and inventions.



*Caution* Perfect competition would not sustain time dependent production functions for technical change because the firms would operate at a minimum efficiency level and it is not beneficial to increase the size of the firm.

**Romer's Model of Endogenous Technological Change:**

Romer assumed production function to be equivalent to:

$Y = K^a (AL)^{1-a}$  where L is labour; A is stock of ideas; a lies between 0 and 1; K is capital. If L and K are doubled, then output will double. If L, K and A is doubled then output will be more than doubled. Hence, A causes increasing returns to scale.

In Romer's model, capital accumulates as people save at a constant rate and it is similar to that of Solow model. There is also depreciation of capital.

Labour grows at a constant rate  $n$ . Romer introduced an equation that describes the accumulation of ideas. In the neo-classical model, A is the productivity term and increases exogenously at a constant rate. But in Romer's model the growth of A is taken as endogenous. Given the stock of knowledge accumulated till a time period  $t$ ,  $\Delta t = dA/dt$  is the number of new ideas produced.

In Romer's model if a particular fraction of the population is engaged in production of ideas i.e. R and D, then the model predicts that all growth is due to technological progress. Rate of growth of output will be equal to rate of capital formation and rate of technical progress. Along the balanced growth path, A will grow at a constant rate.

There are three sectors in Romer's model:

- (a) A Final Goods Sector;
- (b) An Intermediate Goods Sector;
- (c) Research and Development Sector.

In the economy, the R and D sector produces ideas, and sells the right to use these ideas to intermediate sector which in turn uses these ideas to produce capital goods. These capital goods are sold to final goods sector which produces consumer goods from it. The intermediate sector is monopolist and there is imperfection in this sector.

Introduction of monopolistic competition has made us realize that firms spend on creating ideas, earn monopoly rights on them; and then charge monopoly rents for them.

**Self-Assessment**

Notes

1. Fill in the blanks:
  - (i) Growth rate of almost all economies of the world has been faster than .....
  - (ii) The model maintain solow's assumption of ..... to the capital as a factor of production.
  - (iii) Knowledge capital is the means to attain human capital which in turn is the means to increase the .....
  - (iv) Ak model of endogenous growth was presented by .....
  - (v) Most of the economic goods are ..... in nature

**11.3 Some Issues in Endogenous Growth Theory**

A major issue in the endogenous growth theory is about implications of Endogenous Growth Models from developing countries. It has been claimed for a long time that countries are required to increase their savings to give a push to the rate of economic growth. Under this background we can understand the implications of Endogenous Growth theories for developing countries.

First of all, Economists like Arthur Lewis and Rostow emphasized on increasing the rate of savings substantially. The Endogenous Growth Theory gives a great emphasis on accumulation of human capital even more than physical capital. They laid a great stress on knowledge capital. Secondly, since knowledge capital can be acquired by transfer of technology, developing nations would do well if they open up their economies for developed economies. It would increase the sharing of technology. Thirdly, the theory also recognizes the role of policies and government in promoting the rate of knowledge capital and thereby human capital formation. Government need to formulate favourable policies to promote the rate of human capital formation. And most importantly, the theory also suggests that automatic convergence in the growth rate does not occur and therefore a planned effort is required. Rather it explained logically that in spite of same saving rate, population we can see different countries growing at different rates due to difference in their level of human capital. And hence, government needs to formulate favourable policies to promote the rate of human capital formation. It is a way to break vicious circle of poverty.

Endogenous theory is called new growth theory because it came into picture later than exogenous growth theory. Endogenous theory is modern as it explains technology as an endogenous variable. Exogenous theory was outdated with the introduction of endogenous growth models. The idea of the fact that technology is and must be incorporated as an endogenous variable in growth models was also recognized by the economists like Marx and Schumpeter.

Exogenous theories claimed that economies converge towards equal growth rates but endogenous theory expanded the notion of capital to include human capital and claimed that different countries diverge from each other depending upon the level of human capital formation.

**Self Assessment**

2. State whether the following statements are 'true' or 'false'.
  - (i) Solow growth model stated that if initial conditions were similar in different countries, eventually the levels of income of these countries would converge.
  - (ii) According to mankiw, Romer and weil people can not sacrifice their present consumption to accumulate human capital.
  - (iii) 'Long Run Policy Analysis and Long Run Growth both article was published in 1991.
  - (iv) Technology can be taken as a factor which stimulates the productivity of all factory of production.
  - (v) Romer published his two papers in the year 1985 and 1989 in which he presented a way of modeling idea as an engine of growth.

Notes

### 11.4 Summary

- Solow growth model stated that if initial conditions were similar in different countries, eventually the levels of income of these countries would converge.
- According to Mankiw, Romer and Weil people sacrifice their present consumption to accumulate human capital.
- Solow model as well as empirical evidence shows that even if capital formation directly contributes to growth, without technological advancement, growth would stop.
- A major issue in the endogenous growth theory is about implications of Endogenous Growth Models from developing countries.
- Endogenous theory is called new growth theory because it came into picture later than exogenous growth theory.

### 11.5 Key-Words

- accumulate : to gradually get more and more of something over a period of time.
- enhance : to increase or further improve the good quality, value or status of something.
- rival : a person, company, or thing that competes with another in sport business etc.
- external : connected with or situated on the outside of something.

### 11.6 Review Questions

1. In what way are the models incorporate human capital different from the standard neo-classical models?
2. Explain why the production of ideas involves imperfect competition?
3. Why do diminishing returns to capital not set in the Ak model of production?
4. What are the implications of endogenous growth models for developing countries?
5. What is technology and how does it produce increasing returns?

### **Answers: Self-Assessment**

1. (i) population growth (ii) diminishing returns  
(iii) rate of growth (iv) Sergio Rebelo (v) non-rivalrous
2. (i) T (ii) F (iii) T (iv) T  
(v) F

### 11.7 Further Readings



*Books*

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 12: Stochastic Growth Models-Business Cycle Theory

Notes

### CONTENTS

Objectives

Introduction

12.1 Growth Under Uncertainty

12.2 Brock Mirman Model

12.3 The Real Business Cycle Model

12.4 Summary

12.5 Key-Words

12.6 Review Questions

12.7 Further Readings

### Objectives

After reading this unit students will be able to:

- Know about the growth under uncertainty.
- Understand the Brock Mirman Model.
- Describe the real business cycle model.

### Introduction

The word stochastic is derived from a Greek word “stochastikos” which means skilled at hitting targets. This unit explains how to make decisions over time in an environment of uncertainty. In this unit, some models have been explained that deal with the situation in which the decision-maker has to predict future value of variables in the presence of some random external shocks in the economy. These shocks can create business cycles and fluctuations in the process of growth. The unit explains some basic concepts regarding how to deal with uncertainty. It explains some models that explain decision-making in the presence of uncertainty. An effort has been made to explain why an economy experiences fluctuations.

### 12.1 Growth Under Uncertainty

We shall start with an economy with one commodity and no external shocks with an assumption that this commodity can be used either for consumption or investment. Let us assume that in our one commodity economy, in any given period  $t$ , output  $y_t$  is divided into consumption for the next period  $c(t+1)$  and capital for the next period  $k_t+1$ . The production function is:

$$y_t = F(k_t)$$

For simplification, let us not assume that labour is anywhere in production process so that the basic equation of motion is given by:

$$k_{t+1} = f(k_t) - c_t + 1$$

On substituting production function in the above equation, we get:

$$y_t = c_t + 1 + k_t + 1$$

**Notes**

If consumption in the next period is a function of output in the previous period then it is indirectly a function of capital in the previous period.

It implies

$$c_{t+1} = f(y_t), \text{ and}$$

$$y_t = F(k_t)$$

Therefore,

$$c_{t+1} = c(f(k_t))$$

or more generally

$$c_{t+1} = f(k_t)$$

If we assume that the function is continuous and differentiable twice such that :

$$f > 0, k > 0, f(0) = 0$$

$$f' > 0, \text{ and } f'' < 0$$

$$f'(0) = \alpha', f'(\alpha') = 0$$

Then the economy is in steady equilibrium if  $k_{t+1} = k_t$  for all time periods. T is a unique equilibrium. The David Cass and Tjalling Kopsman formulation can be explained as follows:

If we assume that the society has a utility function equal to  $U(c_t)$  and the stream of utility accruing to society  $\{U_1, U_2, U_3, \dots, U_t\}$  then the total utility can be derived by computing the present discounted value of the utility stream which is equal to :

$$U = U_0 + \frac{U_1}{(1+\alpha')} + \frac{U_2}{(1+\alpha')^2} \dots (1)$$

Where  $\alpha'$  is the rate of time preference or discount rate. If we denote  $1/(1+\alpha')$  by  $a$ , and call  $a$  as discount factor, then

$$U = U_0 + aU_1 + a^2U_2 \dots (2)$$

Hence, the first reason put forward for inculcating the discounting of future utility is simple that the social planner has a preference for present utility to future utility.

Cass Koopman's Model assumes that there is a representative agent of the society who aims at maximizing an inter-temporal utility function:

$$U = U_0 + aU_1 + a^2U_2 \dots (3)$$

Where  $a$  is the discount factor and  $0 < a < 1$

The utility function given above is additively separable over time.

**12.1.1 Economic Growth under Uncertainty**

(a) When optimization is not explicitly introduced into the model:

Let us not introduce optimization explicitly into our model. Let production function be equal to  $y_t = f(k_t, \varepsilon_t)$  where  $\varepsilon$  is random variable. This has been brought into the picture to bring about the concept of uncertainty into the model. Such a production function implies that the output in an economy is dependent not only on capital stock but also the economic and market conditions which are quite uncertain. There are manmade, economical and natural uncertainties. Man made uncertainties like civil wars, bomb blast etc. Natural factors also cause natural calamities and affect mainly supply side. Therefore, they have an impact on production function. There is

also uncertainty in government policies. If we take an assumption that all these types of uncertainties are identically and independently distributed over different time periods and economic activities, then equation describing capital formation in the next period can be written as:

$$k_{t+1} = f(k_t, \varepsilon_t) - c(k_t, \varepsilon_t)$$

It implies that uncertainty in the market is affecting not only production but also consumption.

We can write this equation as:

$$k_{t+1} = h(k_t + 1, \varepsilon_t)$$

This is called Markov process. It is an example of stochastic performance.

- (b) When optimization is explicitly introduced into the Model:



*Did u know?* Sudden fluctuations in demand, cyclical fluctuations are the sources of economic uncertainty.

## 12.2 Brock Mirman Model

Brock and Mirman presented two papers in 1970s. In the first paper they explained stochastic optimization with discounting, i.e. inculcated element of uncertainty in Cass-Koopsman Model; and in the second paper they introduced the element of uncertainty without discounting. In other words, they introduced uncertainty in the Ramsey model. Given below is the explanation of Stochastic optimization with discounting.

### Assumptions

- Decisions are being taken explicitly by the individuals i.e. consumer is the planner.
- The goal of the planner is optimization of expected utility.
- Since initial values of capital stock and consumption levels depend on capital stock and consumption in the previous period, therefore, the process of optimization is dynamic.
- There are two time periods.
- Consumer has a given endowment of wealth equal to  $w_1$  which he can invest on two assets  $x$  and  $y$ .  $x$  gives him assured return of  $r_1$  and  $y$  gives him a risky return of  $r_2$ .
- The consumer spreads his wealth among two assets in a ratio of  $a$  and  $1-a$ .
- When there are two time periods:

On the basis of above assumptions, the model states that the consumer's second period wealth will be equal to his second period consumption. It makes consumer budget equation equivalent to:

$$w_2 = c_2 = (w_1 - c_1)[r_1 a + r_2(1-a)] = (w_1 - c_1)r$$

In the above equation  $r = r_1 + r_2(1-a)$

The important point to be noted is that as per above equation the consumer's return on wealth is uncertain and so is his future consumption. If we denote future consumption by  $c$ , then the consumer will have a utility function

Notes

$U\{c_1, c_2\} = u(c_1) + \alpha' u(c_2)$  where  $\alpha'$  is the discount factor. Let  $A_1(w_1)$  be the maximum utility that consumer can get if he has wealth  $w_1$  in time period  $t_1$ . It implies

$$A_1(w_1) = \max u(c_1) + \alpha' Eu[(w_1 - c_1)r]$$



**Caution** For maxima, first derivative has to be zero and second must be negative.

Hence, on differentiating the above equation with respect to time, we get first order conditions to be equal to:

$$u'(c_1) = \alpha Eu'(c_2)r$$

$$Eu'(c_2)\{r_1 - r_2\} = 0$$

(ii) When it is a situation of optimization over T time period:

In such a situation there will be  $(c_1, c_2, c_3, \dots, c_t)$  will be stream of consumption that is random. The objective of the consumer is to maximize his utility from this consumption stream. In terms of an equation, it can be presented as follows :

$$U(c_1, c_2, \dots, c_t) = \sum \alpha^t t Eu(c_t)$$

If at time  $t$ , consumer has a wealth  $w_t$ , and invests in the risky asset, his wealth in the period  $t + 1$  will be equal to :

$$w_{t+1} = [w_t - c_t]r$$

Where is  $r = r_1 + r_2(1 - a)$

In such a situation, optimization problem can be solved by dynamic programming by breaking the problem into two consequent time periods.

Suppose in the period  $t - 1$  the consumer has wealth that is equal to  $w_{t-1}$  the utility that he can get is equal to :

$$A_{t-1}(w_{t-1}) = \max u(c_{t-1}) + \alpha Eu[(w_{t-1} - c_{t-1})r]$$

Now we can get first order condition by differentiating the above equation with respect to time.

$$u'(c_{t-1}) = \alpha' Eu'(c_t)r$$

$$Eu'(c_t)\{r_1 - r_2\} = 0$$

Now we go back to one period back i.e.  $t - 2$ . In this period, if the consumer chooses  $(c_{t-2}, x_{t-2})$  then in the period  $t - 1$ , he will have a wealth which is equal to:

$$w_t - 1 = [w_{t-2}, c_{t-2}]r$$

He can derive expected utility of  $A_{t-1}(w_t - 1)$ . In such a situation, his maximization problem in  $t - 2$  will be expressed by the equation:

$$A_{t-2}(w_t - 2) = \max u(c_{t-2}) + \alpha Eu[(w_t - 2 - c_{t-2})r]$$

Now we can get first order condition by differentiating the above equation with respect to time as we did earlier with only difference that there the time was  $t - 1$  and here it is  $t - 2$ .

$$u'(c_{t-2}) = \alpha EA'(w_t - 1)r$$

$$EA'(w_1 - 1)\{r_1 - r_2\} = 0$$

Similarly, we can get the first order conditions for all time periods.

### Self-Assessment

1. Fill in the blanks:
  - (i) The word stochastic is derived from a Greek word ..... which means skilled at hitting targets.
  - (ii) An effort has been made to explain why an ..... experiences fluctuations.
  - (iii) There are manmade, economical and ..... uncertainties.
  - (iv) Brock and Mirman presented ..... papers in 1970.
  - (v) The objective of the ..... consumer is to maximise his utility from this consumption stream.

## 12.3 The Real Business Cycle Model

Real Business Cycle model is technically an explanation of Brock-Mirman Model. They explained, "What happens under uncertainty" and Real Business Cycle explains, "Why does it happen so?". It tried to explain the reasons for fluctuations in economic activity at macro level.

*Real Business Cycle model Makes two types of propositions:*

- (a) It says that long-term growth and short-term fluctuations in economic activity are studied separately but for both of them same reasons are responsible. The theory uses the word fluctuations and not cycles as the latter conveys as if it occurs regularly which might not be true.
- (b) The word 'real' in the Real Business Cycle Model suggests that this theory like classical economists considers money to be veil and plays down the role of monetary forces. In their opinion money plays a neutral role and fluctuations are brought about by real factors like investment, demand, supply etc.

The Real Business Cycle Model criticizes on Keynesian approach that it gives too much emphasis on the aggregate demand. This theory gives a greater emphasis on supply side and therefore, is sometimes also called 'New-Classical'.

However, there can be many types of external shocks. These shocks can originate on either demand side or supply side. These shocks may be caused even by monetary and fiscal policy of the government. There are different types of productivity shocks:

- (a) Development of new techniques;
- (b) New management practices;
- (c) Bumper crop or crop failure;
- (d) New Suppliers coming from external economy etc.

The Real Business Cycle Model explains productivity shocks and the extension as well as impact of these shocks on other variables in the economy.

The Real Business Cycle Model is built upon Brock-Mirman Model of the type in which discounting is present. The model explains a decision regarding labour and leisure where it is assumed that leisure also gives utility.



Notes

Focus of The Real Business Cycle Model is on productivity shocks.



- Brock and Mirman presented two papers in 1970s. In the first paper they explained stochastic optimization with discounting, i.e. inculcated element of uncertainty in Cass-Koopsman Model; and in the second paper they introduced the element of uncertainty without discounting.
- Real Business Cycle model is technically an explanation of Brock-Mirman Model.
- The Real Business Cycle Model criticizes on Keynesian approach that it gives too much emphasis on the aggregate demand. This theory gives a greater emphasis on supply side and therefore, is sometimes also called 'New-Classical'.

Notes

### 12.5 Key-Words

- Economy : the relationship between production trade and the supply of money in a particular country or region.
- Fluctuation : Process to change frequently in size, amount, quality, etc, especially from one extreme to another.
- Commodity : a product or a raw material that can be bought and sold, especially between countries.

### 12.6 Review Questions

1. How does the presence of uncertainty affect the basic one-goal growth model?
2. Describe the basic structure of Brock-Mirman model.
3. What does RBC theory has to say about the cause of the fluctuations?
4. What is RBC theory called "New classical"?
5. In what way does the RBC theory build upon the Brock-Mirman Model?

### **Answers: Self-Assessment**

1. (i) stochastikos (ii) economy (iii) natural (iv) two  
(v) consumer
2. (i) (c) (ii) (a) (iii) (b)

### 12.7 Further Readings



Books

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

Notes

## **Unit 13: Social and Institutional Aspects of Development: Difference between Development and Underdevelopment**

### CONTENTS

Objectives

Introduction

13.1 Poverty and Inequality

13.2 Nature of Poverty

13.3 Inequalities of Income

13.4 Poverty, inequality and welfare

13.5 Policy options

13.6 Summary

13.7 Key-Words

13.8 Review Questions

13.9 Further Readings

### **Objectives**

After reading this unit students will be able to:

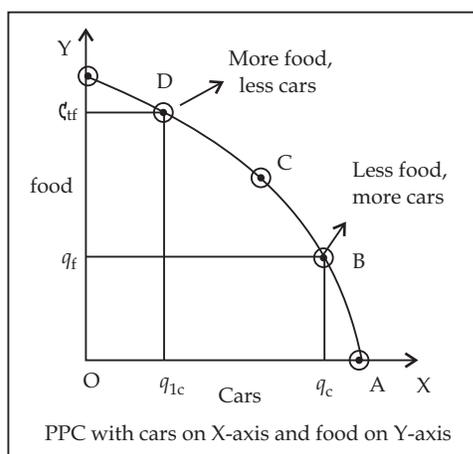
- Learn about poverty and inequality and the nature of poverty.
- Know about inequalities of income.
- Understand poverty, inequality and welfare and policy options.

### **Introduction**

When the benefits of growth are unevenly distributed, poverty continues to persist even at a high rate of economic growth. This is evident in many economies of the world where per capita incomes are quite high still a majority of the section is facing a problem of poverty and miserable quality of life. This unit has tried to explain the twin problem of poverty and inequality.

### **13.1 Poverty and Inequality**

Poverty and inequality are two related problems. More will be inequality; more will be poverty in the economy especially in a country where the level of total output is not so high. This twin problem can be explained with the help of production possibility frontier.



In the figure 1 cars are shown on X-axis and food on the Y-axis. Car is a symbolic of luxuries and food is symbolic of necessities. Curve AE is production possibility frontier showing various combinations of food and car that economy can produce with given resources which are fully utilized in a state of technology. All combinations A, B, C, D, and E are conceivable for the economy and are all efficient.

If the economy is relatively poor, and income is relatively equitably distributed, then it will, operate at some point like D where, it will produce more of food and less cars.

If income is inequitable distributed then production will take at some point around B where it is producing more of cars and less food.

It is so because allocation of resources depends upon effective demand which in turn depends upon distribution of national income.

To take a practical example, we can look at Indian market scenario, where on the one hand, resources are being allocated for producing cosmetics and on the other hand, people are dying of starvation. Since there are huge inequalities, more resources are being allocated for the production of luxuries and poor are deprived of even basic needs.

### 13.2 Nature of Poverty

There are many dimensions of poverty. But in economic sense, Poverty is a phenomenon in which a section of the society is unable to fulfil even its basic necessities of life concerning food, clothing, housing, education and health.

#### Absolute and Relative Poverty

Basis	Absolute Poverty	Relative Poverty
Meaning	It refers to a phenomenon in which a section of the society is unable to fulfil even its basic necessities of life concerning food, clothing, housing, education and health.	It refers to a phenomenon in which inequalities of income exist and hence one person is poor in relation to other person.
Cause	Over population, low economic growth, over dependence on agriculture etc.	Inequalities of income.
Remedy	There are remedies to remove absolute poverty by PAPs and other ways.	It cannot be removed as people have different skills and accordingly their incomes vary.
Measurement	It is measured by poverty line.	It is measured by gini co-efficient.

Notes

Measurement of Poverty

Different economists have given different methodologies for measuring poverty. Some important of these are:

- (a) **Head-Count Ratio:** Head-Count ratio refers to the total number of people whose income is below the defined poverty line. Poverty line is an imaginary line that gives a measuring rod to determine whether a person is poor or non poor. Those who are living below poverty line are poor, while those living above poverty line are non poor. Poverty line is fixed at different levels by different countries depending on their level of development. Poverty line is measured in three steps: (a) measure the minimum calorie requirement for subsistence level; (b) converting the quantitative diet requirements in monetary terms; (c) determining minimum level of consumption expenditure.

$$\text{Head Count Ratio} = \frac{M}{N} \text{ where } M \text{ is the number of poor and } N \text{ is population.}$$

The biggest limitation of Head count ratio is that it does not reflect the intensity of poverty. It may be desirable to know who are the poorest of the poor. The division of poor into the most destitute, destitute, and poor is useful for following purposes.

It may help us to formulate a suitable minimum wage policy. This division may help to draft different policies for different levels of poverty.

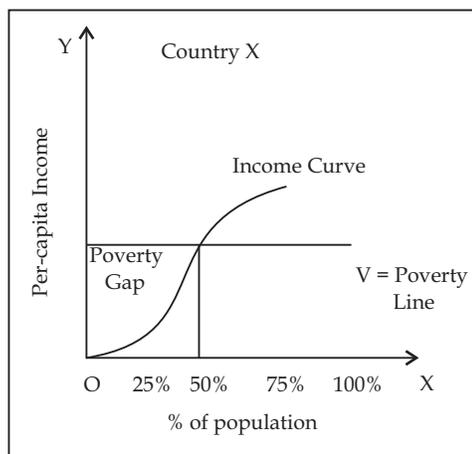
Other issues related to poverty like, insufficient development of mental faculties, can be tackled better.

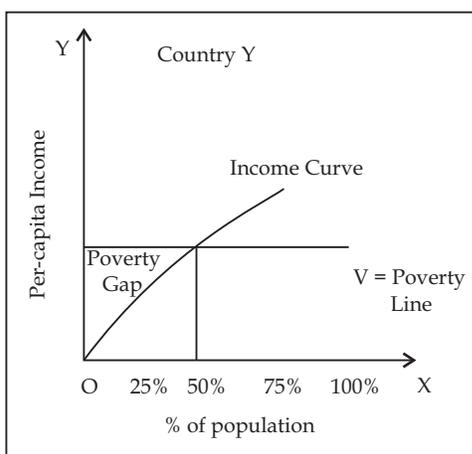
- (b) **Poverty Gap:** It is a measure which helps in measuring magnitude of effort required to eradicate poverty. Poverty gap is defined as the increase in national income required in order alleviating poverty. It is shown with the help of following diagram. It is shown in the diagram that poverty is equal in two countries X and Y but, poverty gap is more in country X, hence, country X would require more effort to eradicate poverty.

$$\text{Poverty Gap} = \frac{Z - X_p}{Z}$$

Where,  $Z$  = poverty line

$X_p$  is the average consumption expenditure of the poor.





(c) **Squared Poverty Gap Poverty Index:**

This is a measure of high intensity of efforts that are required to address the problems of the poorest of the poor. It takes into account poverty ratio, poverty gap ratio and consumption distribution of the poor.

$$\text{Poverty gap index} = \frac{M \cdot (Z - X_p)}{N \cdot Z}$$

Symbols used signify the same as above.

(d) **Foster-Greer-Theobache Measure:** It is measured by using the formula

$$\text{Foster - Greer - Theobache measure} = \frac{M}{N}$$

$[R^2 + (1 - R^2)CVP]$  Where,  $M/N$  is head count ratio,  $R$  is Poverty gap ratio, and  $CVP$  is coefficient of variation of consumption expenditure among the poor.

(e) **Sen Index:** It is measured by using the formula:

$$\text{Sen Index} = \frac{M}{N} [R + (1 - R) GP]$$

Where,  $M/N$  is head count ratio,  $R$  is Poverty gap ratio, and  $GP$  is gini coefficient of consumption expenditure among the poor.

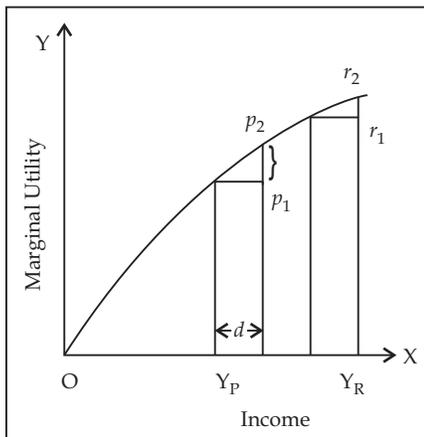
**Functional Impact of Poverty**

Functional impact of poverty shows how the causes of poverty become its consequences as well making a vicious circle of poverty.

**Poor and Access to Credit:** Formal sources of credit are generally inaccessible for the poor due to following reasons:

- (a) Lack of collateral to back the loan amount;
- (b) Since the poor have low income, as per law of diminishing marginal utility, the marginal utility of 1 rupee will be higher for the poor than for the rich. It is for this reason that poor are assumed to have a higher probability of being defaulters in repayment of a loan. It is shown with the help of following diagram. In this diagram, Income is shown on X-axis and utility is shown on Y-axis. It is shown that if both the poor and rich repay a given amount of loan say  $d$ , then  $MUM$  of sacrificed in repaying the loan is higher for the poor. But it does not consider the bad will that being a defaulter will create.

Notes



$p_2 p_1$  = Loss to the poor if they repay the loan.

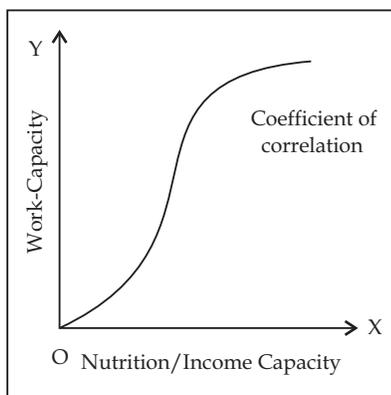
$r_2 r_1$  = Loss to the rich if they repay the loan.

$$r_2 r_1 = p_2 p_1$$

**Poor and Insurance:** Like credit, poor are also denied access to insurance to which poor are rather more vulnerable, due to following reasons:

1. Illiteracy prevents them from understanding the mechanism of insurance;
2. They can't afford to pay premium.

**Poverty and Nutrition:** There exists a vicious circle between poverty and malnourishment. Malnutrition leads to low productivity and low income due to increase in vulnerability to infection, general weakness, retardation of physical and mental growth. With the increase in nutrition level, work capacity also increases, which leads to increase in income. It is shown as a positively sloped curve through following diagram.



**Poverty and the Household:** Even within a poor family, resources are unequally allocated. Some enjoy more income than other members of the family. Generally male members of the family get a higher share than female and dependent old members because they must maintain their minimum diet intake in order to maintain their productivity necessary to get some work.

## 13.3 Inequalities of Income

### Self-Assessment

1. Fill in the blanks:
  - (i) Poverty and ..... are two related problems.
  - (ii) ..... is a phenomenon in which a section of the society is unable to fulfill even its basic necessities of life concerning food, clothing, housing, education and health.
  - (iii) Poverty gap is defined as the increase in ..... required in order to eradicate poverty.
  - (iv) ..... shows how the cause of poverty becomes its consequences as well as making a vicious circle of poverty.
  - (v) Head count Ratio =  $\frac{M}{N}$  where M is the number of ..... and N is .....



*Did u know?* When private ownership of resources is prevalent along with the law of inheritance, it gives birth to antagonistic economic system.

India's per capita income (nominal) is \$ 1219, ranked 142nd in the world, while its per capita purchasing power parity (PPP) of US \$3,608 is ranked 129th. It is estimated that India's Per Capita Income will register an average growth rate of 13% during 2011-20 so as to reach \$ 4,200 by 2020. In the year 2020 India's real GDP is projected to be at \$5 trillion, and per capita Nominal GDP at \$ 3,650. India's per capita purchasing power parity (PPP) will be at \$ 12,800 in the year 2020. States of India have large disparities. One of the critical problems facing India's economy is the sharp and growing regional variations among India's different states and territories in terms of per capita income, poverty, availability of infrastructure and socio-economic development. Although income inequality in India is relatively small (Gini coefficient: 32.5 in year 1999- 2000); India's nominal Gini index rose to 36.8 in 2005, while real Gini after tax remained nearly flat at 32.6.

Despite significant economic progress, a quarter of the nation's population earns less than the government-specified poverty threshold of \$0.40/day. 27.5% of the population was living below the poverty line in 2004-2005.

Reforming cumbersome regulatory procedures, improving rural connectivity, establishing law and order, creating a stable platform for natural resource investment that balances business interests with social concerns, and providing rural finance are important.

#### –World Bank: India Country Overview 2008

Between 1999 and 2008, the annualized growth rates for Maharashtra (9.0%) Gujarat (8.8%), Haryana (8.7%), or Delhi (7.4%) were much higher than for Bihar (5.1%), Uttar Pradesh (4.4%), or Madhya Pradesh (3.5%). By 2010, economically backward states start to catch up with developed states with Bihar with an impressive 11 percent growth rate. This is said to be due to better governance.

According to a World Bank paper Development Policy Review, \$1 a day poverty rates in rural Orissa (43%) and rural Bihar (40%) are some of the highest in the world. Seven low-income states - Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, and Uttar Pradesh - are home to more than half of India's population. Bihar's 80 million people are by far the poorest in India.

On the other hand, rural Haryana (5.7%) and rural Punjab (2.4%) compare well with middle-income countries.

The Economic Survey of India 2007 by OECD concluded:

At the state level, economic performance is much better in states with a relatively liberal regulatory environment than in the relatively more restrictive states".

**Notes**

The analysis of this report suggests that the differences in economic performance across states are associated with the extent to which states have introduced market-oriented reforms. Thus, further reforms on these lines, complemented with measures to improve infrastructure, education and basic services, would increase the potential for growth outside of agriculture and thus boost better-paid employment, which is a key to sharing the fruits of growth and lowering poverty.

**States by GDP per capita**

Andhra Pradesh, West Bengal, Haryana, Maharashtra, Kerala, Punjab, Gujarat and Tamil Nadu have a higher per capita GDP among larger states. Small Delhi and Goa top the list.

**Rural-urban gap**

Like in other countries, cities provide a better standard of living.

Towns and cities make more than two thirds of the Indian GDP, even though less than a third of the population live in them.

India has a high rate of migration from rural areas to urban cities. A major reason for the massive migration to cities was the Partition of India. More than half of the refugees from Pakistan settled in urban areas such as Delhi. It is estimated that up to 590 million people, or 40% of the Indian Population will be living in cities by 2030, much higher than the current 28%. Also, it is estimated that six states, including West Bengal, Tamil Nadu, Gujarat, Maharashtra, Karnataka and Punjab will have more than half of their total population living in Urban areas by 2030.

In India, urban areas have seen a much higher growth rate as compared to rural areas. Despite up to three-fourths of the population living in rural areas, rural areas contribute to only one-third of the national income. The main reason for rural India's poor performance in terms of income is the fact that rural India is mostly dependent on agriculture. The agriculture sector in India grew at a rate of only 1.6% in 2008-09, while the Indian Economy grew at a rate of 6.7%, despite the 2008 Financial Crisis. An extremely slow rate of growth in the agriculture sector of the Indian economy has serious implications for the rural-urban divide, both in terms of income and GDP. Some estimates say that that the average income of a person living in an urban area may be up to 4 times higher than that of a person living in a rural area. The rising levels of urbanization in India is a major reason for the rising levels of income disparity in the country. Despite the fact that up to four-fifths of Indian households save money, almost a quarter of them spend more than they earn.

**Bridging the Urban-Rural Gap**

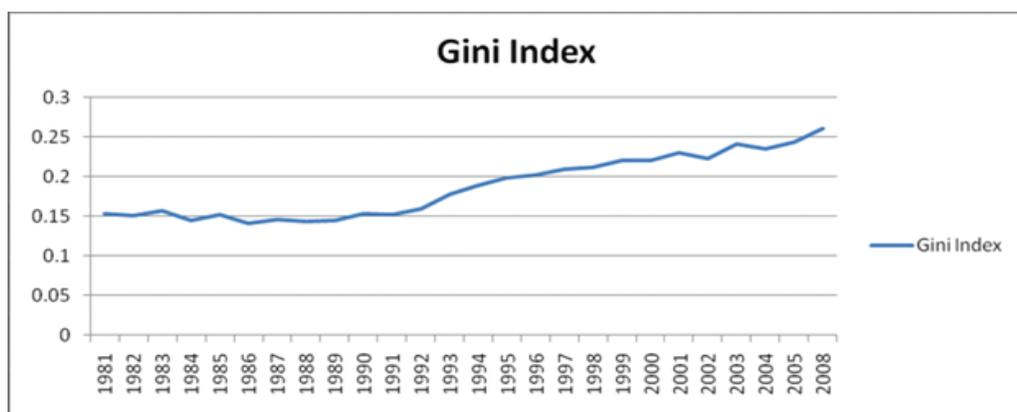
In India, the government has taken steps to bridge the urban-rural gap. This includes setting up the Council for Advancement of People's Action and Rural Technology (CAPART) by the Ministry of Rural Development. CAPART helps in providing assistance to various organizations which help in developmental activities. There is a constantly widening rift between rural and urban India, not only in terms of income, but other social measures. There is an urgent need to strengthen the agriculture sector in India, bring about reforms in labour laws, and provide education..

**Inequality of Income across Indian States**

India has grabbed seven billionaires in the Forbes top 100 rich list 2011 which puts India in the league of the countries with the most riches. Unfortunately at the same time, nearly 28% of the total population of India, accounting for nearly 300 million people is under below poverty line. With increasing population in India, the inequality in India has also grown and the gap between the rich and poor has widened over the past decades. A comparison of the per capita incomes of Indian states to other economies reveals stark inequalities. The per capita GDP of Goa is highest which is 1,35,129 Rs while Bihar is the lowest which is just 16177 Rs. This article looks at the inequality pertaining in India through the lens of Gini-coefficient for the past thirty years for 23 states.

The Gini Co-efficient is the standard measure of inequality. A score of 0 would indicate perfect equality with each state having an equal per capita income whereas a score of 1 would indicate perfect inequality with all income going to one state. Growing Income disparity in India is raising concern over inclusive growth. A study of per capita state GDP figures from 1981 to 2008 enabled the computation of the gini coefficient and inter-state inequality. The average gini-coefficient during 1981-1990 is 0.15 while it increased to 0.19 during 1991-2000. The average gini coefficient for the period of 2001-08 is experienced to be .24 with the percentage increment of more than 26% over previous decade which justifies the growing income disparity in India which alarming. It shows that in India, poor are becoming poorer and rich are getting richer and the growth in India is exclusive rather than inclusive.

The Inter-State Gini for 2008, namely, 0.2608 is far lower than the Gini for India as a whole (0.36) given by UNDP's Human Development Report revealing that the geographic disparity of income is much lower than the social disparity between the richest and poorest people in the country.



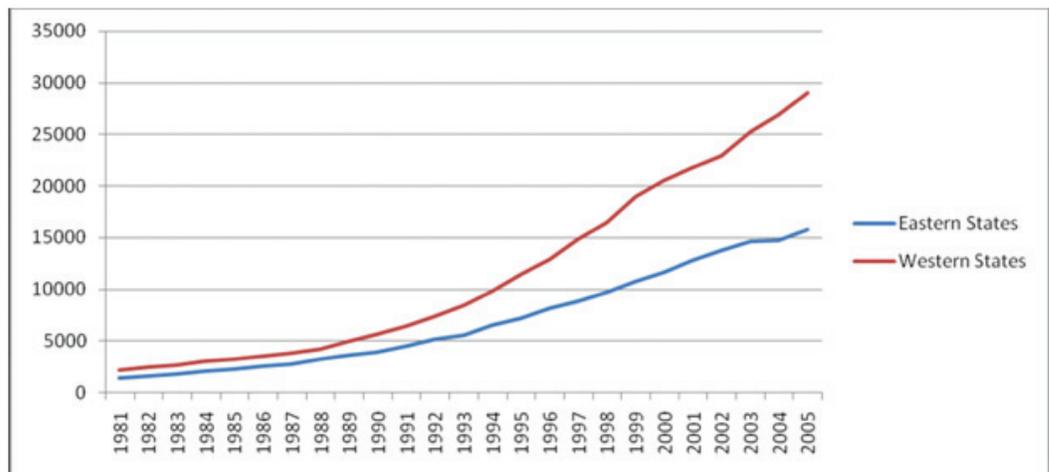
#### Eastern states of the country are lagging in growth as compared to the richer western states

The development divide in India does not lie along a North-South basis, but rather an east-west basis. The 82.5 parallel which is used to determine Indian Standard Time (IST) is arguably the dividing line between the more developed west and the less developed east. A comparison of states lying wholly to the west of this line with states which partly or wholly lie east of this line illustrates this divide.

The average per capita GDP (at current prices) of western states to eastern states from 1981 to 2008 is shown in the diagram below. The gap between per capita incomes of eastern and western states grew by an average of 11% in the 1980s, 19% during the 1990s and slowed down to 10% in the early 2000s. This reflects that eastern states are now getting richer at slower pace but still they lag far behind the western states. These states need to focus on their economic development to reduce their poverty levels which decrease the income disparity and eventually increase their per capita income.

On an average, Easterners grew slower and Westerners faster than the national growth rates for the period of 1991-2009. The average growth rate of the eastern states during 2003-2009 was 7.5% and western states were 8.5% against the overall growth rate of 7.9%. Some low income states like Bihar grew rapidly in the 2000s though the remaining BIMARU states - Madhya Pradesh, UP and Rajasthan grew at a rate slower than the national average. Looking at the Human Development Index scores, an alternative development indicator also reflects this phenomenon. The average HDI score for western states of 0.53 is higher than the average HDI score of 0.46 which shows that slower growth of eastern states has also affected the social development in these states.

Notes



**The Road Ahead and Strategy to reduce the income inequality**

India needs to look at the holistic view of the inequality existing across the states. Special assistance and focus is required on the eastern states on their poverty reduction and skills development. India needs to develop an integrated mechanism where eastern states can be benefited from the greater economic development of the western states by sharing different economic activities. The current need is to balance economic growth with social development and more emphasis should be given on the wider reach of government schemes and equitable distribution of resources. Social entrepreneurship which focuses on developing innovative solutions to solve the social problems with sustained revenue growth can be the possible solution. The companies need to create shared value for all stakeholders rather than just investing in corporate social responsibility programmes which can help them to increase their future income and wealth.



**Caution** Equality of incomes does not and cannot mean that each and every worker in the economy gets exactly equal earning irrespective of the skill, qualification, and risk involvement of his job.

**Measurement of Inequalities of Income**

There are four principles which an ideal statistical tool for measuring inequalities of income must satisfy. These are:

- (a) **The Anonymity Principle:** This principle states that a measure of inequality must remain silent about the quality of people. In other words, it keeps the identity of people involved anonymous.
- (b) **The Scale Independence Principle:** The measure of inequality should depend upon dispersion of national income and not the magnitude of it.
- (c) **The Population Independence Principle:** The measure of inequality of income should not be affected by total size of population.
- (d) **The Transfer Principle or Pigou : Dalton Principle:** It must indicate the impact of transfer of income from the rich to the poor or other way round.

**Two Approaches to Measurement:**

- (a) Personal distribution of income
- (b) Functional distribution of income.

## (i) Personal Distribution

Notes

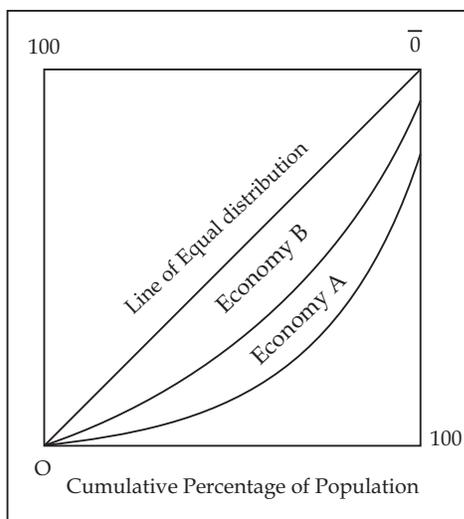


Notes

At micro level, inequalities of income are measured to know the differences in incomes of individuals. It is called personal approach and is based on the income earned by individuals.

It considers only the income earned by a person and neglects the total number of hours devoted to earn that income. There are many methods of measuring inequalities in personal distribution of income. A few of these are:

- (a) **Lorenz Curve:** Lorenz curve is a statistical tool developed by an American statistician Prof. Max D Lorenz to measure inequalities of income. The data relating to population and income distribution is transposed into percentage and arranged into cumulative frequency distribution. A straight line joining the two origins is drawn which represents 100% population and 100% of income. This line is called Line of Equal Distribution. This line acts as a reference point for comparing and knowing the extent of inequalities. If the actual distribution of income line coincides with this line, it shows perfect equalities of income in the economy. Greater is the gap between the line of actual distribution of income and Line of Equal Distribution, greater are the inequalities in the economy and *vice versa*. It is shown with the help of following diagram. Percentage of income is taken along Y-axis and percentage of population is taken along X-axis. Joining 100% of both the axis we get ED. ED is the line of equal distribution. If two Lorenz curves of two economies are such as shown in the diagram then inequalities of income are greater in economy A than Economy B.



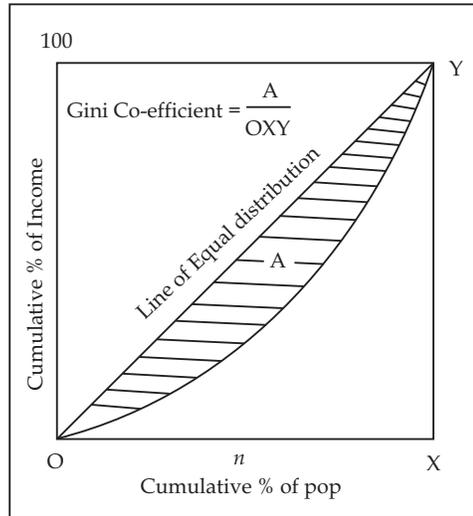
- (b) **Quintile Distribution:** In this method, the distribution of income is shown by quintiles. It is simpler than Lorenz curve and can give same details. For example, say in country A the poorest 20% get 5% of national income and the richest 20% get 45% of national income, then we can say that huge inequalities of income exist in this country.
- (c) **Gini Coefficient or Gini Concentration Ratio:** It is obtained by calculating the ratio of the "area" between the line of equal distribution and Lorenz curve divided by the total area of the half square in which the curve lies.

Notes

It can be shown with the help of a diagram as shown in figure given below:

$$\text{Gini Concentration Ratio} = \frac{\text{Shaded Area A}}{\text{Total Area OXY}}$$

Gini coefficient can vary between 0 and 1.0 indicates perfect equality. 1 indicates perfect inequality.



- (d) **Coefficient of Variation:** It is a relative measure of dispersion based on standard deviation. It assumes income is normally distributed. C. V. is a relative measure of dispersion which shows the extent to which a central value deviates from the all other values.

$$C.V. = \frac{\text{Standard Deviation} * 100}{\text{Mean}}$$

(ii) **Functional Distribution**

Functional distribution gives us the relative share of profits, interest, wages and rent in the national income. For our discussion, we are considering the percentage share of income received by labour in comparison to the percentage share received by other three factors of production. Functional distribution of income is explained with the help of a diagram. We can merge natural and man made resources into capital and labour and organization into one labour. Now there are two factors of production labour (variable factor) and capital (fixed factor). X-axis shows the number of workers employed and y axis shows the wage rate.  $D_1$  is demand curve of labour derived from Marginal productivity of labour.  $S_1$  is supply curve of labour. Equilibrium gets established at point E where ON number of labourers are employed and they get wages equal to OW. Total output generated by all labour employed is OWRN. Out of it, OWEN is the share of labour. Hence, capital gets residual amount which is equal to area WER.

**Criticism:** It ignores the role of non market forces e.g. collective bargaining, monopoly powers etc.

**Growth and Inequalities**

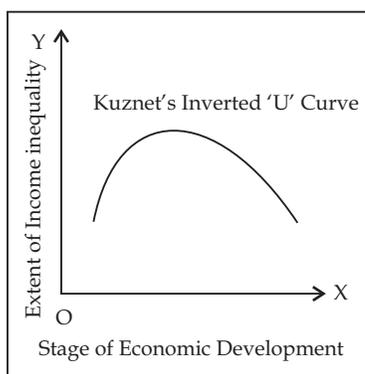
- (i) **Kuznet's Inverted-U Hypothesis:** Simon Kuznet gave this hypothesis which says as an economy grows in initial stage, inequalities of income in the economy increase. But after a particular level

of development, the income differentials start to narrow down. Therefore, after this level, inequalities of income start to decrease.

(ii) **Gary S. Fields' prediction:** Gary S. Fields made use of Lorenz curve to explain how inequalities of income change during the course of economic growth. He gave three situations :

- (a) **Traditional-Sector Enrichment Growth typology:** If in an economy, the benefits of growth are divided among traditional sector worker and modern sector does not grow much, there will be reduction in absolute as well as relative poverty.
- (b) **Modern-Sector Enrichment Growth Typology:** If in an economy, the benefits of growth are shared among people in the modern, sector, and traditional sector does not get its benefits, total output in the economy will increase but inequalities of income will also increase leading to rise in both absolute and relative poverty.
- (c) **Modern-Sector Enlargement Growth:** When economic growth occurs by increasing the size of modern sector, keeping wages in all sectors constant, absolute poverty reduces and Lorenz curve fails to give an idea of what happens to relative poverty. This may also give rise to Kuznet's 'inverted U hypothesis'.

It is shown with the help of the diagram given below:



Task

What are the two approaches measurement of inequalities of income

### 13.4 Poverty, Inequality and Welfare

Inequalities of income lead to poverty, both absolute and relative. It gives birth to an economy where one section gets his dogs vaccinated and other section sees his children starving. Welfare implications of the phenomenon are discussed below:

- (a) **Waste in Resource Allocation:** When there are huge inequalities of income, richer section spends more and more on luxuries. It leads to misallocation of resources.
- (b) **Loss in Productive Capacity:** Extremely rich people sit idle and feel unhappy and demoralized. On the other hand, weaker sections are malnourished and hence do not get proper nourishment. Both of these reduce the productivity in the economy.
- (c) **Loss in Welfare:** According to law of diminishing marginal utility, if an income of Rupee one is taken from the rich and given to the poor, it will increase aggregate utility of the poor.

### **13.5 Policy Options**

Since the problems of poverty, inequality and welfare are very closely related, these problems need to be addressed together. Following policy initiatives can help to tackle the problems :

- (a) **Levelling down excessively large wealth and income:** In order to reduce the income of the rich state can:
- (i) Keep a strong check on unearned income. Law of inheritance may be removed or a heavy wealth tax or death duty can be imposed.
  - (ii) Make use of progressive tax structure.
- (b) **Levelling up the lowest incomes:** In order to increase the income of the poor state can :
- (i) Enact and enforce Minimum Wage Act
  - (ii) Ensure Equal Opportunity for All
  - (iii) Extension of Social Benefits

### **Self-Assessment**

2. State whether the following statements are 'true' or 'false'.
- (i) "Labourers get wages" is the example of unearned income.
  - (ii) Anonymity principle states that a measure of inequality must remain silent about the quality of people.
  - (iii) Lorenz curve is a statistical tool developed by an American Statistician Prof. Max D Lorenz to measure inequalities of income.
  - (iv) Functional distribution didn't give us the relative share of profits, interest, wage and rent in the national income.
  - (v) In order to reduce the income of the rich state can make use of progressive tax structure.

### **13.6 Summary**

- Poverty is a phenomenon in which a section of the society is unable to fulfil even its basic necessities of life concerning food, clothing, housing, education and health.
- Head-Count ratio refers to the total number of people whose income is below the defined poverty line.
- The biggest limitation of Head count ratio is that it does not reflect the intensity of poverty.
- Functional impact of poverty shows how the causes of poverty become its consequences as well making a vicious circle of poverty.
- There are four principles which an ideal statistical tool for measuring inequalities of income must satisfy.
- The data relating to population and income distribution is transposed into percentage and arranged into cumulative frequency distribution.
- Functional distribution gives us the relative share of profits, interest, wages and rent in the national income.
- According to law of diminishing marginal utility, if an income of Rupee one is taken from the rich and given to the poor, it will increase aggregate utility of the poor.

### 13.7 Key-Words

Notes

- starvation : the state of suffering and death caused by having no food.
- deprived : without enough food, education, and all the things that are necessary for people to live a happy and comfortable life.
- methodology : a set of methods and principles used to perform a particular activity.
- alleviate : to make something less severe.
- vulnerable : weak and easily hurt physically or emotionally.

### 13.8 Review Questions

1. Distinguish absolute poverty and relative poverty.
2. Describe in brief the functional impact of poverty.
3. What do you mean by inequalities of income?
4. Explain in brief the Gini coefficient.
5. Explain in brief the relationship between poverty, inequality and welfare.

#### Answers: Self-Assessment

1. (i) inequality (ii) Poverty (iii) national income  
(iv) functional impact of poverty (v) poor, population
2. (i) F (ii) T (iii) T (iv) F  
(v) T

### 13.9 Further Readings



Books

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 14: Measurement and Indicators of Development

### CONTENTS

Objectives

Introduction

14.1 Development GAP

14.2 Growth and Development

14.3 Indicators of Economic welfare

14.4 Alternative Mesures of Economic Welfare

14.5 Summary

14.6 Key-Words

14.7 Review Questions

14.8 Further Readings

### Objectives

After reading this unit students will be able to:

- to know about the development GAP and growth and development.
- to understand indicators of economic welfare.
- to know about the alternative measures of economic welfare.

### Introduction

There are wide gaps in the standards of living of the people in different countries. It is so because countries are at different stages of economic development. The core issue of this unit is what economic development is; how it is different form economic growth and welfare; various indicators of economic welfare. Economic development is wider than economic growth and a better indicator of economic welfare. With economic growth many institutional and social changes take place in the economy which are considered in estimation of economic development and welfare.

### 14.1 Development GAP

Development gap refers to the difference between the standards of living of richer and poorer countries of the globe. In other words, it is the difference in the living standards of countries at either end of the income distribution.

The magnitude of development gap can be understood from the table given below:

Notes

Income Groups by GNI per capita	Number of Countries	GNI (US\$m)	Population	GNI per capital	%of World Population	%of World GNI (US\$)
Countries with less than \$785 Low income countries	63	917	2460	410	41	3.2
Countries between \$786 and \$3115 Lower Middle	54	2324	2048	1130	34	7.4
Countries with \$3116-9635 Upper Middle	38	3001	647	4040	11	9.6
More than \$ 9635 High income	52	24994	903	27680	15	79.4
World	207	31315	6053	5170	100	100

## 14.2 Growth and Development

Earlier economic growth and economic development were taken as synonyms. Economic growth is increase in country's real per capita income which is sustained over a number of years.

1. It is important to note that economic growth is a dynamic and continuous increase in per capita income. Dynamic implies that growth is a process that takes place over a period of time and not at a point of time.
2. An increase in total output is significant when economies of scale are important. It is per capita output that matters when we want to know to increase in standard of living of the population.
3. There is a difference between output and output capacity. Most of the growth theories have emphasized on increasing the total production capacity of the economy but the actual growth depends on how efficiently this production capacity is utilized.

### Modern View

Modern economists do not agree that economic growth and economic development are synonyms. They claim that economic growth is not same as economic development. Economic development is a much broader term than economic growth. As said above economic growth is increase in country's real per capita income which is sustained over a number of years. But economic development refers to increase in standard of living with improvement in quality of life. Growth is a means to attain the ultimate end of economic development. It is very much possible that a country's real per capita income has increased but it has massive poverty, unemployment, high crime rate, low level of nutritional status and so on which indicates that it has grown but not developed.

In fact, the traditional economists viewed that economic growth and economic development mean the same on the ground that they believed in trickle down effect. It states that the benefits of growth will automatically trickle down to all sections of society. Economic development, hence, meant reduction in inequalities, poverty and unemployment.

Prof. Dudley Seers states that the questions to ask about a country's development are therefore : what has been happening to poverty ? What has been happening to unemployment ? What has been happening to inequality ? If all these have declined from high levels then beyond doubt there has been a period of development for the country.

Notes



Notes

we can say that economic development implies a whole gamut of change in socially, economically, politically and spiritually that makes life better than before.

**Economic Growth:** Economic growth refers to a rise in national or per capita income and product. If a production of goods and services in a country rises, by whatever means and along with it average income increases, the country has achieved economic growth.

Economic growth can be either positive or negative. Negative growth can be referred to by saying that the economy is shrinking. Negative growth is associated with economic recession and economic depression

Economic growth on the other hand, is a narrower concept than economic development. It is defined as the increase in the value of goods and services produced by every sector of the economy. It is usually expressed in terms of the gross domestic product or GDP of the country.

Economic growth is defined by increases in GDP. Whereas, economic development is more of a vague measure usually incorporating social measures such as literacy rates or life expectancy as a means of measuring a country's level of development.

Economists often tend to use the two terms economic development and economic growth interchangeably, as they appear to be synonymous with each other.

Economic growth is defined by increases in GDP. Whereas, economic development is more of a vague measure usually incorporating social measures such as literacy rates or life expectancy as a means of measuring a country's level of development.

Economic development is a qualitative measure while economic growth is a quantitative measure.

**Concept of Economic Development**

Economic development implies more, particularly improvements in health, education and other aspects of human welfare. Countries that increase their income but do not also raise life expectancy, reduce infant mortality, and increase literacy rates are missing out of some important aspects of development. The economic development of a country is defined as the development of the economic wealth of the country. Economic development is aimed at the overall well-being of the citizens of a country, as they are the ultimate beneficiaries of the development of the economy of their country.

Economic development is a sustainable boost in the standards of living of the people of a country. It implies an increase in the per capita income of every citizen. It also leads to the creation of more opportunities in the sectors of education, healthcare, employment and the conservation of the environment. Economic Development can be defined as a process whereby the productivity of the resources of an economy improves which leads to increase in economic welfare of the community by accelerating the growth of national income.

Hence, economic development aims at attainment of three objectives simultaneously.

- (a) Increasing the availability of basic needs of life and ensuring these are distributed equitably.
- (b) Raising the standards of living *via* higher incomes, better education and health facilities, enhancing individual and national self-esteem.
- (c) Expanding the range of variety to individuals and nations economically as well as socially. It must eliminate ignorance and human misery.

Hence, quality of life is an important consideration in economic development.

**Economic Development and Structural Change:** In chapter 18, it has been explained through various theories that development brings about structural changes. Some pioneer works in this field have been done by Kuznets and Hollis Chenery. Following changes can be seen in an economy with economic development:

- (a) **Constituents of GDP Change:** With economic development, savings rate increase, government revenues increase, the share of income spent on food items decrease and on industrial goods and services increase.
- (b) **Employment Changes:** The labour force starts to shift from primary sector to secondary and tertiary gradually.
- (c) **Shift in Composition of Exports:** With development, a country starts to export more of manufactured goods and the share of primary goods decreases in exports.
- (d) **Rate of Increase in Population:** With development, in initial phases, population rises but gradually it starts falling due to change in social attitudes.
- (e) **Distribution of Income :** Inverted-U shaped curve given by Simon Kuznets claims that initially income inequalities increase with increase in per capita income and start to fall after a certain level.

Notes

### Self-Assessment

1. Fill in the blanks:
  - (i) Economic development is wider than economic growth and a better ..... of economic welfare
  - (ii) Development gap refers to the difference between the standards of living of ..... and .....countries of the globe.
  - (iii) Earlier economic growth and development were taken as .....
  - (iv) Economic development is a qualitative measure while economic ..... is a quantitative measure.
  - (v) Economic development is a sustainable boost in the standards of living of the people of a .....

## 14.3 Indicators of Economic Welfare

Economic development takes into account economic growth which is quantitatively measurable and economic welfare which is qualitative in nature. Since, economic welfare is a qualitative aspect of development; it needs to be measured in some way or the other. Some indicators of economic welfare with their respective limitations are discussed below.

### *GNP as an indicator of Economic Welfare*

GNP is expected to ensure greater availability of goods and services to a larger portion of society with higher standards of living. It means it is expected to bring about economic welfare but it is subject to following conditions.

#### 1. Changes in Size of GDP and Economic Welfare

Increase in Size of GDP does not necessarily mean greater availability of goods and services.

- (i) Increase in GDP may be eaten away by increasing population leading to no increase or even decrease in per capita income.
- (ii) If GDP is calculated at current prices, it might be increasing due to price rise and there may be no change in availability of goods and services.
- (iii) Sometimes, production for self consumption is not included in GDP due to non availability of data. It makes GDP underestimated.
- (iv) If increase in GDP is brought about by forcing labour to work for longer hours and thereby reducing their welfare, it can't reflect economic welfare.

2. **Changes in the Composition of GDP and Economic Welfare:** Composition means what kinds of goods and services are produced in the economic and in what ratio.

Notes

- (i) If the share of capital goods is more in GDP, it will not increase Economic Welfare in the present but in the future.
- (ii) If increase in output is because of increased production of defense goods, even then there will be no change in economic welfare.
- (iii) If increased output is contributed by increase in the production of liquor, cigarettes, tobacco etc. It does not indicate economic welfare.

**3. Changes in the distribution of GDP and Economic Welfare:**

- (i) If GDP increases and goes into the pockets of few rich leaving majority in the miserable condition, it can't be called an indicator of economic welfare.
- (ii) Transfer of income from the rich to the poor will increase economic welfare; hence it is important to know who is getting the benefits of increased output in the economy.

*Per Capita Income as an Index of Economic Welfare*

Generally speaking, per capita income is taken as an indicator of the economic Welfare but it is not reliable due to the fact that it suffers from following limitation.

- (a) Per capita income does not show the distribution of GDP whether it is equally distributed or unequally distributed. As mentioned above, if GDP increases and goes into the pockets of few rich leaving majority in the miserable condition, it can't be called an indicator of economic welfare.
- (b) It does not reflect the kinds of goods and services that are being produced and consumed in the society. It may be so that the economy is producing pedigree, anti-aging creams on the one hand and 26% people are living below poverty line as it is happening in India.



*Did u know?* Economic Welfare also depends on the quality of public goods.

**14.4 Alternative Measures of Economic Welfare**

As explained above, GDP and Per Capita Income both are incapable of indicating economic welfare. Therefore economists have developed alternative indicators of economic welfare.

*Poverty-Weighted Index of Social Welfare:*

If we give weights according to the income share of that class in total GDP, then we shall get quintiles for different classes. Suppose income is distributed in following way:

**Table 1:** Table showing share of income in different income groups.

Cumulative % of population	Quintiles % share in GDP
Bottom 20%	5
Less than 40%	14
Less than 60%	27
Less than 80%	53
Less than 100	100

In such situation, the total welfare of the society is equal to the sum total of simple weighted sum of the growth of income in each class.

$$G = w_1g_1 + w_2g_2 + w_3g_3 + w_4g_4 + w_5g_5$$

$$G = 0.05g_1 + 0.09g_2 + 0.13g_3 + 0.26g_4 + 0.47g_5$$

If income growth rate of bottom 40% population is zero and middle 20% is 5% and above 40% is 10%, then growth rate is equal to:

$$G = 0.05(0) + 0.09(0) + 0.13(0.05) + 0.26(0.10) + 0.47(0.10) = 0.0795 = 7.95\%$$

It implies GDP will increase by 7.95 % but there will be zero change in income of 40% population and 5% in middle class. In order to make GDP a better indicator of economic welfare we can use Equal Weight index or Poverty Weight Index.

**Equal Weight Index:** It gives equal weightage to all classes. Hence, keeping the data given above unchanged, it will give growth rate equal to :

$$\begin{aligned} G &= 0.20 (0) + 0.20 (0) + 0.20 (0.05) + 0.20 (0.10) + 0.20 (0.10) \\ &= 0 + 0 + 0.010 + 0.020 + 0.020 \\ &= 0.041 \\ &4.1\% \end{aligned}$$

Therefore, equal weight index shows increase in GDP as 4.1% as against 7.95% shown by simple weighted index. It is a better indicator of social welfare.

### *Poverty-Weight Index*

It makes use of 'Subjective' social value in income growth rates of bottom 40% and zero weights to upper 60%.

Hence  $G = 0.60 (0) + 0.40 (0) + 0.0(0.05) + 0(0.10) + 0(0.10)$

$G = 0\%$ . This index will not show any increase in GDP unless and until it has improved the living standards of the poorest section of the society.

It is an indicator of how much benefit of increase in GDP has gone to the weaker section of the society.



Task

What is poverty weight index?

### *UNRISD's Core Indicators of Development*

United Nations research Institute on Social Development selected the most appropriate indicators of development and analyzed the relationship between these indicators at various levels of development.

#### *List of Core Indicators of Socio-economic Development.*

Expectation of life at birth

Percentage of population in localities of 20,000 and over

Consumption of animal protein, per capita, per day

Combined primary and secondary enrollment

Vocational enrollment ratio

Average number of persons per room

Newspaper circulation per 1,000 population

Percentage of economically active population with electricity, gas, water, etc.

Agricultural production per male agricultural worker

Percentage of adult male labour in agriculture

Electricity consumption, *kw* per capita

**Notes**

Steel consumption, *kg* per capita

Energy consumption, *kg* of coal equivalent per capita

Percentage GDP derived from manufacturing

Foreign trade per capita, in 1960 U.S. dollars

Percentage of salaried and wage earners to total economically active population

These indicators are selected because of their high correlation with over all quality of life. Another similar study was conducted by Irma Adelman and Cynthia Morris who studied 74 countries according to 40 different variables.

**The Physical Quality of Life Index (PQLI)**

It was developed for the Overseas Development Council in the mid-1970s by Morris David Morris, as one of a number of measures created due to dissatisfaction with the use of GNP as an indicator of development. PQLI might be regarded as an improvement but shares the general problems of measuring quality of life in a quantitative way. It has also been criticized because there is considerable overlap between infant mortality and life expectancy. Life expectancy at age 1, infant mortality, and literacy are used as indicators of development, describing progress in health, sanitation, education, and women’s status. Gross National Product (GNP) is the standard measure of progress but does not show how output is distributed. The Physical Quality of Life Index (PQLI) is a summation of complex social interrelationships on which no theoretical explanation imposes any given weights/biases. Equal weight is assigned to each component.

In the table given below the performance of third world countries is shown. It is clear that India’s PQLI index is little higher than Pakistan and much lower than China. The striking contrast lies between Sri Lanka and India.

Country	Per Capita GNP (\$)	PQLI
Gambia	348	20
Angola	790	21
Sudan	380	34
Tanzania	299	58
Zimbabwe	815	63
China	304	75
Pakistan	349	40
India	253	42
Sri Lanka	302	82
Singapore	5220	86
Taiwan	2503	87
Saudi Arabia	12720	40
Iraq	3020	48
Brazil	2214	72

**Source:** *Todaro M. P. Economic Development 5th Edition*

**The Human Development Index (HDI)**

United Nations Development Programme (UNDP) has made use of Human Development index to analyse the level of economic development. Like PQLI, HDI also lies between 0 and 1 with 0 showing the worst situation and 1 as the best on the basis of three criterions:

- (a) Longevity of life measured by life expectancy at birth;
- (b) Educational attainments measured by a weighted average of adult literacy rates and mean years of schooling; 2/3 weights are given to the former and 1/3 to the latter.
- (c) Standard of Living measured by the level of real per capita income.

Notes

The countries with HDI ranking between 0-0.49 are called low human development countries; the countries with HDI ranking between 0.50-0.79 are called medium human development countries; and the countries with HDI ranking between 0.80-1 are called high human development countries.

The following table shows the comparison of HDI and CPM with real Per capita income:

Country	Real GDP per Capita (PPP\$)	HDI
USA	24680	0.940
Sweden	17900	0.933
Japan	20660	0.938
South Korea	9710	0.866
Sri Lanka	3030	0.698
Pakistan	2160	0.442
India	1240	0.436
Bangladesh	1290	0.365
China	2330	0.309
UK	17230	0.924
Germany	18840	0.920
Brazil	5500	0.796
Tanzania	630	0.364
Iraq	3413	0.599
Algeria	5570	0.746
Kuwait	21630	0.836

**Source:** HDR, UNDP

Table above shows that there is no direct correlation between per capita income the rank of HDI. It shows GNP growth is not sufficient bring about positive changes in socio-economic scenario of the country.

**Limitations of HDI:**

- (a) The three indicators used in HDI are good but not ideal.
- (b) It does not consider distribution of income directly.
- (c) The index is relative and not absolute and therefore the results derived from it may be misleading.

**The Capability Poverty Measure (CPM)**

Since poverty is often so linked with human development, or lack of it, the 1996 report took a special look at poverty and concluded that income poverty is only part of the picture. "Just as human development encompasses aspects of life much broader than income, so poverty should be seen as having many dimensions," says the report. As a result, the report introduced a new, multidimensional measure of human deprivation called the Capability Poverty Measure, (CPM). The CPM focuses on human capabilities, just as human development index does. Instead of examining the average state of people's capabilities, it reflects the percentage of people who lack basic, or minimally essential human capabilities, which are ends in themselves and are needed to lift one from income poverty and to sustain strong human development.

**Notes**

Indian Nobel Prize winning Economist Amartya Sen, had given his important contribution in developing a multi dimensional measurement called Capability Poverty Measurement.

The index measures human poverty in terms of deprivations.

- (a) Deprivation of life (poor people are deprived a right to live by no provision for nutrition and medical facilities);
- (b) Deprivation of Basic Education ( Particularly girls due to social attitudes are denied the opportunity to be educated).
- (c) Deprivation of access to public and private resources.

CPM focuses on the lack of capabilities of some particular category of people in the country rather than average capabilities of the nation. The CPM of less developed countries is shown in the table given below.

**Table 2:** Table showing CPM of Less Developed countries

Country	CPM
South Korea	8.6
Sri Lanka	19.3
Pakistan	60.8
India	61.5
Bangladesh	76.5
China	17.5
Brazil	10.0
Tanzania	39.4
Iraq	39.9
Algeria	49.5
Kuwait	10.8

**Source:** HDR, UNDP

It is clear on comparing table 1 and 2 that high level of per capita income does not ensure high level of CPM.

**Self-Assessment**

2. State whether the following statements are 'true' or 'false'.
  - (i) Economic development takes into account economic growth which is quantitatively measurable and economic welfare which is qualitative in nature.
  - (ii) Sometimes production for self consumptions is included in GDP due to non availability.
  - (iii) The physical quality of life index is a summation of complex social interrelationships on which no theoretical explanation imposes any given weights.
  - (iv) Equal weight is not assigned to each component.
  - (v) The striking contrast lies between Sri Lanka and India.

**14.5 Summary**

- There are wide gaps in the standards of living of the people in different countries. It is so because countries are at different stages of economic development.
- Development gap refers to the difference between the standards of living of richer and poorer countries of the globe.

- Earlier economic growth and economic development were taken as synonyms. Economic growth is increase in country's real per capita income which is sustained over a number of years.
- Economic growth refers to a rise in national or per capita income and product. If a production of goods and services in a country rises, by weather means and along with it average income increases, the country has achieved economic growth.
- Economic growth on the other hand, is a narrower concept than economic development. It is defined as the increase in the value of goods and services produced by every sector of the economy.
- Economic development takes into account economic growth which is quantitatively measurable and economic welfare which is qualitative in nature.
- It was developed for the Overseas Development Council in the mid-1970s by Morris David Morris, as one of a number of measures created due to dissatisfaction with the use of GNP as an indicator of development.
- United Nations Development Programme (UNDP) has made use of Human Development index to analyse the level of economic development.

Notes

### 14.6 Key-Words

- Measurement : the act or the process of finding the size, quantity or degree of something.
- Indicator : a sign that shows you what something is like or how a situation is changing
- Globe : an object shaped like a ball with a map of the world on its surface
- Synonyms : a word or expression that has the same or nearly the same meaning as another in the same language.

### 14.7 Review Questions

1. Distinguish between economic growth and economic development.
2. What type of structural change take place in an economy as it develops?
3. Highlight import amt limitations at GDP as an indicator of economic welfare.
4. Bring out the limitations of per capita income as an index of economic welfare.
5. What is equal weights index? What is poverty-weight index.
6. What are the three indicators used to form a composite index for PQLI? The GNP and PQLI are highly correlated for all the countries. Is it true or false? Explain

### **Answers: Self Assessment**

1. (i) indicator (ii) richer, poorer (iii) synonyms  
(iv) growth (v) country
2. (i) T (ii) F (iii) T (iv) F  
(v) T

### 14.8 Further Readings



Books

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 15: Population and Development

### CONTENTS

Objectives

Introduction

15.1 Human Resources and Economic Development

15.2 Malthus and Other's Views

15.3 Nature of Population Problem in Developing Countries

15.4 Population, Poverty and Environment

15.5 Need for a Population Policy in a Developing Economy

15.6 Summary

15.7 Key-Words

15.8 Review Questions

15.9 Further Readings

### Objectives

After reading this unit students will be able to:

- Know about the human resources and economic development.
- Describe the malthus and the nature of population problem in developing countries.
- Learn the population poverty and environment and need for a population policy in a developing economy.

### Introduction

A large population can prove to be an asset as well as a liability for the economy depending upon how efficiently it is used. A large population may be an asset as it can provide more and if invested in then high quality human resources. But if they are not used efficiently, they can be a liability for the economy. There are many theories of development and growth which have considered the role of population in determining the rate of economic growth while others have taken it as exogenous variable. It is human capital whose intellect brings about technological progress which increases the growth rate for the economy.

### 15.1 Human Resources and Economic Development

Human resource is the resource which makes use of other resources to produce goods and services. Neither other resources can become useful on their own nor can they use human resource. Therefore, human resource is the most crucial of all resources. Even the objective of economic growth is to provide better living conditions to the human race. Thus, human resource has a dual role in the economy:

- (a) As providers of factor services;
- (b) As units of consumption.



Notes

It is human capital that acts as labour or entrepreneur in the economy. More people means cheap and abundant labour and entrepreneurial skill.

Notes

### Human Resources as Factor Services

- (a) **Minimum Scales of Production:** When we provide infrastructure, it has a fixed cost which must be distributed amongst a large population to make it economically viable. An economy like Australia can certainly grow at a higher rate with higher availability of labour. It is for this reason that these countries have lenient immigration rules.
- (b) **Demographic Transition and Savings:** With the increase in population, the age composition of population also changes. It increases the labour force and decreases the number of dependent members. Therefore, savings also increase.
- (c) **Capital Formation in Agriculture:** In agriculture, there is family labour that works on farm. With the increase in number of persons in the family, total labour hours will increase. It will increase agriculture human capital stock. This relationship is presented as the “Boserup Sequence”. According to Ester Boserup, with the increase in population, land and other natural resources become scarcer, leading to agriculture intensification. Relative price changes and food price goes up. This gives birth to institutions like private property rights. These new institutions facilitate more intensive farming techniques. It enhances the economies of large scale associated with the provision of infrastructure.
- (d) **Labour Force Participation:** When there are more dependent members in the family, it motivates more women to work, postponement of retirement age, increasing number of child workers, and longer working hours for men all leading to increased participation of labour force.
- (e) **Trade Specialization:** A labour abundant country can specialize in labour intensive industries and thereby increase its exports. Therefore, growing labour supply would enable the country to participate more in trade.
- (f) **Technological Changes:** A higher population will be able to provide more geneous and it will increase the pace of technological progress. Simon Kuznets claimed that under following conditions a larger population can promote economic growth.
  - (i) Existence of a variety of unutilized resources;
  - (ii) Rising mobility of labour;
  - (iii) Easier division of labour;
  - (iv) An improvement in technology that facilitates better utilization of human resource.

### Human Resources as Units of Consumption

It is the human resource which demands goods and services produced by the Economy. If population is more than the absorption capacity of nation (it depends on natural resources), then the country is over populated and *vice versa*. An excess population may create troubles and can hinder the growth process.

- (a) A rising population increases current consumption and reduces the capacity to save and capital formation. R.H. Cassen called it a saving effect and investment effect. In saving effect, he states that population growth reduces the savings in the country because of ‘burn of dependency’. In investment effect he says that with an increase in population will force the Economy to spend some resources to reproducing for the unproductive people. Some capital has to be spent to increase the productivity of existing capital.

Coale and Hoover compared the economy along two time paths. In a higher fertility economy, savings would be lower and a portion of investment would be used to increase the productivity of existing labour. In a lower fertility economy, GNP per capita will be higher.

Notes

- (b) With the rising population, an economy has to import more of machinery, raw materials etc. to support their increasing population. However, in domestic economy, there will be greater demand for food, clothing and other necessities. Hence, such an economy with limited foreign exchange has to choose between imports of capital goods imports and the imports of necessities. Since both seem to be unavoidable, it chooses to bear trade deficit.
- (c) If economy is not able to absorb its increasing population productively it will lead to unemployment either open or disguised. Unemployment will create its social and economic side effects.
- (d) With increase in population, social overhead cost keeps increasing.  
Hence, a larger population is a mixed blessing. To some extent, a larger population will stimulate growth process but after a certain level it will start hampering the growth process.



**Caution** A rising population increases the demand for food stock of the economy; land is in limited supply and is subject to diminishing returns, therefore it causes shortages in food supply.

## 15.2 Malthus and Other's Views

Malthus was the first economist to raise the issue of over population. According to Malthus, population has a constant tendency to increase. But growth of means of subsistence particularly food is subject to diminishing returns. There is thus disequilibrium between increase in population and food production and this inequilibrium is tending to be wider with time.

According to Malthus, this equilibrium would create conditions of starvation and under nourishment leading to high mortality and low life expectancy. There could also be epidemics, famines, other man made and natural calamities. Malthus referred to these as 'positive checks' which follow inevitably if human beings do not take preventive measures. According to Malthus, preventive checks may be celibacy, late marriage, moral restraints etc.

### *Optimum Theory of Population*

The concept was first conceived by Prof. Sidwick. Optimum population is defined as that level of population which enables a country to produce, with given resources, technology and capital stock, the highest per capita income.

Dalton has given a formula which tells how much actual population deviates from optimum population.

$$M = A - O/O$$

M is Maladjustment

A is Actual Population

O is Optimum Population

If M is negative country is underpopulated, If M is positive country is over populated.

**Theory of Demographic Transition:** Frank Notestein has envisaged three stages of demographic transition on the basis of the experiences of the developing nations.

**Stage One:** It is a situation of a very backward country. It generally happens in an agrarian economy. In this stage, both death rate and birth rate are high; hence population growth rate remains low. Birth rate is high due to illiteracy, absence of family planning programmes, early marriages, religious beliefs. Children are not taken as responsibility as parents do not spend on their education but as a helping hand as they start working at an early age. The death rate is also high due to poverty, low nutrition, epidemics, poor or no medical facilities, lack of proper sanitation facilities.

**Stage Two:** Stage two is a stage of a developing country where resources are being utilized more efficiently and the process of industrialization has set in. The birth rate continues to be high as masses are still illiterate. On the other hand, death rate falls on account of better health facilities. It leads to population explosion. This stage is destructive for economic growth as the benefits of economic growth are eaten away by increasing population and per capita standards remain intact.

**Stage Three:** In third stage, death rate as well as birth rate falls and hence population remains stable. This stage is prevalent in developed countries. The birth rate falls due to universal literacy levels, extensive use of contraceptives, freer society. Death rate falls due to better medical facilities.

### 15.3 Nature of Population Problem In Developing Countries

The theory of demographic transition applied to present day developing countries but quite differently.

- (a) Since most of the developing countries are overpopulated, physical resources are scarcer and no relief is expected from emigration or mild moral suasion to have smaller families.
- (b) Rate of population growth is much higher than what it was in European countries when they crossed this stage of development. It can be estimated from the fact every year we add one Australia to India. Most of the developed nations of Europe did not stay in second stage of demographic transition for too long. But many developing countries reduced their death rate to as low levels as they are in advanced countries but birth rate did not fall as socio-economic change did not occur. India is an example. We are in second stage of demographic transition since 1921 and till date could not jump to third stage.
- (c) In present day developed countries, increase in population spread out over a longer time and a simultaneous economic development but present day developing countries have experienced sudden and drastic fall in death rate with little or no change in socio-economic environment keeping birth rates high. It makes situation worse for them.

In nutshell, model of demographic transition has to be transplanted to developing countries with caution. Each country needs to understand its own specific causes of the problem and accordingly need to announce a national policy.

#### *Other Demographic Characteristics of Developing Economic*

The theory gives only the quantitative aspect of population however, much depends on qualitative aspect. Such a policy can be framed better by understanding some other qualitative demographic features and their relation with economic development.

- (a) **Life Expectancy:** It is the mean number of years that a newly born child is expected to survive. It is the best statistical tool to measure longevity of life and health infrastructure in the country. If life expectancy is high, it is a symbolic of low death rate and *vice versa*. An increase in life expectancy means that quality of life has improved.
- (b) **Infant Mortality Rate:** It is ratio of the number of children dying before attaining the age 1 to per 1000 live births. Some other relevant indices are (a) Child mortality : it measures the probability of death of a child between age 1 and 5. (b) Under five mortality : It measures the number of children dying before attaining age 5 to per 1000 live births. If any of these indices are high, it is an indicator of poor health facilities and under development. IMR is divided into two components; neonatal deaths (these occur before completing first month after birth) and post neonatal deaths (these occur after 1 month of age but before 1 year).
- (c) **Age Composition:** The age composition refers to the division of population on the basis of age and analyzing the percentage of population in different age groups. It is relevant to know the workforce and labour force available in the economy. Age and sex composition is determined by trend in fertility and mortality. Since, children below 14 are not allowed to work. Retirement age is 60 years. Therefore, people between age group 15-59 constitute work force for the economy. It helps us to know the percentage of people dependent on work force. It is called dependency ratio. Dependency ratio is equal to:

Notes

Total Population – Population in the Age Group 15-59/Total Population

When the share of working population increases; the rate of economic development increases. Young not only work but also save for their old age that increases the rate of savings and thereby investment.

In East Asia without any directed effort population increased in such a way that working population increased much faster than dependent population.

- (d) **Sex Composition:** It is the number of women per 1000 men. It is crucial to judge social welfare. In many developing countries including India, sex ratio is deteriorating day-by-day. Following factors seemed to have worsening the trend.
  - (i) Infanticide is prevalent in many nations.
  - (ii) A progressive undercount of women compared to men has been noticed in different censuses.
  - (iii) Discrimination against women in providing proper diet and health facilities.
  - (iv) There are social customs which increase preference for a male child. A strict population policy asking people to adhere to two children may worsen sex ratio because of increased sex selective births. However, the ratio can be improved by improving the status of women in the society.
- (e) **Literacy and Levels of Development:** It has been empirically studied and proved that there is a strong positive correlation between education and level of Economic Development. Economists and sociologists have believed that education is the panacea to all socio-economic problems. Female literacy rates are still more important as it will increase the availability of work force in the economy. It will increase the usage of contraceptives, reduce infant mortality rate and postpone the age of marriage. Literate population is more aware and makes government more responsible and accountable which further helps in higher rate of Economic Development.
- (f) **Rural-Urban Distribution:** If a major portion of the population is living in rural areas, it indicates that a larger part of labour force is engaged in agriculture. It is also possible that many of them are disguisedly unemployed. Moreover, social indicators of development are poor in rural areas. On the contrary, an increasing share of urban population implies that a larger labour force is occupied in secondary and tertiary sector. It means shifting of labour from low productivity sector to high productivity sector and hence an increase in GDP and rate of Economic Development.

**Self-Assessment**

- 1. Fill in the blanks:
  - (i) Human resource is the resource which makes use of other resources to produce .....
  - (ii) Malthus was the first economist to raise the issue of .....
  - (iii) ..... has given a formula which tells how much actual population deviates from optimum population.
  - (iv) ..... is the mean number of years that a newly born child is expected to survive.
  - (v) Dependency ratio is equal to .....

**15.4 Population, Poverty and Environment**

---

*Population and Poverty*

We can study the relation between poverty and population both at micro and macro level; at micro level, relation of poverty line to fertility rate is studied; and at macro level, relation of poverty to population explosion is studied.

At micro level, it has been seen, observed and proved that fertility rate is higher amongst poor because of high illiteracy and their attitude towards children as helping hands without any feeling of

responsibility of spending on their education as such. High fertility rate is also responsible for their being poor. So, high fertility rate is both a cause as well as effect of poverty.

Notes



*Did u know?* At macro level, population explosion means higher pressure on given fixed natural resources which reduces the availability of resources per capita.

### *Population and Environment*

Environment has a given carrying capacity. If population increases beyond carrying capacity of the environment, it leads to environment degradation. Both rich and poor play their roles in degrading environment. Rich overuse the resources and the poor misuse it. Given a fixed perfectly inelastic supply of fertile land, it increases pressure for food supply. Thus, an economy has to rush even to maintain the present standards of living for all.

Population explosion also has an implication for sustainable development. If population keeps increasing, environment would not be able to sustain it. It will create ecological imbalances and deplete natural resources.

## 15.5 Need for a Population Policy in a Developing Economy

Since most of the developing countries that are facing the problem of population explosion are in second stage of demographic transition, they need a policy that attacks on birth rate. Higher incomes, education, industrialization, social change are the best contraceptives. All of these can reduce fertility rate. According to demand theory given by G. S. Becker, an increase in the level of family income reduces fertility rate because parents now aspire to improve the quality of investment on each child. This reduces the demand for a large number of children. Therefore, if income is redistributed and increased standard of living is ensured, the fertility rate will be reduced. Leibenstein explained his model by taking children as durable consumer goods. He identified six types of utilities that parents get from their children.

- (a) Consumption Utility;
- (b) Economic Utility;
- (c) Economic Risk-reduction utility;
- (d) Old Age Security utility;
- (e) Long run family status maintenance utility;
- (f) Utility derived from contribution to the expended family.

But there are differences in the conditions of developing countries of the present and the experiences of western countries. It has been explained earlier.

For a country like India, population control is necessary to accelerate the rate of economic development. Therefore, it is necessary for us to have a well planned population policy and its effective implementation.

### *Components of Population Policy*

An effective population policy must address following issues:

- (a) **Objective of Full Employment:** Complete elimination of involuntary unemployment and decrease in voluntary unemployment that is there for social hindrances must be a goal of population policy. For ensuring the generation of gainful employment in the economy, we need to have capital formation, gainful employment in rural areas that stops migration from rural to urban areas. It also needs industrialization, provision for skill development, financial system to provide loans and favourable political environment

Notes

- (b) **Empowerment of Women:** Women empowerment implies strengthening women economically, socially, and politically and giving her freedom to take her own decisions. It calls for universal female literacy as the foremost goal. It will reduce infant mortality rate, maternal mortality rate, increase the participation of women in economic activities, increase the status of women in society and family, and will act as a force in breaking vicious circle of poverty.
- (c) **Controlling the Growth of Population:** By popularizing family planning programmes population growth can be controlled. Population control would require people to be more selective in conception of a child. It aims at reducing the number of children per couple to one or two; and to increase the gap between the birth of two children to ensure good health for mother as well as child.



Task

What are the components of population policy?

### Self-Assessment

2. State whether the following statements are 'true' or 'false'.
- The objective of economic growth is not to provide better living conditions to the human race.
  - Optimum theory of population this concept was first conceived by prof. Sidwick.
  - Sex composition is the number of men per 1000 women.
  - Empowerment of women implies strengthening women economically, socially, and politically and giving her freedom to take her own decisions.
  - Population control would not require people to be more selective in conception of a child.

### 15.6 Summary

- A large population may be an asset as it can provide more and if invested in then high quality human resources.
- Human resource is the most crucial of all resources.
- If population is more than the absorption capacity of nation (it depends on natural resources), then the country is over populated and *vice versa*.
- preventive checks may be celibacy, late marriage, moral restraints etc.
- At micro level, it has been seen, observed and proved that fertility rate is higher amongst poor because of high illiteracy and their attitude towards children as helping hands without any feeling of responsibility of spending on their education as such.
- If population increases beyond carrying capacity of the environment, it leads to environment degradation.
- Women empowerment implies strengthening women economically, socially, and politically and giving her freedom to take her own decisions.

### 15.7 Key-Words

- council : extremely important, because it will affect other things.
- viable : that can be done; that will be successful.
- abundant : very clear
- contraceptives : a drug, device or practise used to prevent a woman becoming pregnant.

**15.8 Review Questions**

Notes

1. Explain how human resources promote economic development?
2. Describe how human resources hinder the growth of an economy?
3. Explain in brief the different stages of demographic transition.
4. Examine the relationship between population growth and poverty.
5. Bring out the need for a suitable population policy for a developing country like India.

**Answers: Self Assessment**

1. (i) goods and services (ii) overpopulation  
(iii) Dalton (iv) Life expectancy  
(v) Total population – population in the age group 15-59/Total population
2. (i) F (ii) T (iii) F (iv) T  
(v) F

**15.9 Further Readings**

Books

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 16: Economic Development and Institutions

### CONTENTS

Objectives

Introduction

16.1 Market Failure

16.2 Government Failure

16.3 Institutions and Governance

16.4 Role of Social Norms and the Community in Economic Development

16.5 Summary

16.6 Key-Words

16.7 Review Questions

16.8 Further Readings

### Objectives

After reading this unit students will be able to:

- Know about the market failure and government failure.
- Understand the institutions and governance.
- Learn the role of social norms and the community in economic development.
- Describe the inter-sectoral complementarities, coordination failures and historical lock-ins, etc.

### Introduction

We shall make an effort to understand the impact and influence of institutions on the process of economic development. Adam Smith believed that invisible hands of demand and supply are capable of allocating the resources most efficiently but he assumed that there exists perfect competition in the market. However, in real life, markets are imperfect. We need to understand two things; (a) Non-economic factors are equally or sometimes more important in determining the level of economic development. Non-economic factors influence the economic factors. (b) Institutions are not uniform or static. Social institutions have their own role in determining the pace of economic development.

### 16.1 Market Failure

All classical and most of neo classical economists argue that laissez faire policy is the best as each individual is the best judge of his own interest. If all individuals are left free, there will automatically be maximization of aggregate utility in the society. But later on economists realized that competitive markets lead to the most efficient allocation of resources, if and only if certain conditions are met. If these conditions are not met, the competitive market does not perform well or work perfectly.

The meaning of efficiency and the conditions that is necessary to be fulfilled to attain this efficiency are discussed below.

*The Fundamental Theorems of Welfare Economics*

Notes

There are two fundamental theorems of welfare economics:

- (a) The first theorem states that if certain conditions are fulfilled, competitive market leads to an efficient allocation of resources. Alfred Pareto was a famous welfare economist who developed these conditions.

Pareto claimed that allocation of resources is efficient if it is impossible to make some one better off without making any one else worse off. If it possible to make some one better off without making any one else worse of, it is advisable to shift to that alternative. Therefore it is not a situation of efficiency in allocation of resources. Pareto optimality can be attained only on the PPC and not below PPP. It is so because by using underutilized resources someone else can be made better off without making anyone else worse off.

- (b) The second theorem states that with the proper initial distribution of income, an economy must attain some point on its utility possibility curve. It means it must operate on PPC and not below it. In other words, it must utilize its resources to the fullest and resources must not be under utilized or unemployed.

These theorems are strong advocators of Laissez faire policy. It states that if individual decision maker take their own decision without interference of anyone, and there is competition in the market, then market mechanism will automatically lead to the best allocation of resources and no central planning authority is required at all.

Hence, there are some situations when resources are efficiently allocated but some other times when the conditions of Pareto optimality are not satisfied, it is called the situation of market failure. These are the situations which make a valid ground for the intervention of the government. So, to define, market failure does not mean that nothing good has happened but the best has not happened.

Some situations when markets fail to allocate resources optimally are as follows :

- (a) **Markets that are not Competitive:** Pareto optimality conditions can be fulfilled only when there exists perfect competition in the market. In present scenario, factor as well as commodity market hardly fulfills the conditions of perfect competition. Most of the times there exists imperfect competition. There may be large firms producing differentiated products (Monopolistic competition) or few dominating interdependent firms (Oligopoly), or a single seller producing a unique product (Monopoly). Pareto optimality is hard to attain on these market situations because free entry and exit is precondition for attaining Pareto optimality. It has been proved by Hicks and Robinson that there exists excess capacity in monopolistic competition which proves that these markets can't attain Pareto optimality. Under monopoly, since there is a single seller, seller can always exploit the consumer who has no alternative available. He charges a high price than MC and thereby takes off a portion of consumer surplus.



Notes

Worse than this is the fact that there is a part which accrues neither to government nor seller nor consumer and is called deadweight loss in monopoly.

- (b) **Public Goods:** Public Goods are the goods which are made available either to all or to none. Anyone particular individual can't be denied their access irrespective of whether he pays a price for it or not. The other characteristic of public goods is absence of competition from seller's as well as producer's side. There is no competition amongst buyers (To get a higher quantity) or producers (as these are generally provided by the government only). Example of public goods can be street lighting. The government twill either not supply it at all or supply it for everyone irrespective of whether user has paid for it or not. This creates a problem of Free Riders. Free riders problem is that when you know that rides will be available to payers as well as non payers, each on would like to join the non payers' group. Therefore, markets will either not supply these goods or under supply and when supplies will not get reasonable price for it

Notes

because the marginal cost to the additional individual enjoying the benefit will be zero.

- (c) **Externalities:** Externalities refers to the situations when one firm is affecting the costs of other firms or the society at large. There may be positive as well as negative externalities. In other words, “an externality is said to occur when actions by an individual or firm produce benefits or costs that affect other members of the society but these costs and benefits are not taken into consideration by these firms or individuals.” Externalities can occur not only in production but also in consumption. Question arises why do externalities lead to market failure ? Answer is that when firms or individuals take decisions, they are only concerned only about private costs and benefits that individual and market demand and supply curves reflect. So they equalize Marginal Private Cost with marginal private benefit but marginal social benefit may not be equal to marginal social cost. An example of negative externality can be pollution created by a factory for which it does not compensate anyhow to the society at large. And the example of positive externality can be construction of a hospital in the vicinity of my house which has increased the property value of my house.
- (d) **Incomplete Markets:** Sometimes, the market is not capable of providing a good even when consumers are ready to pay a price equal to its marginal cost. It is a situation of market failure. It happens when supporting industries or infrastructure is not available. An example of a situation like this the non-availability of many facilities in rural areas for which they are willing to pay. It may be that rural households can also afford to pay for metro train if such comfortable transport is provided to them but due to lack of other support services in rural areas.
- (e) **Information Failures:** A case of incomplete information arises when some members in the economic system possess more relevant and correct information than others. Or in other words, it means that same information is not available to all. It may be that producers have more accurate information then they may sell low quality product at a high price; or consumer has more accurate information then firms make adverse selection of the customers. There may also be principal-Agent problem. Managers may pursue objectives other than owners.

These are the situations when government intervention would be profitable as will lead to increase in efficacy in allocation of resources. Some other areas where government intervention is desirable are: first to reduce inequalities of income secondly to force consumers to consume merit goods. Merit goods are the goods that government thinks is in the best interest of the consumers and which they otherwise do not choose to consume. An example can be compulsory pollution under control certification to be maintained for a vehicle.



*Did u know?* Needless to mention, the government must ensure a smooth, efficient and reliable legal framework that gives assurance and incentives to producers to give their best in the markets.

## 16.2 Government Failure

Market failure explained above clarified us that market mechanism is not always efficient. There are situations when markets fail. Now the question arises if all decisions are taken by planning authority, will it be able to attain Pareto optimality. Answer is no. These are the situations of government failure. Government plays many roles in the economy. It engages itself in production of goods and services; it involves in economic planning; it announces monetary, fiscal and other policies for the economy as per requirements; it also takes care of effective administration in the country. But in practice, by all means government may not be able to take market to Pareto optimality and may not attain its intentions of the most efficient allocation of resources. This is called government failure.

We need to understand that if market, in some situations, is not capable to be efficient government is also not omnipotent to know all details and free from any defects. It also is not able to realize its

stated objectives in many cases or in some cases even set its objectives wrong. These are known as cases of government failure.

Causes of Government failure are as follows:

- (a) **Limited Information:** State can never have as much information as market has. It is also possible that state sets its objectives and policies to attain these objectives on incorrect future expectations.
- (b) **Limited Control:** Government has limited control over the private sector both consumers and producers. In spite of levying high taxes on cigarettes, banning its usage in public places, government could not reduce the production or consumption of tobacco to any remarkable extent.
- (c) **Bureaucracy:** In spite of legislation being created it is not implemented so efficiently for many reasons. A good example can be abolition of Zamindari system in India. The law was passed but implementation was not so successful because of bureaucracy.
- (d) **Constraints of Political Process:** If the decisions taken by the government are liked by influential people in the society, it may create problems in the economy. They might create many types of problems. So government has to consider many aspects. Lipsey puts it beautifully when he says that economic efficiency is only one ingredient of the recipe of decisions taken by the government.
- (e) **Nobel Prize winner Gunnar Myrdal explanation to the causes of government failure :** According to Myrdal, following reasons are responsible for government failure :
  - (i) Politicians and government authorities may pursue their self interest which leads to corruption and sub-optimal results.
  - (ii) Concern for their vote bank also compels political parties to take popularists decisions and do not optimal. For example, reservation in Indian Constitutions were expected to reduce over years but kept increasing to influence vote bank positively.
  - (iii) Government with short run perspective may not be able to bring about structural changes and therefore many problems may go unaddressed. Example for it, is population problem in India. We announced policies but did little to bring about structural changes which will automatically sort out the problem.
  - (iv) Government aims to attain not only economic but many goals which may be social or political. Hence, a policy may bring about results which are sub optimal economically but do produce desirable social changes which may be more important than economic goals.
  - (v) Lack of information may create coordination problem.
  - (vi) Most importantly and ironically democratic countries are undermining the ideals of democracy. Some interest groups may unduly influence the government policies in their favour.



Task

Give the two reason of government failure

### 16.3 Institutions and Governance

If market as well as government fails in some situations, then what factors are making them inefficient? Answer is to some extent it is institutional set up of an economy, however some other factors also play their role. It is extremely relevant to understand the role of institutional set up in determining the allocation of resources. Neo-Classical theories were based on 'an institution free environment' in effect. However, economists like Thorstein Veblen did consider the role of institutions in resource allocation. There are many theories which have explained the fact that economic growth is related to some endogenous factors which themselves are neither the causes nor the explanations of economic growth. Institutions and differences in them accounts for a large difference in the performance of different nations.

**Notes**

This can be explained better with the help of some examples. If we want people to give their best, institutions must ensure distribution of income on the basis of productivity. Similarly, level of competition in the market influences the economic output of the firms. It has been observed that greater competition due to globalization, has improved the efficiency of domestic producers as they know that in order to survive in the market, they must be competitive.

It is clearly known that for private goods, for efficient allocation of resources, private ownership rights and anonymous markets are desirable. But for public goods, we need to solve the problem of the choice of institutional set up that would ensure optimization of resources.

**Meaning of Institutions:** According to Douglass North, a Nobel Prize winner in Economics, institutions are the rules of the game in a society or, more formally are the humanly devised constraints that shape human interactions. Institutions acts as an influence as well as a constraint in interactions among people. For example, a social institution of marriage and its relative importance in different societies has implications for population growth, gender inequality, sex ratio and consumption patterns. It is important to keep in mind that institutions are not only important but also endogenous.

There have existed theories which have incorporated the role of institutions in their explanations like Marx's Theory of Economic Development and at the same time some theories have assumed an institution free environment like Walsarian analysis.

Recently economists have made an effort in to extend Walsarian Analysis by incorporating the role of institutions into it.

One view is to understand the role of changes in property rights and transaction costs on Economic Development. This view is explained by the economists like Ronal Coase and Douglass. Transaction costs include the cost of negotiation, monitoring, coordination and enforcement of contracts. If transaction costs are high, it is crucial to allocate property rights. With higher transaction costs, some economies of scale might have to be sacrificed.

Second view is to understand how Economic Development is affected by institutional changes. This is done by economists lie George Akerlof and Joseph Stiglitz.

Once we understand, the reasons for the existence for the existence of some institutions, we can easily analyse their roles in economic development.

**Self Assessment**

1. Fill in the blanks:
  - (i) Social institutions have their own role in determining the pace of ..... development
  - (ii) Non-economic factors are equally or sometimes more important in determining the level of economic .....
  - (iii) ..... factors influence the economic factors.
  - (iv) Public goods are the goods which are made available ..... to all or to none
  - (v) ..... refers to the situations when one firm is affecting the cost of other firms or the society at large.

**16.4 Role of Social Norms and the Community in Economic Development**

In Economics, the most important aspect is optimization. A consumer tries to optimize on utility, a producer tries to optimize on profits, government tries to optimize on social welfare and so on. But all these agents have some constraint within which they have to optimize. For consumers it is budget, for producers it is cost, for government it is total resources and so on. Social norms are still other constraints within which an economic agent must attain its optimum level of equilibrium. It may be so that a firm can earn higher profits by producing liquor rather than milk but still chooses to produce milk on moral grounds. It will lead to sub optimal allocation of resources from the perspective of

economic growth but may be optimal from the perspective of economic development which also takes into account the qualitative aspect of GDP. Hence, if judicial decision leads to moral hazard, it is not desirable. Hence, it is a big social norm.

Markets are based on competition, planning authorities use command and community interacts on the basis of cooperation. Communities in many situations have a potential to correct market and government failures. Sometimes, through combined efforts, government and society can correct market failures. Sometimes, market and society together can correct government failures. Social capital is a term used by social economists to mean the sum total of network of relationships that a person has with other members of the society.



**Caution** Social capital gives added advantage to the persons involved. In those societies where there is lack of mutual trust based relationships, government needs to intervene to correct the situation.

### Self-Assessment

2. State whether the following statements are 'true' or 'false'.
  - (i) The explanations for historical lock-ins can be given by complementarities and network externalities.
  - (ii) Coordination failure occurs when large scale investment take place because other complementary investment are forth coming.
  - (iii) By using linkages, the problem of coordination problem can be solved.
  - (iv) The explanation for such choices do not lie in historical lock-ins.
  - (v) When we consider the position of an economy at a given point of time, it depends on whole sequence of events.

### 16.6 Summary

- Adam Smith believed that invisible hands of demand and supply are capable of allocating the resources most efficiently but he assumed that there exists perfect competition in the market.
- All classical and most of neo classical economists argue that laissez faire policy is the best as each individual is the best judge of his own interest.
- Pareto claimed that allocation of resources is efficient if it is impossible to make some one better off without making any one else worse off.
- Pareto optimality conditions can be fulfilled only when there exists perfect competition in the market.
- Externalities refers to the situations when one firm is affecting the costs of other firms or the society at large.
- Sometimes, the market is not capable of providing a good even when consumers are ready to pay a price equal to its marginal cost.
- A case of incomplete information arises when some members in the economic system possess more relevant and correct information than others.
- Market failure explained above clarified us that market mechanism is not always efficient. There are situations when markets fail.
- One view is to understand the role of changes in property rights and transaction costs on Economic Development.
- Markets are based on competition, planning authorities use command and community interacts on the basis of cooperation.

Notes

Notes

### 16.7 Key-Words

- Influence : the effect that somebody/something has on the way a person thinks or behaves or on the way that something works or develops.
- Efficiency : the quality of doing something well with no waste of time or money.
- Interference : the act of interfering.

### 16.8 Review Questions

1. Explain the concept market failure. Discuss its causes.
2. Describe the possible reasons for government failure.
3. What are institutions? How do they influence economic development?
4. Briefly discuss the two broad views on their role of institutions and their impact.
5. Discuss the role of norms and communities in economic development.
6. Explain the concepts of path dependence and historical lock-ins.

### **Answers: Self Assessment**

1. (i) economic (ii) development (iii) Non-economic  
(iv) either (v) Externalities
2. (i) T (ii) F (iii) T (iv) F  
(v) T

### 16.9 Further Readings



*Books*

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 17: Approaches to Development : Vicious Circle of Poverty and Unlimited Supply of Labor

Notes

### CONTENTS

Objectives

Introduction

17.1 Vicious Circle of Poverty

17.2 Circular Causation

17.3 Comparison of Myrdal and Kaldor on CCC

17.4 Unlimited Supply of Labor

17.5 The Closed Economy

17.6 The Open Economy

17.7 Summary

17.8 Key-Words

17.9 Review Questions

17.10 Further Readings

### Objectives

After reading this unit students will be able to:

- Know about approaches to development: vicious circle of poverty and unlimited supply of labour.
- Know about circular causation and comparison of Myrdal and Kaldor on CCC.
- Understand unlimited supply of labour.
- Learn about the closed economy and open economy.

### Introduction

Positive, step by step proposition developed by a firm or a salesperson to win a favorable response from the prospects. Sales approach is what, in essence, distinguishes a professional from an amateur.

### 17.1 Vicious Circle of Poverty

Poverty is living on a day to day basis with the uncertainty of what the future can bring. Poverty is not being able to provide good education to children. Poverty is the lack of freedom of expression. Poverty occurs when the income of any family or country is less than the level of consumption. The root of poverty is money. Lack of money can lead to people doing many bad actions and in turn result in bad consequences which end up impoverishing more people.

In a sentence, we can summarise it as: Poverty gives rise to crime and crime impoverish people! Think about poverty, and one of the things that come to your mind is Unemployment...people having no job...thus families starving for they have no food. And here is specifically where politicians tend to exploit us and do some finger pointing at their rivals stating that the latter are responsible. Unfortunately this part is very tricky: There is no magic to get unemployed people a job, even if jobs

Notes

were available, you have to have the qualified people! And qualified people are not obtained overnight; it takes time, months of training and even years.

And now unemployed people need to live, they need food, they need shelter, and they need clothing. Where do you think these will be obtained from, space? In a crude language, it will be "kill or die". Killing here refers to committing crimes, like robberies, while die will mean starving yourself and your family as well.

But unfortunately, that's not the end of the story my dear friends; these poverty-compelled 'criminals' often end up in jail serving for lengthy sentences while their family suffers even more with the loss of a potential bread-winner. If these families have kids, guess what they will be doing to survive...crimes of course! Like most readings we come across on the issue of poverty, I am almost certain that you are expecting me to spit something like "Education is the key"! and you will be wrong this time, unfortunately.

but the real enemy is out there: Politicians and Businessmen! Do you really believe that poverty cannot be eradicated if everybody in this world wishes so? It can!!! But, there are people out there who are thinking...and they think: "what do I gain if there is no poor people?", "Is it not more profitable to have poor people?".

It is common knowledge that politicians are prime users (or rather exploiters) of poor people; just go to the talk shows of famous politicians during election period and listen how they artistically use the poor for their own benefit.

And businessmen, with all the millions of dollars given to the poor, why do I say they need poverty? As a matter of fact, these donations are not done because they are happy to do so; it's simply a way for tax deduction! Next time you see Bill Gotes funding charities, know that his company had to pay the money anyway.



**Caution** There are both internal and external factors which affect a country's development. One internal factor affecting a country's development is its economy. By economic factors one usually means factors that are essential for production, for example labour, land resources and capital. In the model "The vicious circle of poverty" the link between lack of capital and underdevelopment is emphasised.

The theory of the vicious circle of poverty can be used both at the national and individual levels, but we will concentrate on the individual level in this report. We think that by studying poverty on the individual level one can more concretely see what causes poverty. On the individual level, the vicious circle of poverty starts with the statement that a poor person (A) cannot pay for an adequate supply of food, and (B) thus is physically weak (C) and cannot work efficiently (D), and unable to earn much money (E), and thus is poor (A). The circle starts all over again with a situation where the person does not have money to get nutritious food (B). This process goes on and on.

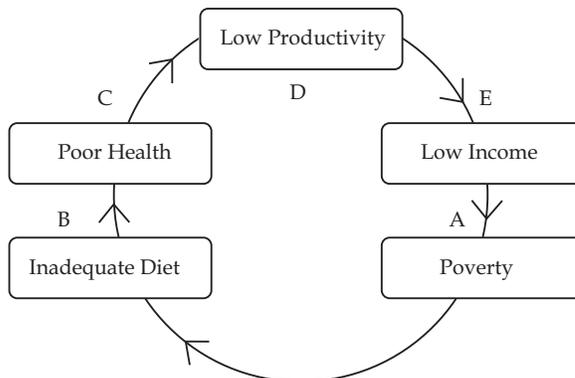


Figure 1: The vicious circle of poverty - Individual level

There have been some criticism raised against this model which state that the circle is inadequate as a total explanation of poverty and underdevelopment. The model does not explain why the person is poor or what is the cause of their poverty. Another thing is that the model does not consider the difference between LDCs, it assumes that all countries are on the same level of poverty. Social conditions are not taken into account either, the model implies that these societies are static and unchanging. The vicious circle of poverty does not tell you anything about how an individual or a country can break out of the circle.

### Self-Assessment

1. Fill in the blanks:

- (i) Poverty is the lack of ..... of expression.
- (ii) The theory of the vicious circle of poverty can be used both at the national and .....
- (iii) ..... has been a critical principle of political economy for over a hundred years.
- (iv) The ..... of poverty does not tell anything about how an individual or a country can break out of the circle.

## 17.2 Circular Causation

Myrdal opposes the strategy of development poles because social systems and economic processes do not develop towards equilibrium but, on the contrary, factors tend to cumulate to positive or negative cycles. Under *laissez faire* conditions in developing countries, there is a tendency towards a negative cumulation. In principle, Myrdal's theory is a negation of the monocausal explanation of problems of developing countries by economic factors alone. Rather, in a comprehensive way, all social relations have to be incorporated. At national level – different stages of development between regions – as well as international level – trade between industrialized and developing countries – differences tend to increase because of the spread effects in the more developed areas and modern sectors and backwash effects in backward areas and traditional sectors. For instance, industrial import goods are in competition with traditional crafts; terms of trade deteriorate; capital is being transferred, etc. The direction of processes depends on the initial situation and the factors causing the change. Under the conditions in developing countries, increased regional dualism often is a consequence of such processes of circular causation.

Circular and cumulative causation (CCC) has been a critical principle of political economy for over a hundred years. While the roots of the concept go back further Thorstein Veblen (1857-1929) utilized the concept in his examination of the evolution of institutions. Gunnar Myrdal (1898-1987) scrutinized the conditions of African Americans and Asian underdevelopment through the lens of CCC; influenced as he was by Knut Wicksell (1851-1926) (Myrdal 1939).



Notes Education is an important aspect to tackle in the fight against poverty

## 17.3 Comparison of Myrdal and Kaldor on CCC

Myrdalian and Kaldorian CCC traditions have significant commonalities as well as important differences. They have three main things in common. The first is the principle of circular causation, where the variables are interrelated, and the general manner of interaction between variables is complex and manifold. Circular causation is a multi-causal approach where the core variables and their linkages are delineated. CCC eschews single factor theories. Both Myrdalian and Kaldorian CCC examine circular relationships, where the interdependencies between factors are relatively strong, and where variables interlink in the determination of major processes.

**Notes**

The second similarity is cumulative causation, where the variables tend to operate as positive feedback processes, magnifying and multiplying the combined impact of the interactions through historical time. The coefficients of interaction between variables will play some role here, as will the extent of any negative feedback (drawback) effects working in the opposite direction. These cumulative interactions are crucial to Myrdalian and Kaldorian empirical studies of money, growth, demand, development and ethnicity. Both forms of CCC examine cumulative dynamics, where the feedback within and between variables often tend to have a multiplier or amplified impact on the overall outcomes.



*Did u know?* Poverty is the lack of essential needs to live that is the lack of proper shelter, clothing and food.

The third similarity relates to traverse, path dependence, and hysteresis that move the system through time in a typically non-equilibrium fashion. Both approaches to CCC recognize the importance of history and time, as well as space and geography, since changes to the social and political economy condition the path of evolution and transformation; and there are regional differences to growth and development as well. The acquisition of knowledge, technical skills and economies of scale/scope affect the path of growth and development in complex and multifarious ways. Both theories explain real world processes that impact nations and regions, and which help explain differences in the outcomes between regions and areas.

The fourth similarity is that cumulative processes often have endogenous contradictions embedded in their dynamics. This aspect has been under-emphasized in the literature, yet it is very important since it means that cumulative changes may sow the seeds of their own demise. When David Gordon (1991), for instance, criticized Kaldor's theory for having too much cumulation and not enough contradiction, he was cognizant of the problem but underplayed the degree that Kaldor himself recognized the problem (e.g., see Kaldor 1966). Setterfield (2001) has set the record straight for Kaldor, since, for instance, regimes of accumulation often have norms and mores that become locked-in, even when industrial change is required (see also Argyrous 2001 and Toner 2001). For Myrdal, on the other hand, the contradictions are more obvious, since cumulation occurs more specifically in tandem with uneven development; and counteracting forces can often be strong (though themselves cumulative, perhaps in a different direction).

These are strong similarities; core ones. Indeed, they are the foundation for linking the traditions. However, the differences are also important, since they allow the traditions to examine marginally different (but complementary) problems. There are three main differences between the models, differences of emphasis rather than quality. The first is that Myrdalian CCC concentrates on the social economy and development through interdisciplinary analysis; whereas Kaldorian CCC centers on more technical demand-supply issues linked to economies of scale and growth. Although Myrdal started out applying CCC to money and macroeconomics (Myrdal [1939] 1965), his most famous two-volume application was to the under-privileged situation of African Americans in the United States (Myrdal 1944), along with his three-volume work on Asian underdevelopment (Myrdal 1968). Myrdal influenced others to apply the theory to issues such as the provision of public and social services in rural and remote areas (Fagence 1980), the socio-political crisis in Poland in the 1980s (Tarkowski 1988), and uneven development at the regional level (Higgins and Savoie 1995). Myrdal's holistic vision is consistent with an interdisciplinary method for the social sciences, broadening the field of inquiry to social, political and economic relationships.

**Self-Assessment**

2. State whether the following statements are 'true' or 'false'.
  - (i) Myrdal opposes the strategy of development poles.
  - (ii) The direction of processes depends on the initial situation and the factors causing the change.

- (iii) Circular causation is a bi-causal approach where the core variables and their linkages are delineated.
- (iv) The acquisition of knowledge, technical skills and economics of scale/scope do not affect the path of growth and development in complex and multifarious ways.

## 17.4 Unlimited Supply of Labour

Interest in prices and in income distribution survived into the neo-classical era, but labour ceased to be unlimited in supply, and the formal model of economic analysis was no longer expected to explain the expansion of the system through time. These changes of assumption and of interest served well enough in the European parts of the world, where labour was indeed limited in supply, and where for the next half century it looked as if economic expansion could indeed be assumed to be automatic. On the other hand over the greater part of Asia labour is unlimited in supply, and economic expansion certainly cannot be taken for granted. Asia's problems, however, attracted very few economists during the neo-classical era (even the Asian economists themselves absorbed the assumptions and preoccupations of European economics) and hardly any progress has been made for nearly a century with the kind of economics which would throw light upon the problems, of countries with surplus populations.

When Keynes's *General Theory* appeared, it was thought at first that this was the book which would illuminate the problems of countries with surplus labour, since it assumed an unlimited supply of labour at the current price, and also, in its final pages, made a few remarks on secular economic expansion. Further reflection, however, revealed that Keynes's book assumed not only that labour is unlimited in supply, but also, and more fundamentally, that land and capital are unlimited in supply—more fundamentally both in the short run sense that once the monetary tap is turned the real limit to expansion is not physical resources but the limited supply of labour, and also in the long run sense that secular expansion is embarrassed not by a shortage but by a superfluity of saving. Given the Keynesian remedies a neoclassical system comes into its own again. Hence, from the point of view of countries with surplus labour, Keynesianism is only a footnote to neoclassicism—albeit a long, important and fascinating footnote. The student of such economies has therefore to work right back to the classical economists before he finds an analytical framework into which he can relevantly fit his problems.



Task

What do you mean by unlimited supply of labour

## 17.5 The Closed Economy

We have to begin by elaborating the assumption of an unlimited supply of labour, and by establishing that it is a useful assumption. We are not arguing, let it be repeated; that this assumption should be made for all areas of the world. It is obviously not true of the United Kingdom, or of North West Europe. It is not true either of some of the countries usually now lumped together as under-developed; for example there is an acute shortage of male labour in some parts of Africa and of Latin America. On the other hand it is obviously relevant assumption for the economies of Egypt, of India, or of Jamaica. Our present task is not to supersede neo-classical economics, but merely to elaborate a different framework for those countries which the neo-classical (and Keynesian) assumptions do not fit. In the first place, an unlimited supply of labour may be said to exist in those countries where population is so large relatively to capital and natural resources, that there are large sectors of the economy where the marginal productivity of labour is negligible, zero, or even negative. Several writers have drawn attention to the existence of such "disguised" unemployment in the agricultural sector, demonstrating in each case that the family holding is so small that if some members of the family obtained other

**Notes**

employment the remaining members could cultivate the holding just as well (of course they would have to work harder : the argument includes the proposition that they would be willing to work harder in these circumstances). The phenomenon is not, however, by any means confined to the countryside. Another large sector to which it applies is the whole range of casual jobs—the workers on the docks, the young men who rush forward asking to carry your bag as you appear, the jobbing gardener, and the like. These occupations usually have a multiple of the number they need, each of them earning very small sums from occasional employment ; frequently their number could be halved without reducing output in this sector. Petty retail trading is also exactly of this type; it is enormously expanded in overpopulated economies; each trader makes only a few sales; markets are crowded with stalls, and if the number of stalls were greatly reduced the consumers would be no whit worse off—they might even be better off, since retail margins might fall. Twenty years ago one could not write these sentences without having to stop and explain why in these circumstances, the casual labourers do not bid their earnings down to zero, or why the farmers' product is not similarly all eaten up in rent, but these propositions present no terrors to contemporary economists.

### **17.6 The Open Economy**

When capital accumulation catches up with the labour supply, wages begin to rise above the subsistence level, and the capitalist surplus is adversely affected. However, if there is still surplus labour in other countries, the capitalists can avoid this in one of two ways, by encouraging immigration or by exporting their capital to countries where there is still abundant labour at a subsistence wage. We must examine each of these in turn. Let us first clear out of the way the effects of the immigration of skilled workers, since our main concern is with an abundant immigration of unskilled workers released by the subsistence sectors of other countries.

It is theoretically possible that the immigration of skilled workers may reduce the demand for the services of native unskilled workers, but this is most unlikely. More probably it will make possible new investments and industries which were not possible before, and will thus increase the demand for all kinds of labour, relatively to its supply. We must also get out of the way relatively small immigrations. If 100,000 Puerto Ricans immigrate to the United States every year, the effect on U.S. wages is negligible. U.S. wages are not pulled down to the Puerto Rican level; it is Puerto Rican wages which are then pulled up to the U.S. level. Mass immigration is quite a different kettle of fish. If there were free immigration from India and China to the U.S.A., the wage level of the U.S.A. would certainly be pulled down towards the Indian and Chinese levels. In fact in a competitive model the U.S. wage could exceed the Asian wage only by an amount covering migration costs plus the "cliff to which we have already referred. The result is the same whether one assumes increasing or diminishing returns to labour. Wages are constant at subsistence level plus. All the benefit of increasing returns goes into the capitalist surplus. This is one of the reasons why, in every country where the wage level is relatively high, the trade unions are bitterly hostile to immigration, except of people in special categories, and take steps to have it restricted. The result is that real wages are higher than they would otherwise be. while profits, capital resources, and total output are smaller than they would otherwise be. The export of capital is therefore a much easier way out for the capitalists, since trade unions are quick to restrict immigration, but much slower in bringing the export of capital under control.

### **17.7 Summary**

- Positive, step by step proposition developed by a firm or a salesperson to win a favorable response from the prospects. Sales approach is what, in essence, distinguishes a professional from an amateur.
- At national level—different stages of development between regions—as well as international level— trade between industrialized and developing countries—differences tend to increase because of the spread effects in the more developed areas and modern sectors and backwash

effects in backward areas and traditional sectors.

- Circular and cumulative causation (CCC) has been a critical principle of political economy for over a hundred years.
- Interest in prices and in income distribution survived into the neo-classical era, but labour ceased to be unlimited in supply, and the formal model of economic analysis was no longer expected to explain the expansion of the system through time.
- We have to begin by elaborating the assumption of an unlimited supply of labour, and by establishing that it is a useful assumption.
- When capital accumulation catches up with the labour supply, wages begin to rise above the subsistence level, and the capitalist surplus is adversely affected.
- The result is that real wages are higher than they would otherwise be. while profits, capital resources, and total output are smaller than they would otherwise be.

### 17.8 Key-Words

- Vicious : very bad or severe
- Causation : To process of one event causing or producing another event, causality

### 17.9 Review Questions

1. Describe the vicious circle of poverty and its significance.
2. Discuss the comparison of Myrdal and Kaldor on CCC.
3. What is unlimited supply of labour Explain it.
4. Explain the open and closed Economy. Discuss the Difference between the open and closed Economy.

### Answers: Self Assessment

1. (i) freedom (ii) individual levels  
(iii) circular and cumulative causation (iv) vicious circle
2. (i) T (ii) T (iii) F (iv) F

### 17.10 Further Readings



Books

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 18: Lewis Model

### CONTENTS

Objectives

Introduction

18.1 Lewis Model

18.2 Lewis Theory

18.3 Relationship Between the Two Sectors

18.4 Surplus Labor and the Growth of the Economy

18.5 Capital Accumulation

18.6 Criticism

18.7 Empirical Tests and Practical Application of the Lewis Model

18.8 Summary

18.9 Key-Words

18.10 Review Questions

18.11 Further Readings

### Objectives

After reading this unit students will be able to:

- Explain about Lewis model.
- Describe relationship between the two sectors.
- Understand surplus and the growth as the economy, etc.

### Introduction

The **dual-sector model** is a model in developmental economics. It is commonly known as the **Lewis model** after its inventor Sir William Arthur Lewis, winner of the Nobel Memorial Prize in Economics in 1979. It explains the growth of a developing economy in terms of a labour transition between two sectors, the capitalist sector and the subsistence sector.

### 18.1 Lewis Model

Initially the dual-sector model as given by W.A Lewis was enumerated in his article entitled "Economic Development with Unlimited Supplies of Labor" written in 1954 by Sir Arthur Lewis, the model itself was named in Lewis's honor. First published in *The Manchester School* in May 1954, the article and the subsequent model were instrumental in laying the foundation for the field of Developmental economics. The article itself has been characterized by some as the most influential contribution to the establishment of the discipline.

### Assumptions

1. The model assumes that a developing economy has a surplus of unproductive labor in the agricultural sector.
2. These workers are attracted to the growing manufacturing sector where higher wages are offered.
3. It also assumes that the wages in the manufacturing sector are more or less fixed.

4. Entrepreneurs in the manufacturing sector make profit because they charge a price above the fixed wage rate.
5. The model assumes that these profits will be reinvested in the business in the form of fixed capital.

Notes



Task

An advanced manufacturing sector means an economy has moved from a traditional to an industrialized one.

## 18.2 Lewis Theory

W.A Lewis divided the economy of an underdeveloped country into 2 sectors:

### The capitalist sector

Lewis defined this sector as “that part of the economy which uses reproducible capital and pays capitalists thereof”. The use of capital is controlled by the capitalists, who hire the services of labor. It includes manufacturing, plantations, mines etc. The capitalist sector may be private or public.

### The Subsistence Sector

This sector was defined by him as “that part of the economy which is not using reproducible capital. It can also be adjusted as the indigenous traditional sector or the “self employed sector”. The per head output is comparatively lower in this sector and this is because it is not fructified with capital. The “Dual Sector Model” is a theory of development in which surplus labor from traditional agricultural sector is transferred to the modern industrial sector whose growth over time absorbs the surplus labor, promotes industrialization and stimulates sustained development. In the model, the subsistence agricultural sector is typically characterized by low wages, an abundance of labour, and low productivity through a labour intensive production process. In contrast, the capitalist manufacturing sector is defined by higher wage rates as compared to the subsistence sector, higher marginal productivity, and a demand for more workers. Also, the capitalist sector is assumed to use a production process that is capital intensive, so investment and capital formation in the manufacturing sector are possible over time as capitalists’ profits are reinvested in the capital stock. Improvement in the marginal productivity of labour in the agricultural sector is assumed to be a low priority as the hypothetical developing nation’s investment is going towards the physical capital stock in the manufacturing sector.

## 18.3 Relationship between the two sectors

The primary relationship between the two sectors is that when the capitalist sector expands, it extracts or draws labor from the subsistence sector. This causes the output per head of laborers who move from the subsistence sector to the capitalist sector to increase. Since Lewis in his model considers overpopulated labor surplus economies he assumes that the supply of unskilled labor to the capitalist sector is unlimited. This gives rise to the possibility of creating new industries and expanding existing ones at the **existing wage rate**. A large portion of the unlimited supply of labor consists of those who are in disguised unemployment in agriculture and in other over-manned occupations such as domestic services casual jobs, petty retail trading. Lewis also accounts for two other factors that cause an increase in the supply of unskilled labor, they are women in the household and population growth. The agricultural sector has a limited amount of land to cultivate, the marginal product of an additional farmer is assumed to be zero as the law of diminishing marginal returns has run its course due to the fixed input, land. As a result, the agricultural sector has a quantity of farm workers that are not contributing to agricultural output since their marginal productivities are zero. This group of farmers that is not producing any output is termed surplus labour since this cohort could be moved to another

**Notes**

sector with no effect on agricultural output. (The term surplus labour here is not being used in a Marxist context and only refers to the unproductive workers in the agricultural sector.) Therefore, due to the wage differential between the capitalist and subsistence sector, workers will tend to transition from the agricultural to the manufacturing sector over time to reap the reward of higher wages. However even though the marginal product of labor is zero, it still shares a part in the total product and receives approximately the average product. If a quantity of workers moves from the subsistence to the capitalist sector equal to the quantity of surplus labour in the subsistence sector, regardless of who actually transfers, general welfare and productivity will improve. Total agricultural product will remain unchanged while total industrial product increases due to the addition of labour, but the additional labour also drives down marginal productivity and wages in the manufacturing sector. Over time as this transition continues to take place and investment results in increases in the capital stock, the marginal productivity of workers in the manufacturing will be driven up by capital formation and driven down by additional workers entering the manufacturing sector. Eventually, the wage rates of the agricultural and manufacturing sectors will equalize as workers leave the agriculture sector for the manufacturing sector, increasing marginal productivity and wages in agriculture whilst driving down productivity and wages in manufacturing.

The end result of this transition process is that the agricultural wage equals the manufacturing wage, the agricultural marginal product of labour equals the manufacturing marginal product of labour, and no further manufacturing sector enlargement takes place as workers no longer have a monetary incentive to transition.

**Self-Assessment**

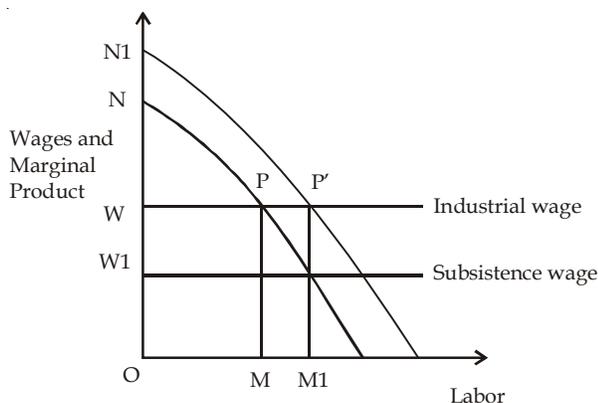
1. Fill in the blanks:
  - (i) Economic Development with Unlimited supplies of labor written in 1954 by the model itself was named in .....
  - (ii) The ..... is a theory of development in which surplus labour from traditional agricultural sector is transferred to the modern industrial sector.
  - (iii) The primary relationship between the two sectors is that when the capitalist sector expands, it extracts from the .....
  - (iv) Improvement in the marginal productivity of ..... in the agricultural sector is assumed to be a low priority.

**18.4 Surplus Labor and the Growth of the Economy**

Surplus labor can be used instead of capital in the creation of new industrial investment projects, or it can be channeled into nascent industries, which are labor intensive in their early stages. Such growth does not raise the value of the subsistence wage, because the supply of labor exceeds the demand at that wage, and rising production via improved labor techniques has the effect of lowering the capital coefficient. Although labor is assumed to be in surplus, it is mainly unskilled. This inhibits growth since technical progress necessary for growth requires skilled labor. But should there be a labor surplus and a modest capital, this bottleneck can be broken through the provision of training and education facilities. The utility of unlimited supplies of labor to growth objectives depends upon the amount of capital available at the same time. Should there be surplus labor, agriculture will derive no productive use from it, so a transfer to a non agriculture sector will be of mutual benefit. It provides jobs to the agrarian population and reduces the burden of population from land. Industry now obtains its labor. Labor must be encouraged to move to increase productivity in agriculture. To start such a movement, the capitalist sector will have to pay a compensatory payment determined by the wage rate which people can earn outside their present sector, plus a set of other which include the cost of living in the new sector and changes in the level of profits in the existing sector. The margin capitalists may have to pay is as much as 30 per cent above the average subsistence wage, WW1 in figure which represents the capitalist sector is shown by N; OW is the industrial wage. Given the

profit maximization assumption, employment of labor within the industrial sector is given by the point where marginal product is equal to the rate of wages, i.e. **OM**.

Notes



Since the wages in the capitalist sector depend on the earnings of the subsistence sector, capitalists would like to keep down productivity/wages in the subsistence sector, so that the capitalist sector may expand at a fixed wage. In the capitalist sector labor is employed up to the point where its marginal product equals wage, since a capitalist employer would be reducing his surplus if he paid labor more than he received for what is produced. But this need not be true in subsistence agriculture as wages could be equal to average product or the level of subsistence. The total product labor **ONPM** is divided between the payments to labor in the form of wages, **OWPM**, and the capitalist surplus, **NPW**. The growth of the capitalist sector and the rate of labor absorption from the subsistence sector depends on the use made of capitalist surplus. When the surplus is reinvested, the total product of labor will rise. The marginal product line shifts upwards to the right, that is to **N1**. Assuming wages are constant, the industrial sector now provides more employment. Hence employment rises by **MM1**. The amount of capitalist surplus goes up from **WNP** to **WN1P'**. This amount can now be reinvested and the process will be repeated and all the surplus labor would eventually be exhausted. When all the surplus labor in the subsistence sector has been attracted into the capitalist sector, wages in the subsistence sector will begin to rise, shifting the terms of trade in favor of agriculture, and causing wages in the capitalist sector to rise. Capital accumulation has caught up with the population and there is no longer scope for development from the initial source, i.e. unlimited supplies of labor. When all the surplus labor is exhausted, the supply of labor to the industrial sector becomes less than perfectly elastic. It is now in the interests of producers in the subsistence sector to compete for labor as the agricultural sector has become fully commercialized. It is the increase in the share of profits in the capitalist sector which ensures that labor surplus is continuously utilized and eventually exhausted. Real wages will tend to rise along with increases in productivity and the economy will enter into a stage of self-sustaining growth with a consistent nature.

### Self-Assessment

2. State whether the following statements are 'true' or 'false'.
  - (i) Surplus labor can be used instead of capital in the creation of new industrial investment projects.
  - (ii) The utility of unlimited supplies of labor to growth objectives does not depend upon the amount of capital available at the same time.
  - (iii) The growth of the capitalist sector and the rate of labor absorption from the subsistence sector depends on the use made of capitalist surplus.
  - (iv) When all the surplus labor is exhausted, the supply of labor to the industrial sector become more than perfectly elastic.

Notes

(v) Real wages will tend to rise along with increases in productivity.



Task

On which theory the Lewis model is based? explain.

## 18.5 Capital Accumulation

The process of economic growth is inextricably linked to the growth of capitalist surplus, that is as long as the capitalist surplus increases, the national income also increases raising the growth of the economy. The increase in capitalist surplus is linked to the use of more and more labor which is assumed to be in surplus in case of this model. This process of capital accumulation does come to an end at some point. This point is where capital accumulation catches up with population so that there is no longer any surplus labor left. Lewis says that it the point where capital accumulation comes to a stop can come before also that is if real wages rise so high so as to reduce capitalists' profits to the level at which profits are all consumed and there is no net investment. This can take place in the following ways :

1. If the capital accumulation is proceeding faster than population growth growth which causes a decline in the number of people in the agricultural or subsistence sector.
2. The increase in the size of the capitalist or industrial sector in comparison to the subsistence sector may turn the terms of trade against the capitalist sector and therefore force the capitalists to pay the workers/laborers a higher percentage of their product in order to keep their real income constant.
3. The subsistence sector may adopt new and improved methods and techniques of production, this will raise the level of subsistence wages in turn forcing an increase in the capitalist wages. Thus both the surplus of the capitalists and the rate of capital accumulation will then decline.
4. and therefore may need more to live on, this will raise the subsistence wage and also the capitalist wage and in turn the capitalist surplus and the rate of capital accumulation will decline.



Notes

Even though the productivity of capitalist sector remains unchanged, the workers in the capitalist sector may begin to imitate the capitalist style and way of life.

## 18.6 Criticism

The Lewis model has attracted attention of underdeveloped countries because it brings out some basic relationships in dualistic development. However it has been criticized on the following grounds :

1. Economic development takes place via the absorption of labor from the subsistence sector where opportunity costs of labor are very low. However, if there positive opportunity costs, e.g. loss of crops in times of peak harvesting season, labor transfer will reduce agricultural output.
2. Absorption of surplus labor itself may end prematurely because competitors may raise wage rates and lower the share of profit. It has been shown that rural-urban migration in the Egyptian economy was accompanied by an increase in wage rates of 15 per cent and a fall in profits of 12 per cent. Wages in the industrial sector were forced up directly by unions and indirectly through demands for increased wages in the subsistence sector, as payment for increased productivity. In fact, given the urban-rural wage differential in most poor countries, large scale unemployment is now seen in both the urban and rural sectors.
3. The Lewis model underestimates the full impact on the poor economy of a rapidly growing

population, i.e. its effects on agriculture surplus, the capitalist profit share, wage rates and overall employment opportunities. Similarly, Lewis assumed that the rate of growth in manufacturing would be identical to that in agriculture, but if industrial development involves more intensive use of capital than labor, then the flow of labor from agriculture to industry will simply create more unemployment.

4. Lewis seems to have ignored the balanced growth between agriculture and industry. Given the linkages between agricultural growth and industrial expansion in poor countries, if a section of the profit made by the capitalists is not devoted to agricultural development, the process of industrialization would be jeopardized.
5. Possible leakages from the economy seem to have been ignored by Lewis. He assumes boldly that a capitalist's marginal propensity to save is close to one, but a certain increase in consumption always accompanies an increase in profits, so the total increment of savings will be somewhat less than increments in profit. Whether or not capitalist surplus will be used constructively will depend on the consumption- saving patterns of the top 10 percent of the population. But capitalists alone are not the only productive agents of society. Small farmers producing cash crops in Egypt have shown themselves to be quite capable of saving the required capital.
6. The transfer of unskilled workers from agriculture to industry is regarded as almost smooth and costless, but this does not occur in practice because industry requires different types of labor. The problem can be solved by investment in education and skill formation, but the process is neither smooth nor inexpensive.

The model assumes rationality, perfect information and unlimited capital formation in industry. These do not exist in practical situations and so the full extent of the model is rarely realised. However, the model does provide a good general theory on labour transitioning in developing economies.



*Did u know?* The world's largest cocoa industry in Ghana is entirely the creation of small enterprise capital formation.

## 18.7 Empirical Tests and Practical Application of the Lewis Model

1. Empirical evidence does not always provide much support for the Lewis model. Theodore Schultz in an empirical study of a village in India during the influenza epidemic of 1918-19 showed that agricultural output declined, although his study does not prove whether output would have declined had a comparable proportion of the agricultural population left for other occupations in response to economic incentive. Again disguised unemployment may be present in one sector of the economy but not in others. Further, empirically it is important to know not only whether the marginal productivity is equal to zero, but also the amount of surplus labor and the effect of its withdrawal on output.
2. The Lewis model was applied to the Egyptian economy by Mabro in 1967 and despite the proximity of Lewis's assumptions to the realities of the Egyptian situation during the period of study, the model failed firstly because Lewis seriously underestimated the rate of population growth and secondly because the choice of capital intensiveness in Egyptian industries did not show much labor using bias and as such, the level of unemployment did not show any tendency to register significant decline.
3. The validity of the Lewis model was again called into question when it was applied to Taiwan. It was observed that, despite the impressive rate of growth of the economy of Taiwan, unemployment did not fall appreciably and this is explained again in reference to the choice of capital intensity in industries in Taiwan. This raised the important issue whether surplus labor is a necessary condition for growth.

**Notes**

This model has been employed quite successfully in Singapore. Ironically however it has not been employed in Sir Arthur Lewis' home country of St. Lucia.

**Self-Assessment**

3. Choose the correct option

- (i) The Lewis model was applied to the ..... of rapidly growing population.  
(a) economy            (b) development    (c) opportunity      (d) industrial
- (ii) The Lewis model was applied to the ..... economy by Mabro in 1967.  
(a) Indian              (b) Egyptian        (c) Chinese            (d) English
- (iii) The Lewis model has been employed quite successfully in  
(a) India                (b) England          (c) Singapore        (d) Egypt

**18.8 Summary**

- Initially the dual-sector model as given by W.A Lewis was enumerated in his article entitled "Economic Development with Unlimited Supplies of Labor" written in 1954 by Sir Arthur Lewis, the model itself was named in Lewis's honor.
- W.A Lewis divided the economy of an underdeveloped country into 2 sectors:

**The capitalist sector**

Lewis defined this sector as "that part of the economy which uses reproducible capital and pays capitalists thereof". The use of capital is controlled by the capitalists, who hire the services of labor.

**The Subsistence Sector**

This sector was defined by him as "that part of the economy which is not using reproducible capital. It can also be adjusted as the indigenous traditional sector or the "self employed sector". The per head output is comparatively lower in this sector and this is because it is not fructified with capital.

- The primary relationship between the two sectors is that when the capitalist sector expands, it extracts or draws labor from the subsistence sector. This causes the output per head of laborers who move from the subsistence sector to the capitalist sector to increase.
- A large portion of the unlimited supply of labor consists of those who are in disguised unemployment in agriculture and in other over-manned occupations such as domestic services casual jobs, petty retail trading.
- due to the wage differential between the capitalist and subsistence sector, workers will tend to transition from the agricultural to the manufacturing sector over time to reap the reward of higher wages.
- Total agricultural product will remain unchanged while total industrial product increases due to the addition of labour, but the additional labour also drives down marginal productivity and wages in the manufacturing sector.
- Surplus labor can be used instead of capital in the creation of new industrial investment projects, or it can be channeled into nascent industries, which are labor intensive in their early stages.
- The utility of unlimited supplies of labor to growth objectives depends upon the amount of capital available at the same time.

- It provides jobs to the agrarian population and reduces the burden of population from land. Industry now obtains its labor. Labor must be encouraged to move to increase productivity in agriculture.
- The margin capitalists may have to pay is as much as 30 per cent above the average subsistence wage.
- Capital accumulation has caught up with the population and there is no longer scope for development from the initial source.
- The process of economic growth is inextricably linked to the growth of capitalist surplus, that is as long as the capitalist surplus increases, the national income also increases raising the growth of the economy.
- This process of capital accumulation does come to an end at some point. This point is where capital accumulation catches up with population so that there is no longer any surplus labor left.
- The Lewis model has attracted attention of underdeveloped countries because it brings out some basic relationships in dualistic development.
- Economic development takes place via the absorption of labor from the subsistence sector where opportunity costs of labor are very low.
- Absorption of surplus labor itself may end prematurely because competitors may raise wage rates and lower the share of profit.
- Wages in the industrial sector were forced up directly by unions and indirectly through demands for increased wages in the subsistence sector, as payment for increased productivity.
- Empirical evidence does not always provide much support for the Lewis model. Theodore Schultz in an empirical study of a village in India during the influenza epidemic of 1918-19 showed that agricultural output declined.
- The Lewis model was applied to the Egyptian economy by Mabro in 1967 and despite the proximity of Lewis's assumptions to the realities of the Egyptian situation during the period of study, the model failed firstly because Lewis seriously underestimated the rate of population growth.

### 18.9 Key-Words

- Assumption : a belief or feeling that something is true or that something will happen.
- Capitalist : A person who owns or controls a lot of wealth and uses it to produce more wealth.
- Accumulation : The process of to gradually get more and more of something over a period of time.

### 18.10 Review Questions

1. What is Lewis model? Explain.
2. Explain the Capitalist sector and subsistence sector.
3. What are the Criticism points of Lewis model? explain.
4. Give any two practical applications of the Lewis model.

Notes

**Answers: Self-Assessment**

- |    |                          |                        |           |        |
|----|--------------------------|------------------------|-----------|--------|
| 1. | (i) Sir Arthur Lewis     | (ii) Dual sector model |           |        |
|    | (iii) Subsistence sector | (iv) labour            |           |        |
| 2. | (i) T                    | (ii) F                 | (iii) T   | (iv) F |
|    | (v) T                    |                        |           |        |
| 3. | (i) (a)                  | (ii) (b)               | (iii) (c) |        |

**18.11 Further Readings**



*Books*

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 19 : Ranis and Fei Model

Notes

### CONTENTS

Objectives

Introduction

19.1 The Fei-Ranis Model of Economic Growth

19.2 Connectivity between Sectors

19.3 Capital-Labor Production Function

19.4 Agricultural Surplus

19.5 Significance of Agriculture in the Fei-Ranis Model

19.6 The Indispensability of Labor Reallocation

19.7 Growth without Development

19.8 Summary

19.9 Key-Words

19.10 Review Questions

19.11 Further Readings

### Objectives

After reading this unit students will be able to:

- Be able to explain the Fei-Ranis model of economic growth and connectivity between sectors.
- Know about the capital-Labor production Function and Agricultural surplus.
- Understand significance of agriculture in the Fei-Ranis model and indispensability of labor reallocation
- Assess growth without development.

### Introduction

**The Fei-Ranis model of economic growth** is a dualism model in *development economics* or *welfare economics* that has been developed by *John C.H Fei* and *Gustav Ranis* and can be understood as an extension of the *Lewis model*. It is also known as the Surplus Labor model. It recognizes the presence of a *dual economy* comprising both the modern and the primitive sector and takes the economic situation of unemployment and underemployment of resources into account, unlike many other growth models that consider underdeveloped countries to be homogenous in nature.

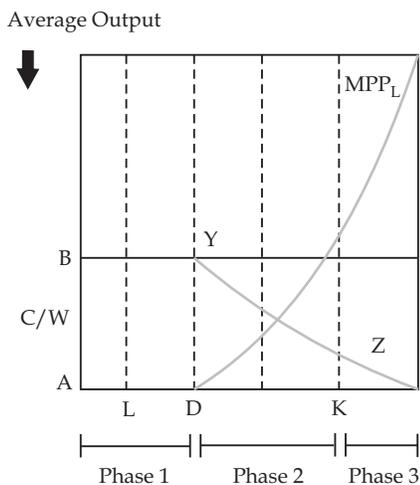
### 19.1 The Fei-Ranis Model of Economic Growth

According to this theory, the primitive sector consists of the existing agriculture sector in the economy, and the modern sector is the rapidly emerging but small industrial sector. Both the sectors co-exist in the economy, wherein lies the crux of the development problem. Development can be brought about only by a complete shift in the focal point of progress from the agricultural to the industrial economy, such that there is augmentation of industrial output. This is done by transfer of labor from the agricultural sector to the industrial one, showing that underdeveloped countries do not suffer from constraints of labor supply. At the same time, growth in the agricultural sector must not be negligible and its output should be sufficient to support the whole economy with food and raw materials. Like

Notes

in the *Harrod-Domar model*, saving and investment become the driving forces when it comes to economic development of under-developed countries. Fei-Ranis economic model can be classified as a classical model, as it uses the classical assumption of subsistence wages.

**Basics of the model**



Depiction of Phase1, Phase2 and Phase3 of the dual economy model using average output.

One of the biggest drawbacks of the Lewis model was the undermining of the role of agriculture in boosting the growth of the industrial sector. In addition to that, he did not acknowledge that the increase in *productivity of labor* should take place prior to the labor shift between the two sectors. However, these two ideas were taken into account in the Fei-Ranis dual economy model of three growth stages. They further argue that the model lacks in the proper application of concentrated analysis to the change that takes place with agricultural development. In Phase 1 of the Fei-Ranis model, the elasticity of the agricultural labor work-force is infinite and as a result, suffers from disguised unemployment. Also, the *marginal product of labor* is zero. This phase is similar to the Lewis model. In Phase 2 of the model, the agricultural sector sees a rise in productivity and this leads to increased industrial growth such that a base for the next phase is prepared. In Phase 2, agricultural surplus may exist as the increasing average product (AP), higher than the marginal product (MP) and not equal to the subsistence level of wages.

Using the help of the figure on the left, we see that

**Phase 1 :  $AL(\text{from figure}) = MP = 0$  and  $AB(\text{from figure}) = AP$**

According to Fei and Ranis, AD amount of labor (see figure) can be shifted from the agricultural sector without any fall in output. Hence, it represents *surplus labor*.

**Phase 2 :  $AP > MP$**

After AD, MP begins to rise, and industrial labor rises from zero to a value equal to AD. AP of agricultural labor is shown by BYZ and we see that this curve falls downward after AD. This fall in AP can be attributed to the fact that as agricultural laborers shift to the industrial sector, the *real wage* of industrial laborers decreases due to shortage of food supply, since less laborers are now working in the food sector. The decrease in the *real wage* level decreases the level of profits, and the size of *surplus* that could have been reinvested for more industrialization. However, as long as *surplus* exists, growth rate can still be increased without a fall in the rate of industrialization. This re-investment of surplus can be graphically visualized as the shifting of MP curve outwards. In Phase2

the level of disguised unemployment is given by AK. This allows the agricultural sector to give up a part of its labor-force until

$$MP = \text{Real wages} = AB = \text{Constant institutional wages (CIW)}$$

Phase 3 begins from **the point of commercialization** which is at K in the Figure. This is the point where the economy becomes completely commercialized in the absence of disguised unemployment. The supply curve of labor in Phase 3 is steeper and both the sectors start bidding equally for labor.

### Phase 3 : $MP > CIW$

The amount of labor that is shifted and the time that this shifting takes depends upon :

1. The growth of *surplus* generated within the agricultural sector, and the growth of industrial capital stock dependent on the growth of industrial profits;
2. The nature of the industry's technical progress and its associated bias;
3. Growth rate of population. So, the three fundamental ideas used in this model are :
  1. Agricultural growth and industrial growth are both equally important;
  2. Agricultural growth and industrial growth are balanced;
  3. Only if the rate at which labor is shifted from the agricultural to the industrial sector is greater than the rate of growth of population will the economy be able to lift itself up from the *Malthusian population trap*.

This shifting of labor can take place by the landlords' investment activities and by the government's *fiscal* measures. However, the cost of shifting labor in terms of both private and *social cost* may be high, for example transportation cost or the cost of carrying out construction of buildings. In addition to that, per capita agricultural consumption can increase, or there can exist a wide gap between the wages of the urban and the rural people. These leakages prevent the creation of agricultural surplus. In fact, surplus generation might be prevented due to a *backward-sloping supply curve of labor* as well, which happens when high income-levels are not consumed. This would mean that the *productivity of laborers* with rise in income will not rise. However, the case of *backward-sloping curves* is mostly unpractical.



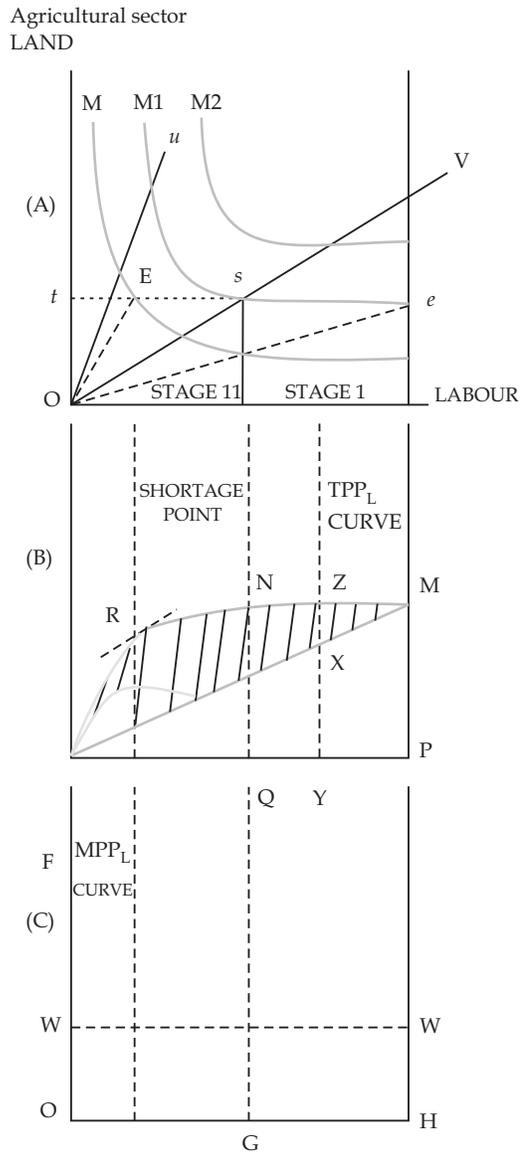
*Did u know?* Three occurrences- high cost, high consumption and high gap in wages, are called as **leakages**,

## 19.2 Connectivity between Sectors

Fei and Ranis emphasized strongly on the industry-agriculture interdependency and said that a robust connectivity between the two would encourage and speedup development. If agricultural laborers look for industrial employment, and industrialists employ more workers by use of larger capital good stock and labor-intensive technology, this connectivity can work between the industrial and agricultural sector. Also, if the surplus owner invests in that section of industrial sector that is close to soil and is in known surroundings, he will most probably choose that productivity out of which future savings can be channelized. They took the example of Japan's dualistic economy in the 19<sup>th</sup> century and said that connectivity between the two sectors of Japan was heightened due the presence of a decentralized rural industry which was often linked to urban production. According to them, economic progress is achieved in dualistic economies of underdeveloped countries through the work of a small number of entrepreneurs who have access to land and decision-making powers and use industrial capital and consumer goods for agricultural practices.

Notes

Notes



**Land-Labor Production Function**

In (A), land is measured on the vertical axis, and labor on the horizontal axis.  $Ou$  and  $Ov$  represent two ridge lines, and the production *contour lines* are depicted by  $M$ ,  $M_1$  and  $M_2$ . The area enclosed by the ridge lines defines the region of factor substitutability, or the region where factors can easily be substituted. Let us understand the repercussions of this. If the amount of labor is the total labor in the agricultural sector, the intersection of the ridge line  $Ov$  with the production curve  $M_1$  at point  $s$  renders  $M_1$  perfectly horizontal below  $Ov$ . The horizontal behavior of the production line implies that outside the region of factor substitutability, output stops and labor becomes redundant once land is fixed and labor is increased.

If  $Ot$  is the total land in the agricultural sector,  $ts$  amount of labor can be employed without it becoming redundant, and  $es$  represents the redundant agricultural labor force. This led Fei and Ranis to develop the concept of **Labor Utilization Ratio**, which they define as the units of labor that can be productively employed (without redundancy) per unit of land. In the left-side figure, labor utilization ratio

$$R = \frac{ts}{Ot}$$

which is graphically equal to the inverted slope of the ridge line Ov.

Fei and Ranis also built the concept of **endowment ratio**, which is a measure of the relative availability of the two factors of production. In the figure, if Ot represents agricultural land and tE represents agricultural labor, then the endowment ratio is given by

$$S = \frac{tE}{Ot}$$

which is equal to the inverted slope of OE. The actual point of endowment is given by E.

Finally, Fei and Ranis developed the concept of **non-redundancy coefficient** T which is measured by

$$T = \frac{ts}{te}$$

These three concepts helped them in formulating a relationship between T, R and S. If  $T = \frac{ts}{te}$  then

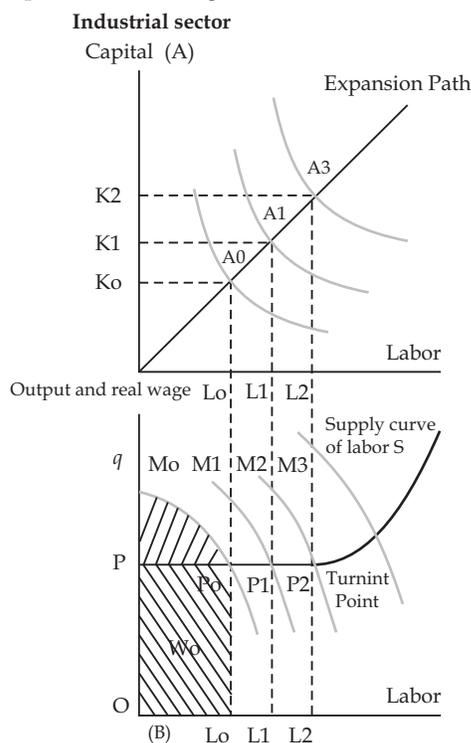
$$T = \frac{ts/Ot}{te/Ot} = \frac{R}{S}, \text{ or } T = \frac{R}{S}$$



Task What is labor utilization ratio?

This mathematical relation proves that the non-redundancy coefficient is directly proportional to labor utilization ratio and is inversely proportional to the endowment ratio.

(B) displays the total physical productivity of labor (TPP<sub>L</sub>) curve. The curve increases at a decreasing rate, as more units of labor are added to a fixed amount of land. At point N, the curve shapes horizontally and this point N conforms to the point G in (C, which shows the *marginal productivity of labor* (MPP<sub>L</sub>) curve, and with point s on the ridge line Ov in (A).



### 19.3 Capital-Labor Production Function

Like in the agricultural sector, Fei and Ranis assume constant returns to scale in the industrial sector. However, the main factors of production are capital and labor. In the graph (A) right hand side, the *production functions* have been plotted taking labor on the horizontal axis and capital on the vertical axis. The expansion path of the industrial sector is given by the line  $OA_0A_1A_2$ . As capital increases from  $K_0$  to  $K_1$  to  $K_2$  and labor increases from  $L_0$  to  $L_1$  and  $L_2$ , the industrial output represented by the production contour  $A_0$ ,  $A_1$  and  $A_2$  increases accordingly.

According to this model, the prime labor supply source of the industrial sector, is the agricultural sector, due to redundancy in the agricultural labor force. (B) shows the labor supply curve for the industrial sector.  $PP_2$  represents the straight line part of the curve and is a measure of the redundant agricultural labor force on a graph with industrial labor force on the horizontal axis and output/*real wage* on the vertical axis. Due to the redundant agricultural labor force, the *real wages* remain constant but once the curve starts sloping upwards from point  $P_2$ , the upward sloping indicates that additional labor would be supplied only with a corresponding rise in the *real wages* level.

$MPP_L$  curves corresponding to their respective capital and labor levels have been drawn as  $M_0$ ,  $M_1$ ,  $M_2$  and  $M_3$ . When capital stock rises from  $K_0$  to  $K_1$ , the *marginal physical productivity of labor* rises from  $M_0$  to  $M_1$ . When capital stock is  $K_0$ , the  $MPP_L$  curve cuts the labor supply curve at equilibrium point  $P_0$ . At this point, the total *real wage* income is  $W_0$  and is represented by the shaded area  $POL_0P_0$ .  $\lambda$  is the equilibrium profit and is represented by the shaded area  $qPP_0$ . Since the laborers have extremely low income-levels, they barely save from that income and hence industrial profits ( $\pi_0$ ) become the prime source of investment funds in the industrial sector.

$$K_1 = K_0 + S_0 + \Pi_0$$

Here,  $K_1$  gives the total supply of investment funds (given that rural savings are represented by  $S_0$ ) Total industrial activity rises due to increase in the total supply of investment funds, leading to increased industrial employment.

#### Self-Assessment

1. Multiple choice questions:  
*Choose the correct option*
  - (i) ..... economic model can be classified as a classified model, as it uses the classical assumption of subsistence wages.
 

(a) Harrod-Domar model	(b) Fei-Ranis
(c) Lewis model	(d) Ronald model
  - (ii) One of the biggest draw back of the Lewis model was the undermining of the role of ..... in boosting the growth of the industrial sectors.
 

(a) agriculture	(b) forestry	(c) building	(d) industry
-----------------	--------------	--------------	--------------
  - (iii) Fei and Ranis took the example of ..... dualistic economy in the 19<sup>th</sup> century.
 

(a) Britain's	(b) America's	(c) Japan's	(d) India's
---------------	---------------	-------------	-------------
  - (iv) ....., which is a measure of the relative availability of the two factors of production.
 

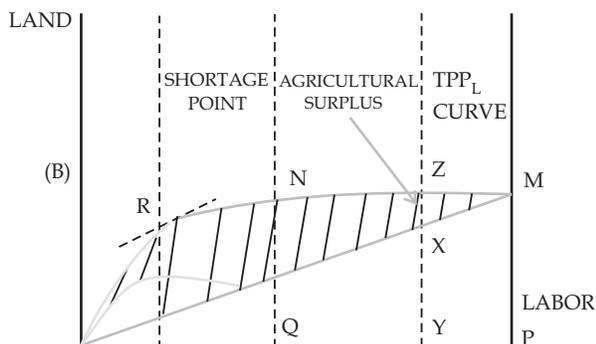
(a) endowment ratio	(b) Labor Utilization ratio
(c) Non-redundancy coefficient	(d) shortage point

### 19.4 Agricultural Surplus

*Agricultural surplus* in general terms can be understood as the produce from agriculture which exceeds the needs of the society for which it is being produced, and may be exported or stored for future use.

### Generation of agricultural surplus

Notes

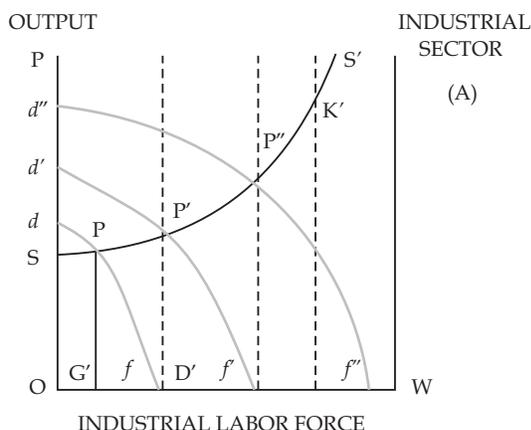


### Agricultural surplus in the dual economy of Fei and Ranis

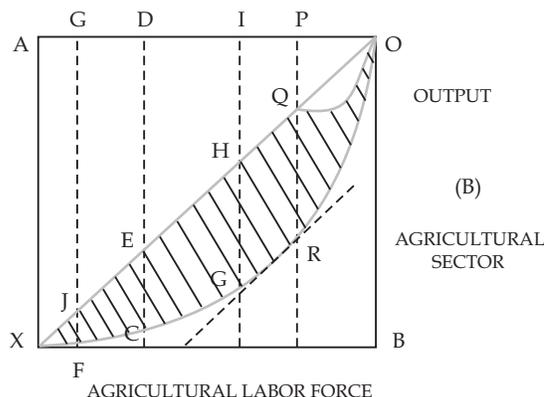
To understand the formation of agricultural surplus, we must refer to graph (B) of the agricultural sector. The figure on the left is a reproduced version of a section of the previous graph, with certain additions to better explain the concept of agricultural surplus. We first derive the average physical productivity of the total agricultural labor force  $APP_L$ . Fei and Ranis hypothesize that it is equal to the *real wage* and this hypothesis is known as the constant institutional wage hypothesis. It is also equal in value to the ratio of total agricultural output to the total agricultural population. Using this relation, we can obtain  $APP_L = MP/OP$ . This is graphically equal to the slope of line OM, and is represented by the line WW in (C).

Observe point Y, somewhere to the left of P on the graph. If a section of the redundant agricultural labor force (PQ) is removed from the total agricultural labor force (OP) and absorbed into the industrial sector, then the labor force remaining in the industrial sector is represented by the point Y. Now, the output produced by the remaining labor force is represented by YZ and the *real income* of this labor force is given by XY. The difference of the two terms yields the total agricultural surplus of the economy. It is important to understand that this surplus is produced by the reallocation of labor such that it is absorbed by the industrial sector. This can be seen as deployment of hidden rural savings for the expansion of the industrial sector. Hence, we can understand the contribution of the agricultural sector to the expansion of industrial sector by this allocation of redundant labor force and the agricultural surplus that results from it.

### Agricultural surplus as wage fund



Notes



Integration of agricultural and industrial sectors to explain use of agricultural surplus as wage fund in a dual economy. Agricultural surplus plays a major role as a wage fund. Its importance can be better explained with the help of the graph on the right, which is an integration of the industrial sector graph with an inverted agricultural sector graph, such that the origin of the agricultural sector falls on the upper-right corner. This inversion of the origin changes the way the graph is now perceived. While the labor force values are read from the left of 0, the output values are read vertically downwards from O. The sole reason for this inversion is for the sake of convenience. The point of commercialization as explained before (See Section on *Basics of the model*) is observed at point R, where the tangent to the line ORX runs parallel to OX.

Before a section of the redundant labor force is absorbed into the industrial sector, the entire labor OA is present in the agricultural sector. Once AG amount of labor force (say) is absorbed, it represented by OG' in the industrial sector, and the labor remaining in the agricultural sector is then OG. But how is the quantity of labor absorbed into the industrial sector determined? (A) shows the supply curve of labor SS' and several demand curves for labor  $df$ ,  $d'f$  and  $d''f$ . When the demand for labor is  $df$ , the intersection of the demand-supply curves gives the equilibrium employment point G. Hence OG represents the amount of labor absorbed into the industrial sector. In that case, the labor remaining in the agricultural sector is OG. This OG amount of labor produces an output of GF, out of which GJ amount of labor is consumed by the agricultural sector and JF is the agricultural surplus for that level of employment. Simultaneously, the unproductive labor force from the agricultural sector turns productive once it is absorbed by the industrial sector, and produces an output of OG'Pd as shown in the graph, earning a total wage income of OG'PS.

The agricultural surplus JF created is needed for consumption by the same workers who left for the industrial sector. Hence, agriculture successfully provides not only the manpower for production activities elsewhere, but also the wage fund required for the process.

### 19.5 Significance of Agriculture in the Fei-Ranis Model

The Lewis model is criticised on the grounds that it neglects agriculture. Fei-Ranis model goes a step beyond and states that agriculture has a very major role to play in the expansion of the industrial sector. In fact, it says that the rate of growth of the industrial sector depends on the amount of total agricultural surplus and on the amount of profits that are earned in the industrial sector. So, larger the amount of *surplus* and the amount of *surplus* put into productive investment and larger the amount of industrial profits earned, the larger will be the rate of growth of the industrial economy. As the model focuses on the shifting of the focal point of progress from the agricultural to the industrial

sector, Fei and Ranis believe that the ideal shifting takes place when the investment funds from surplus and industrial profits are sufficiently large so as to purchase industrial capital goods like plants and machinery. These capital goods are needed for the creation of employment opportunities. Hence, the condition put by Fei and Ranis for a successful transformation is that Rate of increase of capital stock & rate of employment opportunities > Rate of population growth.

### Self-Assessment

2. State whether the following statements are 'true' or 'false'.
  - (i) Due to the redundant agricultural labor force, the real wages remain constant.
  - (ii) Total industrial activity rises due to decrease in the total supply of investment funds, leading to increased industrial employment.
  - (iii) Surplus is produced by the reallocation of labor such that it is absorbed by the industrial sector.
  - (iv) Agricultural surplus does not play a major role as a wage fund.
  - (v) The capital good are needed for the creation of employment opportunities.

## 19.6 The Indispensability of Labor Reallocation

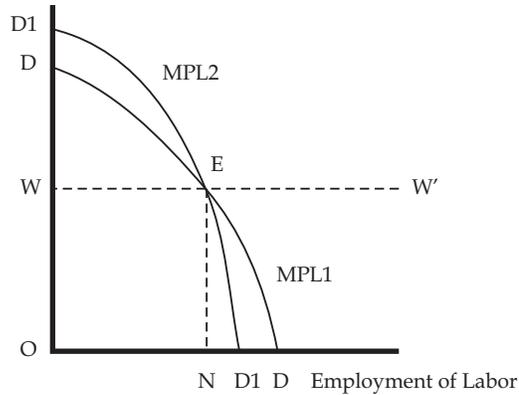
As an under-developed country goes through its development process, labor is reallocated from the agricultural to the industrial sector. More the rate of reallocation, faster is the growth of that economy. The economic rationale behind this idea of labor reallocation is that of faster economic development. The essence of labor reallocation lies in *Engel's Law*, which states that the proportion of income being spent on food decreases with increase in the income-level of an individual, even if there is a rise in the actual expenditure on food. For example, if 90 per cent of the entire population of the concerned economy is involved in agriculture, that leaves just 10 per cent of the population in the industrial sector. As the productivity of agriculture increases, it becomes possible for just 35 per cent of population to maintain a satisfactory food supply for the rest of the population. As a result, the industrial sector now has 65 per cent of the population under it. This is extremely desirable for the economy, as the growth of industrial goods is subject to the rate of per capita income, while the growth of agricultural goods is subject only to the rate of population growth, and so a bigger labor supply to the industrial sector would be welcome under the given conditions. In fact, this labor reallocation becomes necessary with time since consumers begin to want more of industrial goods than agricultural goods in relative terms.

However, Fei and Ranis were quick to mention that the necessity of labor reallocation must be linked more to the need to produce more capital investment goods as opposed to the thought of industrial consumer goods following the discourse of *Engel's Law*. This is because the assumption that the demand for industrial goods is high seems unrealistic, since the *real wage* in the agricultural sector is extremely low and that hinders the demand for industrial goods. In addition to that, low and mostly constant wage rates will render the wage rates in the industrial sector low and constant. This implies that demand for industrial goods will not rise at a rate as suggested by the use of *Engel's Law*.

The growth process will observe a slow-paced increase in the consumer purchasing power, the dualistic economies follow the path of **natural austerity**, which is characterized by more demand and hence importance of capital good industries as compared to consumer good ones. However, investment in capital goods comes with a long gestation period, which drives the private entrepreneurs away. This suggests that in order to enable growth, the government must step in and play a major role, especially in the initial few stages of growth. Additionally, the government also works on the social and economic overheads by the construction of roads, railways, bridges, educational institutions, health care facilities and so on.

**19.7 Growth without development**

Real wage and MPL



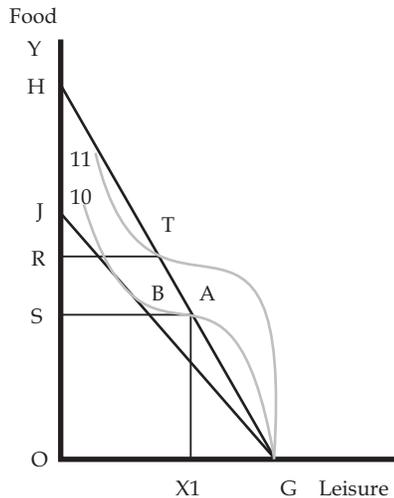
Graph showing growth without development

In the Fei-Ranis model, it is possible that as technological process takes place and there is a shift to labor-saving production techniques, growth of the economy takes place with increase in profits but no economic development takes place. This can be explained well with the help of graph in this section.

The graph displays two MPL lines plotted with real wage and MPL on the vertical axis and employment of labor on the horizontal axis. OW denotes the subsistence wage level, which is the minimum wage level at which a worker (and his family) would survive. The line WW' running parallel to the X-axis is considered to be infinitely elastic since supply of labor is assumed to be unlimited at the subsistence-wage level. The square area OWEN represents the wage bill and DWE represents the surplus or the profits collected. This surplus or profit can increase if the MPL curve changes.

If the MPL curve changes from  $MPL_1$  to  $MPL_2$  due to a change in production technique, such that it becomes labor-saving or *capital-intensive*. then the *surplus* or profit collected would increase. This increase can be seen by comparing  $D_1WE$  with  $DWE$  since  $D_1WE$  is greater in area compared to  $DWE$ . However, there is no new point of equilibrium and as E continues to be the point of equilibrium, there is no increase in the level of labor employment, or in wages for that matter. Hence, labor employment continues as ON and wages as OW. The only change that accompanies the change in production technique is the one in *surplus* or profits. This makes for a good example of a process of growth without development, since growth takes place with increase in profits but development is at a standstill since employment and wages of laborers remain the same.

Reactions to the model



## Food-Leisure Graph

Notes

**Fei-Ranis model of economic growth** has been criticized on **multiple** grounds, although if the model is accepted, then it will have a significant theoretical and policy implications on the under-developed countries' efforts towards development and on the persisting controversial statements regarding the balanced *vs.* unbalanced growth debate.

- It has been asserted that Fei and Ranis did not have a clear understanding of the sluggish economic situation prevailing in the developing countries. If they had thoroughly scrutinized the existing nature and causes of it, they would have found that the existing agricultural backwardness was due to the institutional structure, primarily the system of *feudalism* that prevailed.
- Fei and Ranis say, "It has been argued that. There are reasons to believe that the relationship between money and *physical capital* could be complementary to one another at some stage of economic development, to the extent that credit policies could play an important part in easing bottlenecks on the growth of agriculture and industry." This indicates that in the process of development they neglect the role of money and prices. They fail to differ between wage labor and household labor, which is a significant distinction for evaluating prices of dualistic development in an under-developed economy.
- Fei and Ranis assume that  $MPP_L$  is zero during the early phases of economic development, which has been criticized by Harry T. Oshima and some others on the grounds that  $MPP_L$  of labor is zero only if the agricultural population is very large, and if it is very large, some of that labor will shift to cities in search of jobs. In the short run, this section of labor that has shifted to the cities remains unemployed, but over the long run it is either absorbed by the informal sector, or it returns to the villages and attempts to bring more marginal land into cultivation. They have also neglected seasonal unemployment, which occurs due to seasonal change in labor demand and is not permanent.

To understand this better, we refer to the graph in this section, which shows Food on the vertical axis and Leisure on the horizontal axis. OS represents the subsistence level of food consumption, or the minimum level of food consumed by agricultural labor that is necessary for their survival.  $I_0$  and  $I_1$  between the two commodities of food and leisure (of the agriculturists). The origin falls on G, such that OG represents maximum labor and labor input would be measured from the right to the left. The *transformation curve* SAG falls from A, which indicates that more leisure is being used to same units of land. At A, the marginal transformation between food and leisure and  $MPL = 0$  and the indifference curve  $I_0$  is also tangent to the *transformation curve* at this point. This is the point of leisure satiation.

Consider a case where a laborer shifts from the agricultural to the industrial sector. In that case, the land left behind would be divided between the remaining laborers and as a result, the *transformation curve* would shift from SAG to RTG. Like at point A,  $MPL$  at point T would be 0 and  $APL$  would continue to be the same as that at A (assuming constant returns to scale). If we consider  $MPL = 0$  as the point where agriculturalists live on the subsistence level, then the curve RTG must be flat at point T in order to maintain the same level of output. However, that would imply leisure satiation or leisure as an *inferior good*, which are two extreme cases. It can be surmised then that under normal cases, the output would decline with shift of labor to industrial sector, although the per capita output would remain the same. This is because, a fall in the per capita output would mean fall in consumption in a way that it would be lesser than the subsistence level, and the level of labor input per head would either rise or fall.

Berry and Soligo in their 1968 paper have criticized this model for its  $MPL=0$  assumption, and for the assumption that the transfer of labor from the agricultural sector leaves the output in that sector unchanged in Phase 1. They show that the output changes, and may fall under various *land tenure* systems, unless the following situations arise:

1. Leisure falls under the *inferior good* category
2. Leisure satiation is present.
3. There is perfect substitutability between food and leisure, and the *marginal rate of substitution* is constant for all real income levels.

Notes

Now if  $MPL > 0$  then leisure satiation option becomes invalid, and if  $MPL=0$  then the option of food and leisure as perfect substitutes becomes invalid. Therefore, the only remaining viable option is leisure as an *inferior good*.

- While mentioning the important role of high agricultural productivity and the creation of *surplus* for economic development, they have failed to mention the need for capital as well. Although it is important to create *surplus*, it is equally important to maintain it through technical progress, which is possible through *capital accumulation*, but the Fei-Ranis model considers only labor and output as *factors of production*.
- The question of whether  $MPL = 0$  is that of an empirical one. The underdeveloped countries mostly exhibit seasonality in food production, which suggests that especially during favorable climatic conditions, say that of harvesting or sowing,  $MPL$  would definitely be greater than zero.
- Fei and Ranis assume a close model and hence there is no presence of foreign trade in the economy, which is very unrealistic as food or raw materials can not be imported. If we take the example of Japan again, the country imported cheap farm products from other countries and this made better the country's terms of traded. Later they relaxed the assumption and said that the presence of a foreign sector was allowed as long as it was a "facilitator" and not the main driving forced
- The reluctant expansionary growth in the industrial sector of under-developed countries can be attributed to the lagging growth in the productivity of subsistence agriculture. This suggests that increase in *surplus* becomes more important a determinant as compared to re-investment of *surplus*, an idea that was utilized by Jorgenson in his 1961 model that centered around the necessity of *surplus* generation and *surplus* persistence.
- *Stagnation* has not been taken into consideration, and no distinction is made between labor through family and labor through wages. There is also no explanation of the process of self-sustained growth, or of the investment function. There is complete negligence of terms of trade between agriculture and industry, foreign exchange, money and price.



Notes Money is not a simple substitute for *physical capital* in an aggregate *production function*.

**Self-Assessment**

1. Fill in the blanks:
  - (i) As the ..... of agriculture increases, it becomes possible for just 35 percent of population to maintain a satisfactory food supply for the rest of the population.
  - (ii) Money is not a simple substitute for ..... in an aggregate production function
  - (iii) ..... assume a close model and hence there is no presence of foreign trade in the economy.

**19.8 Summary**

- **The Fei-Ranis model of economic growth** is a dualism model in *development economics* or *welfare economics* that has been developed by *John C.H Fei* and *Gustav Ranis* and can be understood as an extension of the *Lewis model*.
- Fei and Ranis emphasized strongly on the industry-agriculture interdependency and said that a robust connectivity between the two would encourage and speedup development. If agricultural laborers look for industrial employment, and industrialists employ more workers

by use of larger capital good stock and labor-intensive technology, this connectivity can work between the industrial and agricultural sector.

- Like in the agricultural sector, Fei and Ranis assume constant returns to scale in the industrial sector. However, the main factors of production are capital and labor.
- *Agricultural surplus* in general terms can be understood as the produce from agriculture which exceeds the needs of the society for which it is being produced, and may be exported or stored for future use.
- The Lewis model is criticised on the grounds that it neglects agriculture. Fei-Ranis model goes a step beyond and states that agriculture has a very major role to play in the expansion of the industrial sector. In fact, it says that the rate of growth of the industrial sector depends on the amount of total agricultural surplus and on the amount of profits that are earned in the industrial sector.
- As an under-developed country goes through its development process, labor is reallocated from the agricultural to the industrial sector. More the rate of reallocation, faster is the growth of that economy. The economic rationale behind this idea of labor reallocation is that of faster economic development.
- In the Fei-Ranis model, it is possible that as technological process takes place and there is a shift to labor-saving production techniques, growth of the economy takes place with increase in profits but no economic development takes place.

### 19.9 Key-Words

- Commercialization : Grown, Developed
- Connectivity : The process of connecting things
- Redundant : not needed or useful

### 19.10 Review Questions

1. Explain the Fei-Ranis model of economic growth.
2. What do you mean by connectivity between sector explain it.
3. Describe the capital labour production function.
4. Discuss and explain the significance of agriculture in the Fei-Ranis model and agriculture surplus.
5. What do you mean by growth without development Explain with the help of graph.

### Answers: Self-Assessment

1. (i) (b) (ii) (a) (iii) (c) (iv) (a)
2. (i) T (ii) F (iii) T (iv) F  
(v) T
3. (i) Productivity (ii) Physical capital (iii) Fei and Ranis

### 19.11 Further Readings



Books

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 20: Big Push Theory of Growth

### CONTENTS

Objectives

Introduction

20.1 Rodhan's Theory of Big Push

20.2 The Three Indivisibilities

20.3 Indivisibilities and external economies

20.4 Role of the state

20.5 Summary

20.6 Key-Words

20.7 Review Questions

20.8 Further Readings

### Objectives

After reading this unit students will be able to:

- Know about Rodhan's theory of Big Push.
- Describe about the three indivisibilities.
- Learn about the indivisibilities and external economies.
- Explain the role of the state

### Introduction

The **big Push model** is a concept in *development economics* or *welfare economics* that emphasizes the fact that a firm's decision whether to industrialize or not depends on its expectation of what other firms will do. It assumes *economies of scale* and *oligopolistic* market structure and explains when industrialization would happen.

### 20.1 Rodhan's Theory of Big Push

The originator of this theory was *Paul Rosenstein-Rodhan* in 1943. Further contributions were made later on by *Murphy*, *Shleifer* and *Robert W. Vishny* in 1989. Analysis of this economic model usually involves using *game theory*.

The theory of the model emphasizes that underdeveloped countries require large amounts of *investments* to embark on the path of *economic development* from their present state of backwardness. This theory proposes that a 'bit by bit' investment programme will not impact the process of *growth* as much as is required for developing countries. In fact, injections of small quantities of investments will merely lead to a wastage of *resources*. *Paul Rosenstein-Rodhan*, approvingly quotes a *Massachusetts Institute of Technology* study in this regard, "There is a minimum level of *resources* that must be devoted to... a *development* programme if it is to have any chance of success. Launching a country into self-sustaining growth is a little like getting an *airplane* off the ground. There is a critical *ground speed* which must be passed before the craft can become airborne..."

*Rosenstein-Rodan* argued that the entire industry which is intended to be created should be treated and planned as a massive entity (a *firm* or *trust*). He supports this argument by stating that the social

*marginal product* of an *investment* is always different from its private *marginal product*, so when a group of *industries* are planned together according to their social marginal products, the *rate of growth* of the economy is greater than it would have otherwise been.

Notes

## 20.2 The Three Indivisibilities

According to Rosenstein-Rodan, there exist three indivisibilities in *underdeveloped countries*. These indivisibilities are responsible for *external economies* and thus justify the need for a big push. The externalities are as follows:

1. Indivisibility in *production function*
2. Indivisibility of *demand*
3. Indivisibility in the supply of *savings*

### 20.2.1 Indivisibility in production function

Indivisibilities in the *production function* may be with respect to any of the following:

- *Inputs*
- *Processes*
- *Outputs*

These lead to increasing returns (i.e., *economies of scale*), and may require a high optimum size of a firm. This can be achieved even in developing countries since at least one optimum scale firm can be established in many industries. But investment in social overhead *capital* comprises investment in all basic industries (like *power*, transport or communications) which must necessarily come before directly productive investment activities. Investment in social overhead *capital* is 'lumpy' in nature. Such capital requirements cannot be imported from other nations. Therefore, heavy initial investment necessarily needs to be made in social overhead *capital* (this is approximated to be about 30 to 40 percent of the total investment undertaken by *underdeveloped countries*). Social overhead capital is further characterized by four indivisibilities:

1. *Irreversibility* in time : It must precede other directly productive investments
2. *Minimum durability of equipment* : Any lesser level of *durability* is either impossible due to technical reasons or much less *efficient*
3. *Long gestation periods* : The investment in social overhead *capital* takes time to generate returns and its impact in the economy is not immediately or directly visible



Notes

Investment needs to be of a certain minimum magnitude and spread across a mix of industries, without which it will not significantly impact the process of growth.

### 20.2.2 Indivisibility (or complementarity) of Demand

Developing countries are characterized by low per-capita income and purchasing power. Markets in these countries are therefore small. In a *closed economy*, modernization and increased efficiency in a single industry has no impact on the economy as a whole since the output of that industry will fail to find a market. A large number of industries need to be set up simultaneously so that people employed in one industry consume the output of other industries and thus create *complementary* demand.

To illustrate this, Rosenstein Rodan gives the example of a shoe industry. If a country makes large *investments* in the shoe industry, all the disguisedly employed labour from the other industries find work and a source of income, leading to a rise in production of shoes and their own incomes. This increased income will not be expended only on buying shoes. It is conceivable that the increased

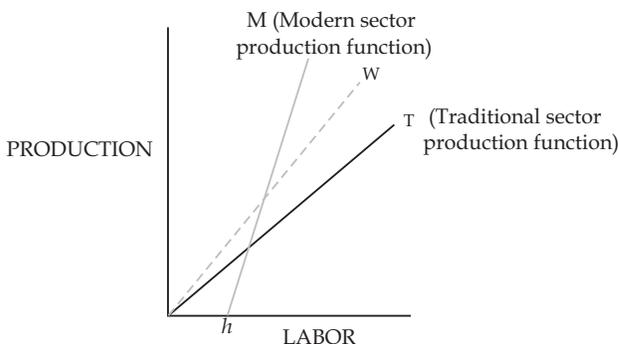
Notes

incomes will lead to increased spending on other products too. However, there is no corresponding supply of these products to satisfy this increased demand for the other goods. Following the basic *market forces* of demand and supply, the prices of these commodities will rise. To avoid such a situation, *investment* must be spread out amongst different industries.

The situation may be different in an *open economy* as the output of the new industry may replace former imports or possibly find its market by way of *exports*. But even if the world market acts as a *substitute* for domestic demand, a big push is still needed (though its required size may now be reduced due to the presence of international trade).

**20.2.3 Indivisibility in the supply of savings**

We cannot always rely on foreign aid as the huge levels of investments in the different *sectors* need to be made not only once, but multiple number of times. Hence domestic savings are a must. But in an underdeveloped economy, this is a challenge due to the low income levels. *Marginal rate of savings* needs to be increased following the rise in incomes due to higher investment.



**Figure: 1**

Consider a country whose economy is characterized by a large number of *sectors* which are so small that any increase in the productivity of one sector has no impact on the economy as a whole. Each sector can either rely on traditional methods or switch to modern methods of production which would increase its efficiency. Let us assume that there are  $l$  workers in the economy and  $n$  sectors. Each sector therefore has  $l/n$  workers.

Using *traditional technology*, a sector would produce  $l/n$  amount of output, with each worker producing one unit of the commodity. Using *modern technology* a sector would produce more as the productivity would be greater than one unit per worker. However, a modern sector would require some of the workers (say  $h$ ) to perform administrative tasks.

In figure 1, the x-axis represents the labor employed and the y-axis represents the level of production. The production in the traditional *sector* is given by the curve T and the production in the modern sector is given by M. The curve M has a positive intercept on the x-axis, implying that even with zero production, there is a minimum level of  $h$  workers who still remain employed for carrying out administrative activities. With our assumption of  $l/n$  workers in the economy, the modern sector will have a higher level of productivity than the traditional sector. The production function of the modern sector is steeper than that of the traditional sector because of the higher productivity of workers in the former. The slope of both production functions is  $l/m$ , where  $m$  is the marginal labor required to produce an additional unit of output. This level of  $m$  is lower for the modern sector than it is for the traditional sector.

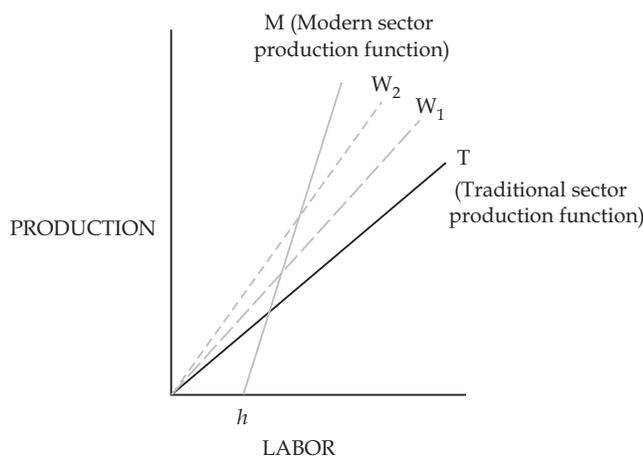


Figure: 2

Assume that the traditional sector pays workers one unit of output which is subsequently spent equally by them in all sectors. The modern sector pays higher wages to workers. If all the workers are employed by the traditional sector, then the demand generated for the output of each sector is  $D_1 = 1/n$ . We have two possible cases:

- *Wages are low* – When low wages are prevalent in the economy, say  $w_1$ , a firm which faces demand  $D_1$  will need to employ  $l^*$  workers if it wants to modernize. This will cost the firm  $w_1 l^*$ . Now, wages are low. Therefore

$$w_1 l^* < D_1$$

This implies that costs (given by  $w_1 l^*$ ) are lower than the earnings (given by  $D_1$ ).

So the firm makes a profit and will choose to modernize (even if other firms do not).

- *Wages are high* – When high wages are prevalent in the economy, say  $w_2$ , a firm which faces demand  $D_1$  will make losses if no other firms choose to modernize.

This is because

$$w_2 l^* > D_1$$

This implies that costs (given by  $w_2 l^*$ ) are higher than the earnings (given by  $D_1$ ).

However, if all the other firms have modernized, the firm faces a higher demand,  $D_2$  arising out of higher income levels of workers of these modernized firms. The firm will hence choose to modernize as well so that it makes profits:

$$w_2 l^* < D_2.$$



Did u know? High levels of investment require a corresponding high level of savings.

### Self-Assessment

1. Fill in the blanks:

- The big Push model is a concept in .....
- Developing countries are characterized by ..... and purchasing power.
- High level of investment require a corresponding .....
- The investment in social over head ..... takes time to generate returns and its impact in the economy is nto immediately or directly visible.

## **20.3 Indivisibilities and External Economies**

The concept of *externalities* is relevant for the Industrialization of *underdeveloped countries*, where decisions are to be made regarding distribution of savings among alternative *investment opportunities*. These arise from the interdependence in market economies. *Pecuniary economies* are *external economies* transmitted through the *price system*, as prices are the *signalling device* (under conditions of *perfect competition* in a market economy). They arise in an industry (say industry X) due to internal economies of overcoming technical indivisibilities. This reduces the price of its product, which will benefit another industry (say industry Y) which use this output as an input or a factor of production. Subsequently, the profits of industry Y will rise, leading to its expansion and generating demand for the output of industry X. As a result, industry X's production and profits also expand.

However in *underdeveloped countries*, conditions of *perfect competition* are not present due to the *decentralized* and *differentiated* nature of the market. Prices fail to act as a *signalling system* in the following ways:

- Prices express the situation as it is and do not predict future economic situations
- Prices can decide present productive activities but cannot determine investments which would be appropriate for developing countries
- The response of the private sector to price signals is inadequate and imperfect due to the differentiation and decentralisation in developing countries

This justifies the need for centralized pan-industry planning of investment in Developing countries, as the private sector cannot undertake such planning.

**Enlargement of the market size** is another important externality which arises from the complementarity of industries. There exists an incentive to expand the scale of operations because the employees of one industry become the customers of another industry. In terms of products too (as in the above example of industries X and Y), one industry generates demand for the output of the other when the scale of operations increase.

**Marshallian economies** also accrue to a firm within a growing industry, resulting from *agglomeration* of industrial districts or clusters in a particular area. These occur due to the following advantages of agglomeration identified by *Alfred Marshall*:

1. Spillover of information
2. Specialization and division of labor
3. Development of a market for skilled labor.

**Availability of skilled labour** is an externality which arises when *industrialization* occurs, as workers acquire better training and skills. This is not achievable by mere establishment of a few industries, but requires a large program of industrial growth. It is one of the most important external economies because absence of skilled labor is a strong impediment to *industrialization*.

## **20.4 Role of the State**

The large-scale programme of industrialization advocated by this model requires huge investments which are beyond the means of the private sector. The investment in infrastructure and basic industries (like power, transport and communications) is 'lumpy' and has long gestation periods. The role of the state in this theory is therefore critical for investment in social overhead *capital*. Even if the private sector had the requisite resources to invest in such a programme, it would not do so since it is driven by profit motives. Many investments are profitable in terms of social marginal net product but not in terms of private marginal net product. Due to this there is no incentive for individual entrepreneurs to invest and take advantage of external economies.

## Criticisms

## Notes

The theory has been criticized by *Hla Myint* and *Celso Furtado*, among others, primarily on the grounds of the massive effort required to be taken by *underdeveloped countries* to move along the path of *industrialization*. Some of the major criticisms are as follows:

- *Difficulties in execution and implementation* : The execution of related projects during the course of *industrialization* may involve unexpected or unavoidable changes due to revisions of plans, delays and deviations from the planned process. *Hla Myint* notes that the various departments and agencies involved in the process of development need to coordinate closely and evaluate and revise plans continuously. This is a challenging task for the governments of developing countries.
- *Lack of absorptive capacity* : The implementation of industrialization programmes may be constrained by ineffective disbursement, short-term bottlenecks, *macroeconomic* problems and volatility, loss of competitiveness and weakening of institutions. *Credit* is often utilized at low rates or after long time lags. There is often a loss of competitiveness due to the *Dutch disease* effect.
- *Historical inaccuracy* : When viewed in light of historical experience of countries over the last two centuries, no country displayed any evidence of development due to massive *industrialization* programmes. *Stationary economies* do not develop simply by making large-scale investment in social overhead *capital*.
- *Problems in mixed economies* : In a *mixed economy*, where the *private* and *public sectors* co-exist, the environment for growth may not be a conducive one. Unless there is a *complementarity* between the sectors, there is bound to arise competition between them, with the *government departments* keeping their plans confidential out of fear of *speculative activities* by the *private sector*. The private sector's activities are simultaneously inhibited due to *lack of information* of government policies and the general economic situation.
- *Neglect of methods of production* : Rather than *capital formation*, it is productive techniques which determine the success of a country in *economic development*. The big push model ignores productive techniques in its support for *capital formation* and *industrialisation*.
- *Shortage of resources in underdeveloped countries* : Eugenio Gudín criticizes the theory of the big push on the grounds that *underdeveloped countries* lack the *capital* required to provide the big push required for rapid *development*. If an underdeveloped nation had ample *capital* supply and scarce *factors*, it would not be classified as *underdeveloped* at all. Limited *resource* availability is the first impediment to such countries. Though this problem may be overcome by foreign aids, *industrialization* may not take off as expected if the aid flows are volatile.
- *Ignores the agricultural sector* : With its heavy emphasis on *industry*, the model finds no place for *agriculture*. This is a gaping flaw in the theory, as in most *underdeveloped countries* it is this sector which is large and has labor *surplus*.

Investments in agriculture need to go hand-in-hand with those in industry so as to *stimulate* the industrial sector by providing a market for industrial goods. If neglected, it would be difficult to meet the food requirements of the nation in the *short run* and to significantly expand the *size of the market* in the *long run*.

- *Inflationary pressures* : It follows from the neglect of the agricultural sector that *food shortages* are likely to occur with *industrialization*. Though it would take time for investments in social overhead *capital* to yield returns, the *demand* would increase immediately, thus imposing *inflationary pressures* on the economy. Cost escalations may even cause projects to be postponed and the *development process* in general to slow down.
- *Dependence on indivisibilities* : The emphasis of this theory on indivisibility of processes is too much, as *investments* need not necessarily be on such a large scale to be economic. *Social reforms*

Notes

are ignored, which are vital if a country is to grow on the basis of its own *resources* and initiatives. *Development* is bound to intensify if social reform is a part of the *industrialization* process.



Task

What do you mean by criticism? Also write some major criticisms.

### Self-Assessment

2. State whether the following statements are 'true' or 'false'.
  - (i) Enlargement of the market size is another important externality which arises from the complementarity of industries.
  - (ii) Recursivity economies are external economics transmitted through the price system, as prices are the signalling device.
  - (iii) The investment in infrastructure and basic industries is not lumpy and has short gestation periods.
  - (iv) Inflationary pressures doesn't follow from the neglect of the agricultural sector that food shortages are likely to occur with industrialization.

### 20.5 Summary

- The theory of the model emphasizes that underdeveloped countries require large amounts of *investments* to embark on the path of *economic development* from their present state of backwardness.
- *Rosenstein-Rodan* argued that the entire industry which is intended to be created should be treated and planned as a massive entity
- **Marshallian economies** also accrue to a firm within a growing industry, resulting from *agglomeration* of industrial districts or clusters in a particular area.
- **Availability of skilled labour** is an externality which arises when *industrialization* occurs, as workers acquire better training and skills.
- Many investments are profitable in terms of social marginal net product but not in terms of private marginal net product.
- The theory has been criticized by *Hla Myint* and *Celso Furtado*.

### 20.6 Key-Words

- optimum : the best possible, producing the best possible results.
- efficient : doing something well and thoroughly with no waste of time, money, or energy.
- disguise : to change your appearance so that people cannot recognize you.
- pecuniary : relating to or connected with money
- impediment : something that delays or stops the progress of something.

### 20.7 Review Questions

1. Write a short note on Rodhan's theory of Big Push.
2. Characterize the social overhead capital by food indivisibilities.
3. Briefly explain the indivisibility in the supply of saving.
4. According to Rosenstein-Rodhan what are the three indivisibilities in underdeveloped countries.

### Answers: Self-Assessment

Notes

1. (i) welfare economics (ii) percapita income  
(iii) high level of saving (iv) capital
2. (i) T (ii) T (iii) F (iv) F

### 20.8 Further Readings



*Books*

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 21: Balanced Growth and Unbalanced Growth

### CONTENTS

Objectives

Introduction

21.1 Balanced Growth

21.2 Ragnar Nurkse's balanced Growth Theory

21.3 Unbalanced Growth

21.4 Balanced Vs. Unbalanced Growth

21.5 Summary

21.6 Keywords

21.7 Review Questions

21.8 Further Readings

### Objectives

After reading this unit students will be able to:

- Know about the balanced growth and unbalanced growth.
- Describe about the balanced and unbalanced growth.
- Explain the balanced and unbalanced growth theory.

### Introduction

A mechanism of endogenous growth suitable for investigation of sectoral or regional interaction is developed. It is shown how the high value placed on production linkages by economic historians might be reconciled with the high value placed on openness (often implying lack of linkages) by observers of contemporary less developed countries. When the output of one sector is traded and the output of the other is non-traded, it is shown how the traded goods sector acts as the 'engine of growth' in the sense that its profitability of knowledge acquisition primarily determines the steady state aggregate growth rate. It is also shown how sectors or regions interact out of steady state through product, labor, and capital markets, and in particular how if the former interaction dominates the growth of one sector 'pulls along' the growth of the other while if the latter two interactions dominate one sector or region booms while the other declines. The unit builds on these results to show why liberalization of foreign trade should lead to a transition from a lower to a higher steady state growth rate and why, during the course of this transition, growth might initially be even slower than before liberalization.

In macroeconomics, balanced-growth equilibrium means that the capital intensity of an economy, its capital stock divided by total output, remains constant. In the standard exogenous growth model, balanced growth is a basic assumption, while other variables like the capital stock, real GDP, and output per worker are growing. Developing economies may adopt a strategy of unbalanced growth to rectify previous investment decisions, as put forward by economist Albert O. Hirschman.

## 21.1 Balanced Growth

Notes

Balanced growth has at least two different meanings in economics. In macroeconomics, balanced growth occurs when output and the capital stock grow at the same rate. This growth path can rationalize the long-run stability of real interest rates, but its existence requires strong assumptions. In development economics, balanced growth refers to the simultaneous, coordinated expansion of several sectors. The usual arguments for this development strategy rely on scale economies, so that the productivity and profitability of individual firms may depend on market size. In macroeconomics, balanced growth is usually associated with constant returns to scale. For most development economists, the term is more strongly associated with increasing returns, and a debate that began with Rosenstein-Rodan (1943). He argued that the post-war industrialization of Eastern and South-Eastern Europe would require coordinated investments across several industries. The idea is that expansion of different sectors is complementary, because an increase in the output of one sector increases the size of the market for others. A sector that expands on its own may make a loss, but if many sectors expand at once, they can each make a profit. This tends to imply the need for coordinated expansion, or a "Big Push", and potentially justifies a role for state intervention or development planning.

## 21.2 Ragnar Nurkse's balanced growth theory

The balanced growth theory is an economic theory pioneered by the economist Ragnar Nurkse (1907-1959). The theory hypothesises that the government of any underdeveloped country needs to make large investments in a number of industries simultaneously. This will enlarge the market size, increase productivity, and provide an incentive for the private sector to invest.

Nurkse was in favour of attaining balanced growth in both the industrial and agricultural sectors of the economy. He recognised that the expansion and inter-sectoral balance between agriculture and manufacturing is necessary so that each of these sectors provides a market for the products of the other and in turn, supplies the necessary raw materials for the development and growth of the other.

Nurkse and Paul Rosenstein-Rodan were the pioneers of balanced growth theory and much of how it is understood today dates back to their work.

Nurkse's theory discusses how the poor size of the market in underdeveloped countries perpetuates its underdeveloped state. Nurkse has also clarified the various determinants of the market size and puts primary focus on productivity. According to him, if the productivity levels rise in a less developed country, its market size will expand and thus it can eventually become a developed economy. Apart from this, Nurkse has been nicknamed an export pessimist, as he feels that the finances to make investments in underdeveloped countries must arise from their own domestic territory. No importance should be given to promoting exports

### Size of market and inducement to invest

The size of a market assumes primary importance in the study of what induces investment in a country. Ragnar Nurkse referenced the work of Allyn A. Young to assert that inducement to invest is limited by the size of the market. The original idea behind this was put forward by Adam Smith, who stated that division of labour (as against inducement to invest) is limited by the extent of the market.

According to Nurkse, underdeveloped countries lack adequate purchasing power. Low purchasing power means that the real income of the people is low, although in monetary terms it may be high. If the money income were low, the problem could easily be overcome by expanding the money supply; however, since the meaning in this context is real income, expanding the supply of money will only generate inflationary pressure. Neither real output nor real investment will rise. It is to be noted that

**Notes**

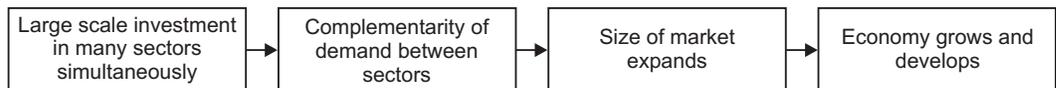
a low purchasing power means that domestic demand for commodities is low. Apart from encompassing consumer goods and services, this includes the demand for capital as well.

The size of the market determines the incentive to invest irrespective of the nature of the economy. This is because entrepreneurs invariably take their production decisions by taking into consideration the demand for the concerned product. For example, if an automobile manufacturer is trying to decide which countries to set up plants in, he will naturally only invest in those countries where the demand is high. He would prefer to invest in a developed country, where though the population is lesser than in underdeveloped countries, the people are prosperous and there is a definite demand.

Private entrepreneurs sometimes resort to heavy advertising as a means of attracting buyers for their products. Although this may lead to a rise in demand for that entrepreneur's good or service, it does not actually raise the aggregate demand in the economy. The demand merely shifts from one provider to another. Clearly, this is not a long-term solution.

Ragnar Nurkse concluded,

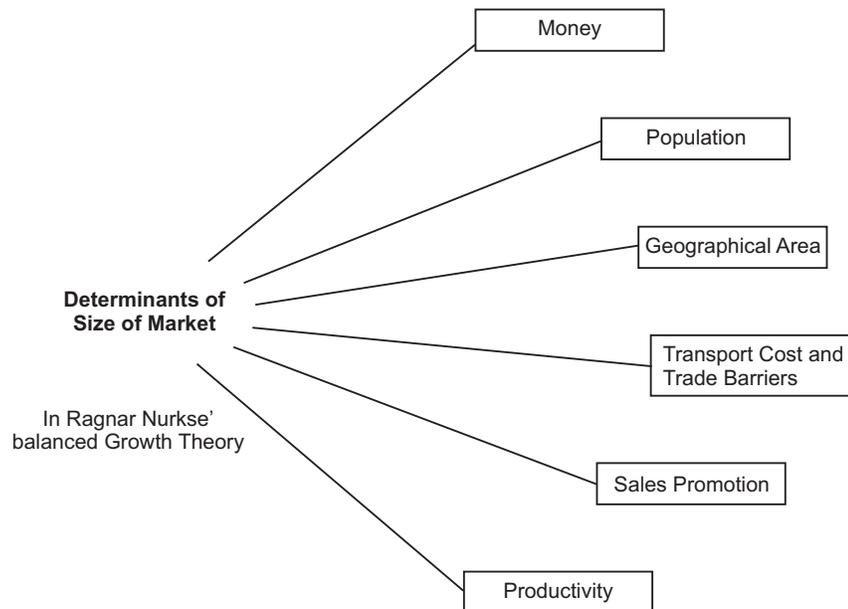
"The limited size of the domestic market in a low income country can thus constitute an obstacle to the application of capital by any individual firm or industry working for the market. In this sense the small domestic market is an obstacle to development generally."



The process of economic development as per Ragnar Nurkse's Balanced Growth Theory

**Determinants of size of market**

According to Nurkse, expanding the size of the market is crucial to increasing the inducement to invest. Only then can the vicious circle of poverty be broken. He mentioned the following pertinent points about how the size of the market is determined:



Determinants of size of market

## Money supply

Nurkse emphasised that Keynesian theory shouldn't be applied to underdeveloped countries because they don't face a lack of effective demand in the way that developed countries do. Their problem is to do with a lack of real purchasing power due to low productivity levels. Thus, merely increasing the supply of money will not expand the market but will in fact cause inflationary pressure.

## Population

Nurkse argued against the notion that a large population implies a large market. Though underdeveloped countries have a large population, their levels of productivity are low. This results in low levels of per capita real income. Thus, consumption expenditure is low, and savings are either very low or completely absent. On the other hand, developed countries have smaller populations than underdeveloped countries but by virtue of high levels of productivity, their per capita real incomes are higher and thus they create a large market for goods and services.

## Geographical area

Nurkse also refuted the claim that if a country's geographical area is large, the size of its market also ought to be large. A country may be extremely small in area but still have a large effective demand. For example, Japan. In contrast, a country may cover a huge geographical area but its market may still be small. This may occur if a large part of the country is uninhabitable, or if the country suffers from low productivity levels and thus has a low National Income.

## Transport cost and trade barriers

The notion that transport costs and trade barriers hinder the expansion of the market is age-old. Nurkse emphasised that tariff duties, exchange controls, import quotas and other non-tariff barriers to trade are major obstacles to promoting international cooperation in exporting and importing. More specifically, due to high transport costs between nations, producers do not have an incentive to export their commodities. As a result, the amount of capital accumulation remains small. To address this problem, the United Nations produced a report in 1951 with solutions for underdeveloped countries. They suggested that they can expand their markets by forming customs unions with neighbouring countries. Also, they can adopt the system of preferential taxation or even abolish customs duties altogether. The logic was that once customs duties are removed, transport costs will fall. Consequently, prices will fall and thus the demand will rise. However, Nurkse, as an export pessimist, did not agree with this view. Export pessimism is a trade theory which is governed by the idea of "inward looking growth" as opposed to "outward looking growth".

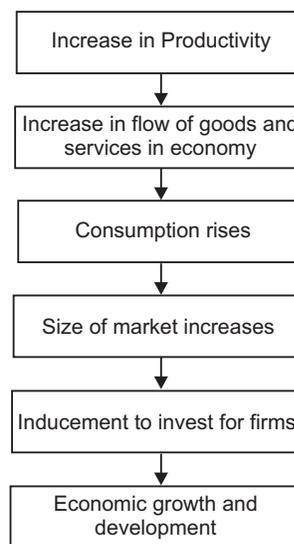
## Sales promotion

Often, it is true that a company's private endeavour to increase the demand for its products succeeds due to the extensive use of advertisement and other sales promotion technique. However, Nurkse argues that such activities cannot succeed at the macro level to increase a country's aggregate demand level. He calls this the "macroeconomic paradox".

## Productivity

Nurkse stressed productivity as the primary determinant of the size of the market. An increase in productivity (defined as the output per unit input) increases the flow of goods and services in the economy. As a response, consumption also rises. Hence, underdeveloped economies should aim to raise their productivity levels in all sectors of the economy, in particular agriculture and industry.

Notes



The process of how increased productivity leads to economic development and growth

For example, in most underdeveloped economies, the technology used to carry out agricultural activities is backward. There is a low degree of mechanisation coupled with rain dependence. So while a large proportion of the population (70-80%) may be actively employed in the agriculture sector, the contribution to the Gross Domestic Product may be as low as 40%. This points to the need to increase output per unit input and output per head. This can be done if the government provides irrigation facilities, high-yielding variety seeds, pesticides, fertilisers, tractors etc. The positive outcome of this is that farmers earn more income and have a higher purchasing power (real income). Their demand for other products in the economy will rise and this will provide industrialists an incentive to invest in that country. Thus, the size of the market expands and improves the condition of the underdeveloped country.

Nurkse is of the opinion that Say's Law of markets operates in underdeveloped countries. Thus, if the money incomes of the people rise while the price level in the economy stays the same, the size of the market will still not expand till the real income and productivity levels rise. To quote Nurkse,

"In underdeveloped areas there is generally no 'deflationary gap' through excessive savings. Production creates its own demand, and the size of the market depends on the volume of production. In the last analysis, the market can be enlarged only through all-round increase in productivity. Capacity to buy means capacity to produce."

**Export pessimism**

Citing the limited size of the market as the main impediment in economic growth, Nurkse reasons that an increase in productivity can create a virtuous circle of growth. Thus, a large scale investment programme in a wide array of industries simultaneously is the answer. The increase in demand for one industry will lead to an increase in demand for another industry due to complementarity of demands. As Say's Law states, supply creates its own demand.

However, Nurkse clarified that the finance for this development must arise to as large an extent as possible from the underdeveloped country itself i.e. domestically. He stated that financing through increased trade or foreign investments was a strategy used in the past - the 19th century - and its success was limited to the case of the United States of America. In reality, the so-called "new countries" of the United States of America (which separated from the British empire) were high income countries to begin with. They were already endowed with efficient producers, effective markets and a high purchasing power. The point Nurkse was trying to make was that USA was rich in resource endowment as well as labour force. The labour force had merely migrated from Britain to USA, and

thus their level of skills were advanced to begin with. This situation of outward led growth was therefore unique and not replicable by underdeveloped countries.

In fact, if such a strategy of financing development from outside the home country is undertaken, it creates a number of problems. For example, the foreign investors may carelessly misuse the resources of the underdeveloped country. This would in turn limit that economy's ability to diversify, especially if natural resources were plundered. This may also create a distorted social structure. Apart from this, there is also a risk that the foreign investments may be used to finance private luxury consumption. People would try to imitate Western consumption habits and thus a balance of payments crisis may develop, along with economic inequality within the population.

Another reason exports cannot be promoted is because in all likelihood, an underdeveloped country may only be skilled enough to promote the export of primary goods, say agricultural goods. However, since such commodities face inelastic demand, the extent to which they will sell in the market is limited. Although when population is at a rise, additional demand for exports may be created, Nurkse implicitly assumed that developed countries are operating at the replacement rate of population growth. For Nurkse, then, exports as a means of economic development are completely ruled out.

Thus, for a large-scale development to be feasible, the requisite capital must be generated from within the country itself, and not through export surplus or foreign investment. Only then can productivity increase and lead to increasing returns to scale and eventually create virtuous circles of growth.

### **Role of state**

After World War II, a debate about whether a country should introduce financial planning to develop itself or rely on private entrepreneurs emerged. Nurkse believed that the subject of who should promote development does not concern economists. It is an administrative problem. The crucial idea was that a large amount of well dispersed investment should be made in the economy, so that the market size expands and leads to higher productivity levels, increasing returns to scale and eventually the development of the country in question. However, it should be noted that most economists who favoured the balanced growth hypothesis believed that only the state has the capacity to take on the kind of heavy investments the theory propagates. Further, the gestation period of such lumpy investments is usually long and private sector entrepreneurs do not normally undertake such high risks.

### **Reactions**

Ragnar Nurkse's balanced growth theory too has been criticised on a number of grounds. His main critic was Albert O. Hirschman, the pioneer of the strategy of unbalanced growth. Hans W. Singer also criticised certain aspects of the theory.

Hirschman stressed the fact that underdeveloped economies are called underdeveloped because they face a lack of resources, maybe not natural resources, but resources such as skilled labour and technology. Thus, to hypothesise that an underdeveloped nation can undertake large scale investment in many industries of its economy simultaneously is unrealistic due to the paucity of resources. To quote Hirschman,

"If a country were ready to apply the doctrine of balanced growth, then it would not be underdeveloped in the first place."

Hans Singer asserted that the balanced growth theory is more applicable to cure an economy facing a cyclical downswing. Cyclical downswing is a feature of an advanced stage of sustained growth rather than of the vicious cycle of poverty. Hirschman also stated that during conditions of slack activity in developed countries, the stock of resources, machines and entrepreneurs are merely unemployed, and are present as idle capacity. So in this situation, simultaneous investment in a large number of sectors is a well-suited policy. The various economic agents are temporarily unemployed and once the inducement to invest starts operating, the slump will be overcome. However, for an underdeveloped economy, where such resources are absent, this principle doesn't fit.

**Notes**

Another contention was Nurkse's approval of Say's Law, which theorises that there is no overproduction or glut in the economy. Supply (production of goods and services) creates a matching demand for the output and this results in the entire output being sold and consumed. However, Keynes stated that Say's Law is not operational in any country because people do not spend their entire income - a fraction of it is saved for future consumption. Thus, according to Nurkse's critics, his assumption of Say's Law being operational in underdeveloped countries needs greater justification. Even if the section of savers is few, the tenet of putting emphasis on supply rather than demand has been widely discredited.

Nurkse states that if demand for the output of one sector rises, due to the complementary nature of demand, the demand for the output of other industries will also experience a rise. Paul Rosenstein-Rodan spoke of a similar concept called "indivisibility of demand" which hypothesises that if large investments are made in a large number of industries simultaneously, an underdeveloped economy can become developed due to the phenomenon of complementary demand. However, both Nurkse and Rosenstein-Rodan only took into consideration the situation of industries that produce complementary goods. There are substitute goods too, which are in competition with each other. Thus if the state pumps in large investments into the car industry, for example, it will naturally lead to a rise in the demand for petrol. But if the state makes large scale investments in the coffee sector of a country, the tea sector will suffer.

Hans Singer suggested that Nurkse's theory makes dubious assumptions about the underdeveloped economy. For example, Nurkse assumes that the economy starts with nothing at hand. However, an economy usually starts at a position which reflects the previous investment decisions undertaken in the country, and at any given moment, an imbalance already exists. So the logical step would be to take on those investment programmes which complement the existing imbalance in the economy. Clearly, such an investment cannot be a balanced one. If an economy makes the mistake of setting out to make a balanced investment, a new imbalance is likely to appear which will require still another "balancing investment" to bring equilibrium, and so on and so forth.

Hirschman believed that Nurkse's balanced growth theory wasn't in fact a theory of growth. Growth implies the gradual transformation of an economy from one stage to the chronologically next stage. It entails the series of actions which leads the economy from a stage of infancy to that of maturity. However, the balanced growth theory involves the creation of a brand new, self-sufficient modern industrial economy being laid over a stagnant, self-sufficient traditional economy. Thus, there is no transformation. In reality, a dual economy will come into existence, where two separate economic sectors will begin to coexist in one country. They will differ on levels of development, technology and demand patterns. This may create inequality in the country.

	<i>Notes</i> Balanced growth is not an inevitable property of growth models.
---	--

**Limitations:**

Although the balanced growth hypothesis has been widely discussed, it has a number of limitations. The ideas are difficult to test empirically. From a purely theoretical point of view, the argument does not generalize straightforwardly to open economies. If firms can sell their output abroad, the role of domestic market size appears much less important.

The balanced growth hypothesis then requires a more complex story, perhaps one in which firms are especially reliant on domestic markets in the early stages of their development.

The ideas have also been criticized on other grounds. The most prominent sceptic was Hirschman (1958), who argued that simultaneous, coordinated investment asked too much of developing countries. He regarded growth as a necessarily unbalanced dynamic process, in which successive disequilibria create the conditions for development in other sectors.

Importantly, this process is seen as too complex and unpredictable to lend itself readily to a government-inspired "Big Push", partly because governments may lack the relevant information, and partly because simultaneous investment would place too many demands on limited organizational resources. Hirschman summarized his objections by saying: 'if a country were ready to apply the doctrine of balanced growth, then it would not be underdeveloped in the first place'

### **21.3 Unbalanced Growth**

The theory of unbalanced growth is the opposite of the doctrine of balanced growth. According to this concept, investment should be made in selected sectors rather than simultaneously in all sectors of the economy. No underdeveloped country possesses capital and other resources in such quantities as to invest simultaneously in all sectors. Therefore, investment should be made in a few selected sectors or industries for their rapid development, and the economies accruing from them can be utilized for the development of other sectors. Thus the economy gradually moves from the path of unbalanced growth to that of balanced growth. Economists like Singer, Kindleberger, Streeten, etc. have expressed their views in favour of the unbalanced growth doctrine which are in fact criticisms of the theory of balanced growth. It is, however, Hirschman who has propounded the doctrine of unbalanced growth in a systematic manner.

#### 1. Hirschman's strategy

The concept of unbalanced growth has been popularized by Hirschman.

2. It is his contention that deliberate unbalancing the economy according to a pre-designed strategy is the best way to achieve economic growth in an underdeveloped country. According to Hirschman, investments in strategically selected industries or sectors of the economy will lead to new investment opportunities and so pave the way to further economic development. He maintains that "development has of course proceeded in this way, with growth being communicated from the leading sectors of the economy to the followers, from one industry to another, from one firm to another." He regards development as a "chain of disequilibria" that must keep alive rather than eliminate the disequilibria, of which profits and losses are symptoms in a competitive economy.

If the economy is to be kept moving ahead, the task of development policy is to maintain tensions, disproportions and disequilibria. This "seesaw advance" is induced by one disequilibria that in turn leads to a new disequilibrium and so on ad infinitum.

According to Hirschman, when new projects are started they appropriate external economies created by previous projects and create new external economies that can be exploited by subsequent ones. There are some projects that appropriate more external economies than they create which he calls convergent series of investments. Hirschman also calls them induced investments for they are net beneficiaries of external economies. There are other projects too that create more external economies than they appropriate which he characterizes as divergent series of investments. From the point of view of the economy, the latter may have a greater social desirability than private profitability, whereas induced investments may be less desirable from the social viewpoint. In practice, development policy should aim at

1. the prevention of convergent series of investments which appropriate more external economies than they create; and
  2. the promotion of divergent series in which more economies are created than are appropriated.
- Development can only take place by unbalancing the economy. This is possible by investing either in social overhead capital (SOC) services or in directly productive activities (DPA). The former create external economies while the latter appropriate external economies.

#### **Unbalancing the Economy with SOC.**

Social overhead capital has been defined as "comprising those basic services without which primary, secondary and tertiary productive activities cannot function." In SOC are included investments on

**Notes**

education, public health, communications, transportation and conventional public utilities like light, water, power, irrigation and drainage schemes, etc. A large investment in SOC will encourage private investment later in DPA. For example, cheaper supply of electric power may encourage the establishment of small industries. SOC investments indirectly subsidise agriculture, industry or commerce by cheapening various inputs which they use for reducing their costs. Unless SOC investments provide cheap or improved services, private investments in DPA will not be encouraged. Thus the SOC approach to economic development is to unbalance the economy so that subsequently investments in DPA are stimulated. As Hirschman puts it, "Investment in SOC is advocated not because of its direct effect on final output, but because it permits and in fact invites DPA to come in.... Some SOC investment is required as a prerequisite of DPA investment."

**Unbalancing the Economy with DPA.**

An imbalance can also be created via DPA. A government might directly or indirectly invest in DPA instead of investing in SOC. If DPA investment is undertaken first, the shortage of SOC facilities is likely to raise production costs substantially. In course of time, political pressures might stimulate investment in SOC also. Investment sequences are generated by profit expectations and political pressures. Profit expectations generate the sequence from SOC to DPA and political pressures from DPA to SOC.



*Caution* In developing economies there is low investment due to the low domestic savings.

**The Path to Development.**

Hirschman calls the first sequence (from SOC to DPA) "development via excess capacity of SOC" and the second sequence (from DPA to SOC) "development via shortage of SOC." As to which sequence should be followed first for economic development, Hirschman prefers that sequence which is "vigorously self-propelling." This is explained in Fig. 1. DPA investments are measured along the vertical axis. The curves a, b, and c are isoquants showing various quantities of DPA and SOC which will give the same gross national product at any point. As we move to a higher curve, it represents a higher gross national product. The curves are so drawn that the 45° line through the origin connects the optimal points on the different curves. This line shows the balanced growth of DPA to SOC. Hirschman makes two assumptions: firstly, that SOC and DPA cannot be expanded simultaneously, and secondly, that sequence of expansion should be adopted which maximizes induced decision making. If the path to development is followed via excess capacity of SOC, the economy will follow the dotted line AA'BB'C.

When the economy increases SOC from A to A' on the same isoquant a, the induced DPA increases from A to B' until balance is restored at B where the whole economy is on a higher isoquant b.

The higher gross national product thus achieved induces government to increase SOC further to B'' from B, DPA also follows suit from B to point C via C' on more higher isoquant c. If the other path to development via shortage of SOC is followed, the economy moves along the thick line AB'BC'C.

When DPA increases to B' from A, SOC has to move to A' and then to B.

When DPA is increased further to C' from B, balance requires SOC to increase to C via B''.

It is to be noted that development path via excess SOC capacity is more continuous and smooth than the second path. It is in a way what Hirschman calls self-propelling. The other path via SOC shortage capacity is not so, because if there is a belated adjustment of SOC, as it is likely to be due to the absence of political pressures in the beginning, the DPA cost of producing a given output rises. According to Hirschman, "Development via SOC shortage is an instance of the disorderly, compulsive sequence while via excess SOC capacity is essentially permissive."

## Linkages.

Notes

Having studied the virtues of specific imbalance, the problem is one of finding the kind of imbalance that is likely to be most effective. Any investment may have both forward linkage and backward linkage effects. Forward linkage effects encourage investment in subsequent stages of production, and backward linkage effects in earlier stages of production. Development should aim at discovering projects with the largest total linkage. Such projects vary from time to time and country to country, and can be found only by empirical studies of their input-output tables. Hirschman says, "The industry with the highest combined linkage score is iron and steel. Perhaps the underdeveloped countries are not so foolish and so exclusively prestige-motivated in attributing prime importance to this industry." But he opines further that "the industrial development clearly cannot be started everywhere with an iron and steel industry just because the industry maximizes linkage." The reason being the lack of interdependence and linkage in underdeveloped countries. For example, agriculture, including primary production, and mining are weak in both backward and forward linkage effects. The primary production activities mostly of the enclave type leading to exports have little development effects on the economy in adding either to employment or to gross national product in an underdeveloped country.

## Last Industries First.

Hirschman, therefore, advocates the setting up of "last stage industries first." In making industrial products, a developing country need not undertake all the stages of production simultaneously. It can begin with the manufacture of durable consumer goods at the final stages of production. It can import many converting, assembling and mixing plants for final touches to almost finished products. In this way, the country can turn out finished consumer goods that it was previously importing, and then move on to the higher stages of production-to intermediate goods and machines through backward linkage effects. Backward linkage effects are important not only from secondary back to primary production, but also from tertiary back to both secondary and primary production. Backward linkage effects are the combined result of several last stage industries in a country. A backward linkage effect is produced by increases in demand. Therefore, when the demand for import-replacing commodities increases, it justifies some domestic last stage production. In other words, in the making of some products, when demand reaches a certain threshold, it is advantageous to manufacture the product at home. So long as the threshold is being reached, it pays to import the product. When the threshold is reached, Hirschman suggests subsidies or protection to import-replacing industries. But it is not desirable to give infant industry protection till the industry has been fully established. Hirschman calls last stage industries as import enclave industries. They are different for export enclave industries. The latter produce only for exports and are primarily related to staple products and minerals in LDCs. According to Hirschman, LDCs do not give due importance to the part played by exports in their economic development. They often treat exports like a stepchild. Their exports do not expand and fail to produce forward linkage effects within the economy. Hirschman, therefore, suggests export promotion which is the only practical way of achieving industrialization via import substitution. Hirschman sums up his Strategy of Economic Development in these words, "Economic development typically follows a path of uneven growth; that balance is restored as a result of pressures, incentives, and compulsions; that the efficient path towards economic development is apt to be somewhat disorderly and that it will be strewn with bottlenecks and shortages of skills, facilities, services, and products; that industrial development will proceed largely through backward linkage, i.e., will work its way from the 'last touches' to intermediate and basic industry."



*Did u know?* A sector that expands on its own may make a loss, but if many sectors expand at once, they can each make a profit.

Notes

### A Critical Appraisal

The doctrine of unbalanced growth, as propounded by Hirschman, is a heroic attempt at pointing out the way to accelerate economic development for underdeveloped countries. It is realistic and takes into account almost all aspects of development planning. The various incentives, obstacles and resistances to development are studied in their proper perspective. The discussion of forward and backward linkage effects together with last stage production is highly useful. Hirschman's stress on export promotion and import substitution further introduces a touch of realism. He is neither in favour of overall state planning of the Russian type nor does he leave everything on to the shoulders of private enterprise. Unless the SOC path of economic development is followed by the state, it will not encourage private investment in DPA, because private enterprise in an underdeveloped country is unable to create the necessary economic surplus required for development, to carry it further and even to sustain losses. He, therefore, appears to be in favour of a mixed economy.

### Self Assessment

1. Fill in the blanks:
  - (i) ..... economists saw how a balanced growth path might arise from relatively appealing assumptions.
  - (ii) ..... are two useful references on multi-sector growth modely.
  - (iii) ..... is a situation in which the various sectors of a given economy are not growing at a rate similar to one another.
  - (iv) For most development economics, the term is more strong associated with increasing returns, and a debate that began with .....

### Limitations

The doctrine of unbalanced growth is, however, not free from certain limitations.

1. Inadequate Attention to the Composition, Direction and Timing of Unbalanced Growth. Paul Streeten criticising Hirschman's theory of unbalanced growth asks, "The crucial question is not whether to create imbalance, but what is the optimum degree of imbalance, where to imbalance and how much in order to accelerate growth; which are the 'growing points,' where should the spearhead be thrust, on which slope snowballs grow into avalanches." He thus points out that inadequate attention has been paid to the composition, direction and timing of unbalanced growth.
2. Neglects Resistances. Streeten further points out that "the theory concentrates on stimuli to expansion and tends to neglect or minimize resistances caused by unbalanced growth." For instance, Hirschman neglects resistances in attitudes created by an imbalance. When development is the outcome of deliberate unbalancing the economy, the business attitudes change due to shortages and tensions, and there is lot of opposition and hostility. Hirschman neglects this type of reaction on the part of the existing institutions in underdeveloped countries.
3. Beyond the Capabilities of Underdeveloped Countries. Hirschman's development strategy is beyond the capabilities of UDCs because investment creates imbalances thereby creating pressures and tensions in the growth process which are overcome by the inducement mechanism. But pressures and tensions are bound to be serious in underdeveloped countries thereby hampering the process of development.
4. Lack of Basic Facilities. There may be lots of difficulties in procuring technical personnel, raw materials, and basic facilities like power and transport and even in finding out an adequate domestic and foreign market for the products.
5. Lack of Factor Mobility.

Moreover, inducement mechanism is practicable where there is internal flexibility of resources. But in undeveloped countries it is difficult and impossible to shift resources from one sector to another.

6. Emergence of Inflationary Pressures.

One of the serious limitations of the unbalanced growth doctrine is the development of inflationary pressures within the economy. When large doses of investment are being injected into the economy at certain strategic points, income will rise which may tend to increase the demand for consumer goods relative to their supply. Shortages arise due to strains, pressures and tensions. Such a situation leads to inflationary rise in the price level. It becomes difficult to control prices in underdeveloped countries, as the governments are incapable of wielding monetary and fiscal measures effectively.

7. Linkage Effects not Based on Data.

Hirschman's analysis of the linkage effects suffers from the fact that it is not based on data pertaining to an underdeveloped country where social overhead facilities are not fully developed for a generation or so.

8. Too much Emphasis on Investment Decisions.

Hirschman's development strategy is largely related to maximising investment decisions. No doubt decision making is a crucial factor in economic development, yet underdeveloped countries need not only investment decisions but also administrative, managerial and policy decisions. Thus Hirschman lays too much emphasis on investment decisions as compared to other important decisions essential for development.

## 21.4 Balanced Vs. Unbalanced Growth

Having examined critically the doctrines of balanced and unbalanced growth, we attempt an overview of these strategies of economic development.

### Differences

The case for balanced growth rests on the fact that vicious circles of poverty are at work in underdeveloped countries which are responsible for the small size of the local market for their goods. The solution lies in a balanced pattern of investment in a number of mutually supporting different industries so that the size of the market is enlarged. Its critics argue that an underdeveloped country does not possess sufficient resources in men, materials and money for simultaneous investments in a number of complementary industries. Another serious weakness of this doctrine is that it emphasises the complementarity of markets for final goods, primarily consumer goods as an inducement to invest and leaves out intermediate goods markets. Proponents of unbalanced growth strategy favour investments in selected sectors rather than simultaneously in all sectors of the economy. Investments in selected sectors lead to new investment opportunities. This is possible by deliberately unbalancing the economy. The aim is to keep alive rather than eliminate the disequilibria by maintaining tensions, disproportions and disequilibria. The strategy of unbalanced growth aims at removing scarcities in underdeveloped countries by induced investment decision-making. Critics point out that in such countries decision-making itself is scarce along with other resources. Moreover, creating imbalances within the economy by making investments in strategic sectors in the face of acute shortage of resources leads to inflationary pressures and balance of payments difficulties in underdeveloped countries. Despite these differences in approaches, the doctrines of balanced and unbalanced growth have two common problems:

One, relating to the role of the state, and two, the role of supply limitations and supply inelasticities. Nurkse believes that balanced growth is relevant primarily to a private enterprise system. "It is private investment that is attracted by markets and that needs the inducement of growing markets. It is here that the element of mutual support is so useful and, for rapid growth, indispensable." But critics point out that private enterprise alone is incapable of taking investment decisions in underdeveloped

**Notes**

countries. Therefore, balanced growth presupposes planning. On the other hand, in Hirschman's unbalanced growth strategy, the state plays an important role in encouraging SOC investments thereby creating disequilibria. If development starts via investment in DPA, political pressures force the state to undertake investments in SOC. Thus unbalanced growth also requires state planning. Since both balanced growth and unbalanced growth involve lumpy investments in complementary activities, they require state planning. In order to get investment decisions implemented and to benefit from complementarities, coordination between the private and public sectors is essential in an underdeveloped country, whether it adopts the strategy of balanced growth or unbalanced growth. The other problem concerning the two strategies is the role of supply limitations and supply inelasticities. Nurkse's theory of balanced growth is mainly related to the lack of demand, and neglects the role of supply limitations. This is not a correct view because underdeveloped countries woefully lack in the supply of capital, skills, economic infrastructure and other resources which are inelastic in supply. But the demand for final goods can be created by import restrictions and export promotion without recourse to the strategy of balanced growth. The unbalanced growth doctrine also neglects the role of supply limitations and supply inelasticities. Though it emphasises the scarcity of decision making, yet it ignores the scarcity of physical, human and financial resources in an underdeveloped country. Thus both strategies err in neglecting supply limitations and base their arguments on the developed countries which have high elasticity of supply of resources.

**Similarities**

This distinction between balanced and unbalanced growth techniques leads to certain points of similarities between the two. First, both believe in the existence of a private enterprise system based on market mechanism under which they operate. At the same time, they imply the operation of state planning. Second, both ignore the role of supply limitations and supply inelasticities. Lastly, both the doctrines assume interdependence, but of different degrees. In balanced growth, the development of one sector is dependent on the development of other sectors. On the other hand, under unbalanced growth, the economy gradually moves on the path of economic development via tensions, disproportions and disequilibria, and ultimately reaches balanced growth. Thus both the strategies involve interdependence among different sectors of the economy, but the interdependence is of different degrees



*Task*

Briefly explain balanced and unbalanced growth theory.

**Self Assessment**

2. State whether the following statements are 'true' or 'false'.
  - (i) Balanced and unbalanced growth theory didn't reflect the debate about government-controlled economies versus free market economies.
  - (ii) High taxation, reducing consumption and providing funds for investment, either directly or indirectly.
  - (iii) Government may select inappropriate sectors for support.
  - (iv) Unbalanced growth theorists agree that significant development cannot be achieved within free, unregulated markets by a small number of industries.

**21.5 Summary**

- Despite these weaknesses the technique of unbalanced growth has come to be recognised as a novel technique for the development of underdeveloped countries. Russia was the first country to adopt it and has been successful in accelerating its rate of economic growth within a short-

period of time. India also followed suit by adopting this technique with the Second Five-Year Plan. Whereas Russia could succeed by creating large surpluses in the heavy industries sector and by keeping down the consumption levels, in India such an extreme policy is impracticable. Here investments in heavy industries are being kept up at a high level in the five-year plans and at the same time every effort is being made to step up production of consumer goods. But nothing is done to keep the consumption levels low in order to generate large economic surplus. The continuous rise in the price level however tends to keep the real consumption standards low. Unless the government controls the inflationary pressures, planning with unbalanced growth will fail to achieve the goal of self-sustaining growth.

- The controversy between balanced and unbalanced growth has been stretched too far and has become almost barren. Keeping in view the scarcity of resources in a developing country, the best course is to adopt the strategy of unbalanced growth. Under this strategy, SOC should be developed first which will encourage subsequent investments in DPA when the economy will ultimately move on the path to balanced growth. The experience of many developing countries like India reveals that unless such SOC's as power, irrigation, manpower, transport, etc. are developed first, the development of agriculture, industry and commerce is retarded. The rapid development of Russia has of course proceeded in this way with growth being communicated from the leading to the followers. But developing countries wedded to democracy should try to control the twin evils of inflation and adverse balance of payments while pursuing this strategy of development.
- In macroeconomics, balanced growth refers to classes of equilibrium growth paths, while in development economics the term refers to a particular development strategy.
- The idea plays an important role in teaching and research in macroeconomics because of its simplicity and explanatory power.
- Unbalanced growth is a situation in which the various sectors of a given economy are not growing at a rate similar to one another.
- in Hirschman's opinion, the real bottleneck is not the shortage of capital, but lack of entrepreneurial abilities.
- Unbalanced growth theorists agree that significant development cannot be achieved within free, unregulated markets by a small number of industries.

### **21.6 Key-Words**

- **aggregate** : a total number or amount made up of smaller accounts that are collected together.
- **entrepreneur** : person who makes money by starting or running business, especially when this involves taking financial risks.
- **contradict** : to say that something that something that somebody else has said is wrong, and that the opposite is true.
- **bureaucratic** : connected with a bureaucracy and involving complicated official roles which may seem unnecessary.

### **21.7 Review Questions**

1. What do you mean by Balanced growth?
2. What do you mean by the unbalanced growth?
3. What is the difference between Balanced and unbalanced growth?
4. Explain the theory of balanced and unbalanced growth.

Notes

**Answers: Self-Assessment**

- |    |                         |                                      |         |        |
|----|-------------------------|--------------------------------------|---------|--------|
| 1. | (i) Solow, swan         | (ii) greenwood et as., Kong samut et |         |        |
|    | (iii) unbalanced growth | (iv) Rosenstein-Rodan                |         |        |
| 2. | (i) F                   | (ii) T                               | (iii) T | (iv) T |

**21.8 Further Readings**



*Books*

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 22: Critical Minimum Efforts Thesis

Notes

### CONTENTS

Objectives

Introduction

22.1 Theory of Balanced Growth

22.2 Explanation of Critical Minimum Effort Theory

22.3 Stimulants and Shocks

22.4 Critical Evaluation

22.5 Summary

22.6 Key-Words

22.7 Review Questions

22.8 Further Readings

### Objectives

The objectives of this unit can be summarized as below:

- Be able to explain the balanced growth theories.
- Know about the terms stimulants and shocks.
- Know about critical evaluation.

### Introduction

The theory of critical minimum effort is associated with the name of Harvey Leibenstein. The theory is based on the relationship between the three factors, viz. (i) per capita income, (ii) population growth, and (iii) investment.

Leibenstein identified population also an income-depressing factor (or a), whereas investment is an income-generating factor.

Growth in an economy is possible when the income-generating factors turnout to be more powerful than the income-depressing factors. A small additional investment may generate a small income. The additional income would be eaten up by the additions to the population which may come in the wake of the additional income, and hence the effort may fail to general a cumulative process of growth. What is required is an initial substantially large volume of investment that may create conditions which should outweigh the growth of population, i.e., if necessary it is necessary that the initial effort or the initial series of efforts must be above a certain minimum magnitude.

Suppose the level of per capita income is OA. This level is low as compares to the critical minimum level it would fail to take the economy out of stagnation forced would be strong in relation to the effect of income depressing forces would be strong in relation to the effect of income-generating forces. When level of income is raised to OB, the growth curve will follow the path BCR. It is evident that per capita income is rising up to point C, and thereafter the per capita income is declining. It means, OB level of income is insufficient to generate the growth momentum in the economy.

If sufficient investment is injected into the system to raise per capita income to OM, sustained growth will occur and effort of stimulants would be relatively strong than that of shocks. There, any level of investment lower than the critical cannot ensure sustained growth.

The term 'critical' is indicative of the fact that the investment should at least be of such a level which could raise per capita income to OM for achieving sustained growth. However, it would be with

Notes

convenient and cheaper to make the effort in two doses. The initial infection of investment might be enough to raise per capita income to OB. Then at time T, the second dose of investment could be infected to raise per capita income to OM, thereby taking the economy to the critical minimum level of income required for sustained growth. Reasons for critical minimum effort: Critical minimum effort, in Leibensteins opinion is necessitated by the following factors:

One, some of the factors of production is indivisible, so that unless they are used in full or in minimum amount, they will lead to internal diseconomies. To overcome these diseconomies, some minimum critical investment may be necessary.



Notes

This theory is one of the **balanced growth theories**. In this theory Leibenstein essentially talks about how large doses of investments in an economy can help the economy in development.

There is a sort of mutuality and interdependence between a number of firms and industries. As these develop, there emerge external economies. Apparently, these economies can be reaped only when there are at least those minimum numbers of industries operating which make these economies possible. In their absence, these economies may not arise at all; these economies may not arise at all. Three, at any time the economy may be subjected to autonomously generated income depressing factors and at the same time be subject to depressants induced by some aspect of the process of growth. A certain minimum investment is necessary to overcome there and to initiate sustained growth. Four, there are some attitudes which are to be developed for growth. Among those, more important are:

"Western Market Incentives" implying a strong profit incentive,

A willingness to accept entrepreneurial risks, and an eagerness to promote scientific and technical process. These attitudes come in only when the economy undertakes same level of investment.

The above factors make it necessary that some minimum level of investment is undertaken in an economy to make it possible for the growth promoting forces to set in. The investment must be made in sizeable lump, and not through marginal increments that result from a set of unrelated individual decisions. The theory is more realistic than Rosenstein-Rodan's "big push" theory because critical minimum effort can be broken up into a series of smaller efforts which can be properly timed to put the economy on the path of sustained growth. However, the theory is open to criticisms on the following grounds: One, Leibenstein assumes that population increases as the income rises above the subsistence level. Beyond a particular level of income, population declines.

This assumption implies that rise in income has a direct bearing on the growth of population. But, in reality, this relation is not so simple. Growth of population is influenced by social attitudes, customs traditions of the people, and not merely by the per capita income. Two, according to Myint, the functional relation between per capita income and income growth rate is not as simple as assumed by Leibenstein. It is complex and has two stages.

In the first stage, the level of per capita income influences the rate of saving and investment which, in turn, depends on the pattern of income distribution and the effectiveness of financial institutions in mobilising saving. In the second stage, the relation between investment and resultant output depends upon the economic and social system of the country. The relationship can be improved through innovations.

The meaningful innovation is possible when updated technology, skilled labour and necessary infrastructure in the country. However, these are not available in the initial phase of development, and the critical minimum runs into difficulties. Three, in underdeveloped countries external forces play an important role in the initial stages of development. This theory does not explain clearly the

role of external forces like foreign capital, foreign trade, international economic relations, etc. These forces exert a vital impact on development and these factors play an important role in the development process.

Notwithstanding the above shortcomings, the theory shows the way for breaking vicious circle of poverty. The path of sustained growth is not even and smooth. It is rather difficult and complex one. Minimum efforts are essentially required to overcome the difficulties and achieve sustained growth, which is the ultimate objective of a development strategy.

## **22.1 Theory of Balanced Growth**

The theory of 'Balanced Growth' has been put forward as a solution to the problem of vicious circle of poverty that afflicts the demand side of capital formation. To break this vicious circle, the theory of balanced growth advocates a simultaneous setting up of a large number of mutually complementary industries that would generate demand for each other's products and thus expand the size of the market and increase inducement to invest.

Rosenstein Rodan gave the earliest version of the balanced growth theory. He observed that in underdeveloped countries, no new industry has a chance to survive due to limited size of market demand.

Thus, if for example, a shoe factory is set up employing a hundred workers, the chances are that it would soon close down due to lack of demand for shoes. But if in place of one factory, we simultaneously set up, say, one hundred factories employing thousands of workers, the chances are that all these factories would survive.

This is because the additional income in the hands of these workers arising from their employment, will create additional demand in the market as they spend money on various products produced by these industries.

Thus demand for shoes, as well as for goods produced by other industries increases that enables all of them to survive and grow. Nurkse agreed with Rosenstein Rodan and put forward the balanced growth theory on similar lines but enlarged the scope of the balanced growth programme to include many more industrial sectors.

According to Nurkse, the only way to remove the obstacles arising out of the small size of the market is "more or less synchronised application of capital to a wide range of different industries. Here is an escape from the dead lock, here the result is an overall enlargement of the market ... most industries catering for mass consumption is complementary in the sense that they provide a market for and thus support each other."

The people working in these industries will be buyers of each others produce. Accordingly, each individual industry shall create a demand for the goods of the others. The essence of Nurkse's theory is that if large investment is undertaken in the mutually dependent industries, the vicious circle of poverty can be broken and the country can look forward to the economic advancement.

### **Weaknesses of the Theory of Balanced Growth**

The Theory of Balanced Growth suffers from inherent weaknesses. Singer has expressed his doubts about the practicability of balanced growth doctrine. According to him, if underdeveloped countries are to launch a large investment package in industries without paying much attention to agriculture, they are bound to run into difficulties.

To avoid food and raw material shortage, the big push in industry will have to be accompanied by a big push in agriculture as well. But when we think of such a large and varied package of industrial investment and investment in agriculture at the same time, it creates serious doubts about the capacity of the underdeveloped countries to follow the path of balanced growth.

As he says, "The resources required for carrying out the policy of balanced growth are of such order of magnitude that a country disposing of such resources would in fact not be underdeveloped."

Notes

In underdeveloped countries there is an acute shortage of capital and other resources. To suggest that they can move on the path of economic progress by massive investment simultaneously in all sectors appears totally impractical. In fact, the balanced growth doctrine requires huge amounts of precisely these resources whose limited availability is the basic characteristic of the underdeveloped economies.



*Did u know?* The “minimum” amount of effort that is required is “critical” for the economy to move towards development hence this theory is called **critical minimum effort**.

**Self-Assessment**

1. Fill in the blanks:
  - (i) The critical minimum effort theory has been given by ..... in his book Economic Backwardness and economic growth.
  - (ii) The ..... is a function of per capita income and Rate of Investment is a function of per capita income.
  - (iii) The system is ..... for small displacement but not large one.
  - (iv) The critical minimum effort theory is more or less on extension of the .....

**22.2 Explanation of Critical Minimum Effort Theory**

In the discussion of economic development of underdeveloped countries a major theme has been advanced in recent years. The underdeveloped countries are described as in a state of equilibrium which is sometimes called a vicious circle. This circle is believed to be so vicious and deep-rooted that no small effort can be expected to break it up. If the underdeveloped countries are to be developed at all, a certain minimum effort (usually defined in terms of investment) and a certain minimum speed of growth is required. Any effort smaller than the minimum would be fruitless. Rosenstein-Rodan, Nurkse and many other have, in one way or another, made contributions to this theme, and a most refined version of this theme was recently formulated by Leibenstein. It is the purpose of this paper to present and criticize Leibenstein’s theory, which he calls the “critical minimum effort thesis”. It is out contention that the critical minium effort thesis is weak both logically and empirically, and its weakness is primarily due to what may be called the fallacy of aggregation.

**The Quasi-Stable Equilibrium**

An underdeveloped or backward economy is characterized by Leibenstein as one which is in a state of quasi-stable equilibrium with respect to per capita income. Equilibrium is used in the usual sense to mean that there exists a set of values or magnitudes for the variables which, once attained, would remain unchanged–period after period. An equilibrium is called stable if these variables, when disturbed by an outside force, would return to their previous values after adjustment. A quasistable equilibrium is referred to as a condition in which only some variables of the system are stable. That is, after a disturbance some variables will return to their previous values while others will settle down at new magnitudes.

An underdeveloped economy may be described as basically in equilibrium because there are little forces within the economy which would could lead to a change in the magnitudes of the variables. The per capita income is low, savings are small, net capital formation is negligible and thus labor productivity and income are kept low. Since income is low, consumption and education levels are low, and these in turn keep labor productivity low due to poor health, lack of knowledge, etc. This vicious circle may of course be described in a number of different ways but the main idea is that the characteristics of an underdeveloped economy are such that they keep the economy underdeveloped. There is nothing in the economy which would deliver it from poverty. It is simply stagnant – year after year.



Notes

would be reduced by *gh*. Since the income-raising forces are also at work, the net effect on per capita income is to reduce it by *bh*. Now at the level of *oi* the income-raising forces would, if at work alone, raise income by *kj* (or *mj*), but at the same time the income-depressing forces would lower income by *mp*. The net effect would be to reduce income by *jp*. This process will continue until *oe* is reached and the effect of income-raising forces is the same as that of income-depressing forces.

At any level of the per capita income within the range from *oe* to *oq* income depressing forces are greater than the income-raising forces. Any stimulant which raises per capita income above *oe* but below *oq* will prove to be futile, for per capita income will eventually return to *oe*.

If the stimulant is of such a magnitude that per capita income is raised from *oe* to a point at, or above *oq*, the effect of income-raising forces will outrun that of income-depressing forces. Thus, in terms of Figure 1, the critical minimum effort which is called for to break the vicious circle (centering on a per capita income of *oe*) is a stimulant which is of such a magnitude that it is capable of raising the per capita income to *oq* or above.

### Determinants of the Critical Minimum Effort

Leibenstein maintains that in order to raise income, even without considering all the induced effects, a certain minimum effort is required, on account of both internal and external economies or diseconomies. In the first place, there is the problem of internal diseconomies of scale due to factor indivisibilities. For certain types of production of firm has to be above a certain minimum size if efficiency is to be achieved. This problem becomes serious if a number of such firms have to be established simultaneously. And here the concepts of external economies, inter-dependence and balanced growth come to the front.

“External economy” refers to the fact that “as an industry expands, costs for all firms within the industry are reduced, although no firm within the industry is any more efficient than it was previously. Thus a firm, if alone, may not be able to cover its costs, but will be able to do so if a number of other firms within the industry are also in operation. The same applies to an industry which may be able to exist and expand only when other industries are established. This is, of course, the familiar argument of balanced growth as propounded by Rosenstein-Rodan and Nurkse, although the latter two emphasize the demand rather than the cost aspect of the interdependence of different industries. The simultaneity of the establishment of various industries requires a large amount of initial investment, especially when factor indivisibilities are considerable.

Leibenstein also argues for the need for a large effort in the development of what he calls the growth agents and growth activities. An underdeveloped economy is pictured as one which possesses a great deal of culturally and institutionally determined attitudes that inhibit growth. The tendency toward “zero-sum” activities, the general inertia and fear of undertaking new types of activities and the likelihood of a high rate of failure of new activities in the initial stage all require a rapid rate of growth of the economy if these difficulties are to be overcome. In other words, there is a high degree of entrepreneurial interdependence in the initial stage of development. To make it possible for a sufficient number of growth agents to succeed so that they can establish themselves firmly and set an example for other imitators, low rates of growth would not succeed, for they are “unlikely to induce that synchronized expansion of all factors so that the interaction and results generate sustained growth”. The rate of economic growth must be sufficiently large and pervasive to make a significantly large number of people feel that new value and new experiences will persist and replace the existing values and modes of behavior.

### The Nature and Magnitude of the Minimum Effort

In terms of Leibenstein’s basic theoretical framework, it is not difficult to determine the critical minimum amount of effort which is needed to break the vicious circle of an underdeveloped economy, as Figure 1 shows. But in practical terms Leibenstein makes no attempt to suggest any minimum figure. In the first place, Leibenstein is not always absolutely clear as to what he really means by an effort. He speaks of stimulant as before, but a stimulant may be an unusually good climate, or a discovery of some sort, but not all of it can be measured in monetary terms.

If focus is on the most important variables of Leibenstein's theory, however, no great injustice is done if one simply equates the term effort with investment and regards induced population growth as the income-depressing force. In doing so, one is able to come up with a specific number regarding the critical minimum effort. According to Leibenstein, there is a maximum limit to the effect of the income depressing forces. An increase of income can only induce a population increase of no greater than a certain rate (say, 3 per cent a year), as set by biological limitations. If the stimulant (investment) can raise per capita income to a level which generates income growth at a rate higher than, say 3 per cent, the vicious circle is then broken. How much of an investment is required to achieve a certain growth rate of national income depends on the incremental or marginal capital-output ratio (ICOR) which Leibenstein believes is probably higher in the less developed stage than in the more developed stage. If it is assumed that the ratio is 5:1, a net investment of 15 per cent of the national income is required to produce a growth rate of 3 per cent of the national income.

### The Doctrine of Growing Points

So much for the exposition of Leibenstein's theory. Our criticism of his theory will be along two lines. First, we will examine the validity of the proposition that for an underdeveloped economy a certain minimum amount of investment is required in order to assure its success. Secondly, we will scrutinize the crucial theme which Leibenstein maintains, namely that when per capital income is below a certain level, the income-depressing forces will eventually overtake the income-generating forces. Our efforts will be aided, however, if the first presents what may be called the doctrine of growing points, which, in brief, states that the development of a few points of a backward economy, even though the development is slight and done at a slow pace, may lead the economy into the path of sustained growth.

The argument for a large amount of investment on account of capital indivisibilities of "lumpiness" is certainly valid for certain industries. If an atomic plant is to be built at all, it has to be built a specific size, and a few yards of railroad are of little value to an economy. But there is also a wide range of industries where there is much capital divisibility as well as substitution among factors. Even in cases where factor proportions are fixed the scale need not be too large. It would be very hard to imagine that there is any backward economy which is so poor as to be incapable of mobilizing any savings at all in order to start a few firms, even though it may require an intensive use of capital. If that were the case, there would be little chance, if any at all, for that country to be developed in the absence of massive foreign assistance.

The significant issue is not whether it requires a large amount of investment to get a few factories started. The issue is whether a few factories, if started alone, can succeed. The position of Rosenstein-Rodan and Nurkse is that these factories will not, and they cannot be expected to succeed unless there is a more or less simultaneous development of a wide front of industries. The reason is that these few factories, if established alone, will not find enough customer to buy their products. The low income level of the economy limits the purchasing power of the people and hence the market. The income of the workers who have been employed by the few newly established factories will undoubtedly increase, but it cannot be expected that the workers will spend all their income on the products of the new factories. When investment is made on a wide front of the economy, however, the various industries established will become each other's customers, and the problem of the lack of a market, or the lack of an inducement to invest is resolved.

But is it true that an industry which is unprofitable when undertaken alone will become profitable when many other industries are developed at the same time? And is it true that the establishment of one industry presupposes the founding of a number of other industries at the same time?

An affirmative answer to the first question is likely to require that the supply of labor and capital be rather elastic. If not, it may happen that the increase in the demand for labor and capital resulting from the simultaneous establishment of many industries will be so large that it will cause wages and interest to be bid up to such an extent that few industries will be profitable to the investors. It may be true that the supply of unskilled labor in the "overpopulated" underdeveloped countries may be,

**Notes**

over a wide range, a horizontal one, but it is certainly not so for skilled labor, management personnel and capital. Indeed, the shortage of these factors is just a symptom of underdevelopment. The doctrine of balanced growth tries to solve the demand side of the problem of investment, but fails to give adequate attention to the supply side.

How true is the doctrine even in terms of the demand side? It is true that simultaneous development of a number of industries will solve the market problem, it nevertheless remains untrue that a balanced development is the only way to solve the demand problem as the doctrine implies. There are always sectors in an economy which, even developed individually, may prove to be profitable to investors. The fact that there are imports means there is a market for goods which are not produced at home. Under certain circumstances, such as a favorable protective tariff or in time of war, the import-replacing industries may prove to be profitable. There are always profitable possibilities when one develops a product for export. Even in a poor economy there are always certain tools of production these tools or new tools for similar purposes at a lower cost, there would certainly be a market. The same is true for the field of consumption where there is always room for products with a better quality or a lower cost. In short, there has always been and still is, in a backward economy as in an advanced economy, a demand for consumption as well as capital goods, and there is always room to replace the with new, better or cheaper products by introducing new production methods or other improved methods.

**The Process of Diffusion**

The doctrine of growing points does not merely mean that the particular industries which are developed will grow. Properly interpreted, it means that the economy in general will also grow as these few points are developed. The main task for the doctrine is to explain how the development of a few points may lead to the development of the whole economy.

This task is not particularly difficult, however, as the links between the development of points and the development of the whole economy have been very well supplied and indeed have become very familiar. For the clarity of discussion of the following may be noted here: (1) the demonstration effect; (2) the reinvestment effect; and (3) the linkage effect.

There are two aspects of the demonstration effect. One is the familiar Schumpeterian imitation effect; namely, when one innovator starts a business a cluster of imitators follows suit. Take the Chinese experience (1840–1937) for instance, the compradors of the foreign firms in China played an important role in establishing modern industries in China, and their efforts were undoubtedly stimulated by what they saw in their foreign employers. When a few Chinese statesmen interested themselves in the establishment of modern industries in China in the latter part of the nineteenth century for the purpose of counterbalancing foreign economic influence in China, they started an important, if limited, movement of economic modernization. Many other Chinese chose to follow their path with avowed patriotic purposes. Examples of this sort can be multiplied in other countries as well; and there is little doubt that it is a part of human behavior to follow and imitate others.

The other aspect of the demonstration effect concerns consumption, and has been well formulated and emphasized recently by Duesenberry and Nurkse. The idea of “keep up with the Jones” is perhaps as old as human history, and it plays an important role in economic development. Take again the Chinese experience as an example: it is still a matter of interesting research to investigate the process by which the Chinese people (especially the urban people) changed their taste in favor of modern products and services. Apparently it did not take long for the urban residents as well as the well-to-do in the rural sector to acquire a taste for such modern products as cigarettes or such services as a haircut of Western style. When one samples one modern product he is likely to develop a desire for others, and what he does is bound to be imitated by others. Thus the demonstration effect (regarding consumption) may not be as undesirable as Nurkse fears if the purpose is to find a market for new products.

The number of innovators or entrepreneurs is small in any nation. It is this group that is always tirelessly trying to explore new possibilities and introduce new technologies and production functions. When these entrepreneurs make a profit they try to reinvest as much of it as possible, not only in their

already established fields but also in new lines of business. It is this group which constantly probes and expands new economic frontiers. In the case of China, successful men of this kind have been very few in number in the modern era, but the records of the successful Chinese entrepreneurs like Chang Chien or Jung Tsun-ching seem to support out above viewpoint. The record of Jardine, Matheson and Company, a foreign trading firm in China, is even more revealing. It was founded in China as a small trading firm in the 1830's. Always growing, the firm became one of the largest trading firms in China, with an interest in a large number of industries, such as silk reeling, packing, cold storage, engineering, shipping, shipyards, insurance, cotton textiles and breweries.

### The Fallacy of Aggregation

The doctrine of growing points as presented above obviously does not fit into Leibenstein's theoretical framework. It is true, Leibenstein does not deny the process of cumulative development as outlined above, but he maintains, as noted previously, that such processes could not take place in an economy where per capita income is below a certain level, as it is in the underdeveloped countries. For in such an economy the cumulative effects of development would be outstripped by the induced depressing forces. We have discussed Leibenstein's induced depressants; let us now examine the validity of his most important income-depressing force, population growth.

In Libenstein's model, population is regarded as a function of per capita income, but such an aggregate analysis reveals little of the process of development. If attention is paid to the various sectors of the economy, it may be found that very little functional relationship exists between population and per capita income, even when per capita income is at a very low level.

Suppose there is a poor traditional society which is now under foreign political or economic intrusion as happened in China after the 1840's. The confrontation may set in motion a chain of events which will lead to a certain degree of economic modernization. In the case of China the confrontation with the West after the 1840's provoked considerable anti-foreign sentiment, and a number of economic measures were undertaken by the Chinese to counteract foreign economic influence in China. When this "retaliation effect" was reinforced by the demonstration and linkage effects of foreign economic penetration, a modern sector of the economy, though very limited, was developed along the Chinese coast, while the interior and agricultural sectors remained essentially unchanged.

When a country is developed in the above pattern, which may be conveniently called "development without", it is difficult to see how Leibenstein's population mechanism can work. In the modern sector, income and per capita income would rise if the rate of income growth is greater than the rate of induced population growth. Even here it is dangerous to pursue the analysis on a per capita basis. Certainly it is the entrepreneurial and managerial group that will enjoy the highest rates of income growth. The common worker's income may not grow much at all if the labor supply is, within a broad range, very elastic, as it appears likely to be in the "overpopulated" countries. The experience of Great Britain and Japan in the early stages of their development certainly does not indicate any significant increase in income for the common workers. Thus, even assuming that there is a relation between income growth and population growth (an assumption which is commonly held but is very dubious and which will be examined below), an increase in per capita income, raised primarily by rising incomes of the rich, may not be accompanied with any appreciable increase in population (leaving the matter of immigration aside).

In the rural sector it is almost by definition that nothing will change much under the pattern of "development without". In the long run the rural or tradition sector will be gradually encroached upon; this sector gradually diminishes as the modern sector expands. But there is no good reason to believe that in this traditional sector, when incomes remain essentially unchanged, the population will increase when there is a rapid increase in income in the modern sector, which by sheer arithmetic will increase per capita income for the entire economy.

Now let us consider another type of development which may be called "development within." Suppose there is some sort of agricultural revolution and the process of economic development starts in the agricultural sector and then diffuses into the industrial sector. Labor productivity in the agricultural

**Notes**

sector increases, but whether this will cause an increase of income for the average peasant depends very much on the structure of land ownership and the tenure system. It is quite possible that gains in productivity are reaped primarily by the landlords, leaving the standard of living of the average peasant virtually unchanged. Per capita income in the rural sector may thus increase considerably with little increase in population.

Leibenstein's assertion of a positive relation between per capita income and population may not be true even in a situation which approximates perfect income distribution. The determinants of population growth are of a very complex nature; to reduce them to one single factor, income, is very much of an oversimplification. The determinants of birth rates are far from being understood, and are undoubtedly different in different countries, because of different religious attitudes, family concepts or other values. Even for the death rate, income becomes an obvious crucial factor only when death is caused by outright starvation. Otherwise the relationship between income and the death rate is by no means a simple one.

**Population as a Factor of Growth**

So much for the effect of income growth on population growth. But thus far we have examined only half of the population theory as proposed by Leibenstein. The other half as noted before states that as population increases, per capita income will fall and return to its previous level. The constancy of per capita income will fall and return to its previous level. The constancy of per capita income in the long run has led Leibenstein, it may be recalled, to use the term "quasi-stable equilibrium." Our chief objection here is that as income increases there is little reason to believe that the induced population growth will necessarily outgrow income growth and reduce per capita income to its previous level, even if there is an induced population growth. Leibenstein invokes the law of diminishing returns to support his contention, but the law requires the condition "other things being equal." In the process of development this condition cannot be assumed as prevailing.

When an underdeveloped economy has experience for some time an increase in income at, say 2 per cent, there must be many changes in the structure of the economy and the utilization of resources. All the factors leading to further cumulative development as discussed in the section on growing points can be expected to continue to function. Why would all these factors cease to operate if there is an induced population increase? Leibenstein supplies no satisfactory explanation.

Given the state of the arts, the law of diminishing returns is bound to operate with regard to agriculture in countries where land is limited relative to labor and capital. But whether the law is operative with regard to agriculture in countries where land is limited relative to labor and capital. But whether the law is operative with regard to manufacturing is a different matter. It is quite possible that within a broad range, the law of increasing rather than decreasing returns may be at work. As Marshall emphasized, an increase of labor and capital would generally lead to improved organization and efficiency (and other external economies), thus offsetting the tendency toward diminishing returns. It may be true, as Wicksell insisted, that in the long run diminishing returns would eventually prevail even in manufacturing, but in the long run, the state of the arts cannot be held constant. It is precisely the progress in technology which has made possible the continued increase in production both in agriculture and in manufacturing in the now advanced countries.



*Did u know?* The "minimum" amount of effort that is required is "critical" for the economy to move towards development hence this theory is called **critical minimum effort**.

**Self-Assessment**

1. Fill in the blanks:
  - (i) The critical minimum effort theory has been given by ..... in his book Economic Backwardness and economic growth.

- (ii) The ..... is a function of per capita income and Rate of Investment is a function of per capita income.
- (iii) The system is ..... for small displacement but not large one.
- (iv) The critical minimum effort theory is more or less on extension of the .....

### 22.3 Stimulants and Shocks

Leibenstein has used these 2 terms **stimulants** and **shocks** in his theory quite often. He defines **Stimulant** as any event that changes the value of a variable away from its equilibrium value so that due to this event there is an initial increase in the per capita income. *Shock* on the other hand has been defined by Leibenstein as any event external to the system due to which per capita income is reduced initially.

Now in underdeveloped economies shocks are more powerful than stimulants so what should be done in such a scenario is that the levels of incomes should be risen to such an extent that stimulants become stronger than shocks and the growth in incomes becomes self sustaining.

#### Factors Determining the Need for a Minimum Effort

Leibenstein in his theory discusses the factors that determine the need for the **minimum effort** required by the developing economies:

- **Internal Diseconomies** : Because of presence of indivisibilities in the factors of production it is necessary for the economy to have investments of a certain minimum size.
- **External Economies Interdependencies and Balanced Growth** : In a closed economy, industries are **interdependent** on one another. So industry will require materials from industry 2, and so on. Therefore for one to exist the other must also exist. So this shows that the minimum investment required for all these industries to exist should be of considerable amount. This leads to a notion of balanced growth. Leibenstein says that if there were no technological indivisibilities then balanced growth could be easily achieved with any level of investment. But due to presence of indivisibilities balanced growth requires a substantial minimum amount of investment.
- **Overcoming Induced and Autonomous Depressants** : The developing or underdeveloped economies have both autonomous and induced factors depressants. To overcome these factors investments above a certain minimum size is required.
- **Non-Economic Aspects and Growth Momentum** : The underdeveloped countries have old and traditional attitudes and mindset, which has to be changed as these inhibit growth. Economic growth requires the promotion of the following type of attitudes:
  - (i) a strong profit incentive
  - (ii) willingness to accept entrepreneurial risk
  - (iii) an eagerness to promote technical and scientific progress.

If a country wants to achieve balanced growth, then critical minimum effort is almost a pre-condition.



Task

What is the meaning of "Stimulants and shocks"?

### 22.4 The Critical Minimum Effort Thesis

Furthermore, it might also be argued that sometimes a population increase will serve not as a braking force but as a stimulating force to further growth. In a country where the land-population ratio is high this seems likely to be true. Even in a country which is quite crowded, an increase in population may mean more labor force and the wage rate may thus be depressed. The beneficiaries may not be

Notes

Richardo's landlords only; the capitalists may also stand to gain. There is little doubt that the low level of wages was an important factor contributing to the development at the early stages in both England and Japan. In addition, under certain conditions the so-called disguised unemployment may turn out to be a source of capital formation and become an asset to economic development, as is so much emphasized by Nurkes. In short, while on the one hand one should not exaggerate the idea that population is always an asset to economic growth, it is unconvincing to maintain that it is always an asset to economic growth, it is unconvincing to maintain that it is always a liability. If it is Leibenstein fails to tell why and how it is in his model.

**Self-Assessment**

2. State whether the following statements are 'true' or 'false'.
  - (i) Critical minimum effort theory is one of the balanced growth theories.
  - (ii) A backward economy is an equilibrium system whose equilibrium state does not possess a degree of quasistability.
  - (iii) The critical minimum effort theory as opposed to big stress on the fact that a lump sum amount of investment has to be made instantaneously.
  - (iv) The critical minimum effort is also consistent with the concept of decentralised democratic planning as practiced in India.

**22.5 Summary**

- We have pointed out what we believe to be the weakness of Leibenstein's critical minimum effort thesis. Leibenstein himself admits that his theory is not a logical necessity. Indeed, in an interesting diagram he illustrates how an initial increase in income may lead to a continuous increase which he calls the case of slow progressive growth. But he discards this case as unrealistic for it fails to explain why many of the underdeveloped countries which must have experienced some stimulants or shocks have remained underdeveloped for centuries.
- But the same can be said of every country in the world before, say, the latter part of the eighteenth century. Rapid sustained growth in income has been a relatively new experience for mankind. And for those countries which are now economically advanced, it certainly has taken a long time to transform their economies from traditional to modern. The history of these countries scarcely supports the idea which Leibenstein implies that a small, gradual increase in income would not result in such a transformation. We are not prepared to agree that crash programs or large efforts are not desirable to accelerate the development of the underdeveloped countries today. The shortcomings in such an acceleration as pointed out by Ellis may be real and should be considered. The point is, however, that in view of the rising expectations of these countries, any failure to develop these countries at a reasonably fast pace may create serious political and social problems not only for these countries themselves but for the world as a whole.
- What we oppose is simply the idea that economic gradualism is doomed to failure, as Leibenstein suggests. In a sense Leibenstein has to be or had better be wrong; for in the absence of massive foreign aid or totalitarian methods in mobilizing resources, what hope would there be for these underdeveloped countries if economic gradualism would inevitably fail?
- The **critical minimum effort theory** has been given by *Harvey Leibenstein*, in his book *Economic Backwardness and Economic Growth*. This theory relates to overpopulated and underdeveloped or developing nations such as *India* and *Indonesia*.
- Nelson and Leibenstein have stressed on the importance of *Social structure, Human capital, and Entrepreneurship*, but they say that the development of these and investment in these sectors alone can not attain critical minimum effort.
- The main idea of the theory is that the **vicious circle** needs to be broken and the **per capita income** should increase.
- Leibenstein has used these 2 terms **stimulants** and **shocks** in his theory quite often.

## 22.6 Key-Words

Notes

- Critical : Extremely important because a future situation will be affected by it.
- Induced : to persuade or influence somebody to do something
- Quasi : that appears to be something but is not really so
- Diminish : to become or to make something become smaller weaker etc.

## 22.7 Review Questions

1. What is zero population growth?
2. What is the need for critical minimum effort? Discuss.
3. Critically examine the concept of critical minimum effort.
4. Explain the terms  
(i) Stimulant (ii) Shocks
5. State and explain the doctrine of critical minimum effort. What are its shortcomings.

### Answers: Self Assessment

1. (i) harvey leibenstein (ii) population growth  
(iii) quasi-stable (iv) harod-Domar model
2. (i) T (ii) F (iii) F (iv) T

## 22.8 Further Readings



Books

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 23: Low - Level Equilibrium Trap

### CONTENTS

Objectives
Introduction
23.1 Nelson Model
23.2 Graphical Demonstration of Theory
23.3 Summary
23.4 Key-Words
23.5 Review Questions
23.6 Further Readings

### Objectives

After reading this unit students will be able to:

- Know about Nelson Model.
- Explain the graphical demonstration of theory.

### Introduction

The theory developed by Richard R. Nelson in his article **A Theory of the Low-Level Equilibrium Trap** published in 1956.

According to Nelson the malady of underdeveloped economies can be diagnosed as a stable equilibrium level of per capita income at or close to subsistence requirements. At this low stable equilibrium level, both the rate of investment and saving are low. If per capita income is increased above the minimum subsistence level, it encourages growth in population. The population growth, in turn pushes down per capita income again to subsistence level. Thus the economy is caught in low level equilibrium trap. Getting out of the trap requires increasing the rate of growth of income to the levels higher than the rate of increase in population. In Nelson's opinion following four conditions are conducive to trapping:

### 23.1 Nelson Model

Nelson uses a model with three equations **First**, there is an income determination equation. Income depends on the stock of capital, the size of the population, and the level of technique. **Second** net investment consists of saving-created capital plus additions to the amount of land under cultivation. **Third**, there is the population growth equation according to which in areas with low per-capita incomes short-run changes in the rate of population growth are caused by changes in the death rate, and changes in the death are caused by changes in the level or per-capita income. Yet once per capita income reaches a level well above subsistence requirements, further increases in per-capita income have a negligible effect on death rate. With these three sets of relationships, it is easy to see that an underdeveloped economy is caught in a low level trap.

#### **Income determination equation**

In first case the economy is at minimum subsistence level of per capita income. When per capita is less than that of the minimum subsistence level the population decreases. After a stationary point

when per capita income increases then the subsistence level population increases until it reaches a physical limit. Population growth increases till it reaches its upper physical limit after which it declines. The declines occurs because at high per-capita income levels, people become conscious about their living standards and try to adopt a small family norm.



*Task* When was "A theory of the Leon-Level Equilibrium Trap" published?

**New investment is equal to capital created out of savings**

In this case there is a certain level of income in the economy with on savings as all the income is spent on consumption. Also the level of investment is zero. There is negative investment in the economy when savings are negative implying a situation where consumption is greater than income i.e. people live on past capital. However when per capita income rises then savings also rises from zero level which leads to rise in the investment level in the economy.

**Population growth equation**

Whenever the per capita income reaches a level above the subsistence level any further increase in it will have a negligible effect on death rates. Moreover changes in death rate are due to changes in per capita income.

**Conclusion**

Starting from this low level equilibrium trap, any small increase in per capita income will not be able to sustain itself or lead to further increase in per capita income because the rate of growth in population is higher than the rate of growth in total income.

This happens till the time rate of growth in population is greater than the rate in growth of total income. It is only when the level of per capita income is increased by a discontinuous jump that the country can hope to come out of the low level equilibrium trap, because the rate of growth exceeds the rate of growth of population. Nelson’s thesis advocates that if the country is to break the shackles of low level equilibrium trap, its rate of growth of total income must be higher than 3 percent per year. This can be done only when, to use Leibenstein’s terminology, that amount of minimum effort is undertaken which pushes up the level of capita income.



*Did u know?* Consequently, per capita income will fall to previous low equilibrium level.

**Explanations**

**“ The population tends to rise when per capita income rises above minimum subsistence wage.”**

According to Nelson underdeveloped countries have always stable equilibrium per capita income equal to subsistence level and this low per capita income entrapped such economies in vicious cycle presented below.

Notes

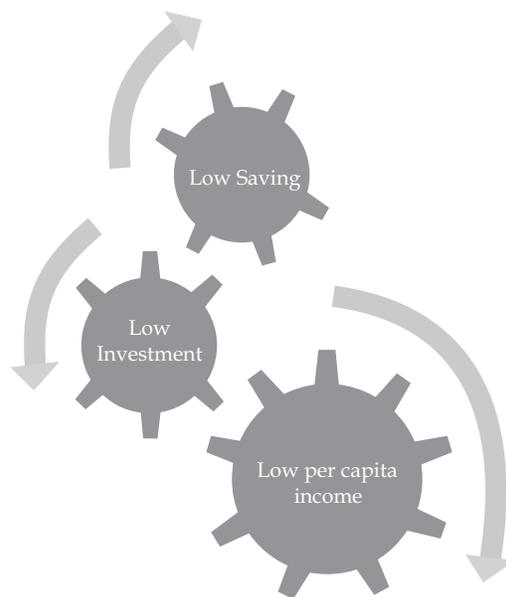


Fig.1

An increase in per capita income works on population growth rate as;

- In beginning increase in per capita income leads to increase population.
- Then it decrease population.

To show how underdeveloped countries (UDC's) are trapped by low equilibrium level of income Nelson presents three sets of relations.

- $Y = f(K, L, Tech)$
- New investment is equal to capital created out of savings (in form of addition to machine tools and addition of new land).
- Whenever the per capita income reaches a level above the subsistence level any further increase in it will have a negligible effect on death rates. Moreover changes in death rate are due to changes in per capita income.



Notes

As there is continuous increase in the per capita income there is a rising proportion of total income saved and invested.

**Reasons Behind the trap**

- High Correlation between per capita income and population growth rate
- Scarcity of non cultivable area of land.
- Inefficient techniques of production.
- Social and economic inertia.
- Little propensity to direct addition per capita income to increase investment.

**Self-Assessment**

- Fill in the blanks:
  - Second Net investment consists of ..... capital plus additions to the amount of land under cultivation in Nelson model.
  - ..... increases till it reaches it upper physical limit after which it declines.

- (iii) There is ..... investment in the economy when savings are negative implying a situation where consumption is greater than income.
- (iv) Nelson's thesis advocates that if the country is to break the shackles of low level equilibrium trap, into rate of growth of total income must be higher than ..... per year.
- (v) According to Nelson New investment is equal to ..... created out of saving.

Notes

### 23.2 Graphical Demonstration of Theory

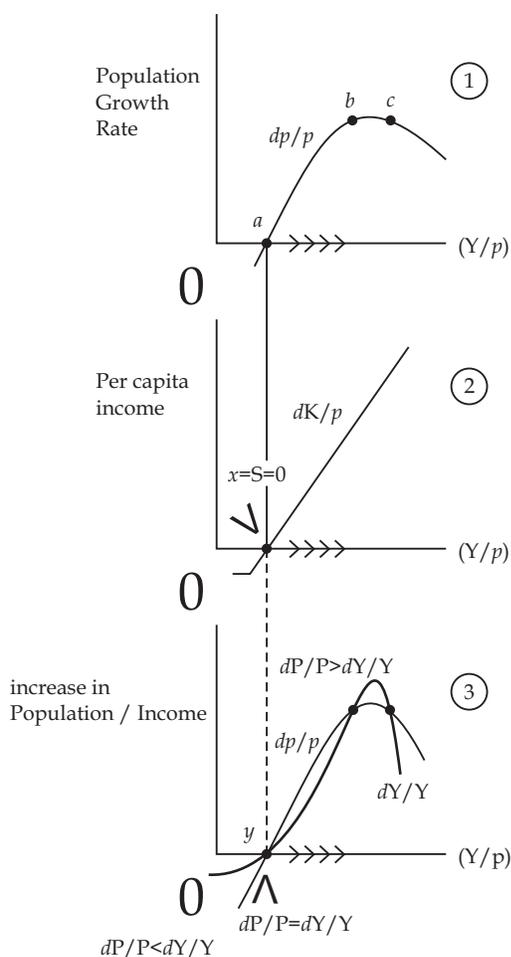


Fig 2

#### Explanation

- In panel (1) of figure the curve  $dp/p$  shows population growth rate by taking per capita income  $(Y/P)$  along x-axis and population growth rate along y-axis. Curve  $dP/p$  intersects x-axis at point "a" indicating minimum subsistence per capita income where  $dP/p = Y/P$ . Population is decreasing left to point "a" whilst it is increasing right to the same point shown by arrows. When per capita income is above subsistence level at first Population growth rate attains maximum point "b" then becomes stationary and lastly starts decelerating after point "c".
- Panel (2) of figure shows the curve of per capita rate of investment out of saving ( $dK/p$ ) relating per capita of investment with varying levels of per capita income. At point "x" savings are zero. Left to the point, saving is negative while it is increasing along investment growth curve ( $dK/p$ ).

**Notes**

- Panel (3) shows curves of population growth rate ( $dP/p$ ) and per capita income growth ( $dY/Y$ ) by taking  $dP/p$  and  $dY/Y$  along  $y$ -axis and per capita income along  $x$ -axis. Both curves ( $dP/p$ ) and  $dY/Y$  are intersecting at point “ $y$ ” where  $dY/Y = dP/p$ . Before point “ $y$ ”  $dP/p < dY/Y$  which push an economy to point “ $y$ ” where zero saving is equal to minimum subsistence level of per capita income. Above “ $y$ ” point  $dP/p > dY/Y$  pushing an economy again to point “ $y$ ”. This process goes on and on entrapping an economy of UDC’s in an equilibrium trap of low-level of per capita income.

**Getaway from the trap**

According to Nelson following steps can avoid trap;

- Favorable socio-economic and political environment.
- Reduction in family size.
- Change in income distribution.
- Proportion of public investment must be changed.
- Loans should be taken from foreign countries to support investment and capital.
- Improved techniques of production.

**Self-Assessment**

2. State whether the following statements are ‘true’ or ‘false’.

See the graph, (Fig. 2).

- Curve  $\frac{dp}{p}$  intersects x-axis at point “ $a$ ” indicating minimum subsistence per capita income where  $dp/p = y/p$
- Population is increasing left to point “ $a$ ” while it is increasing right to the same point shown by arrows.
- In panel 2 of figure 2 left to the point, saving is negative while it is increasing along investment growth curve.
- According to Nelson, there should not improved techniques of production for avoiding trap.
- There should be reduction in family size.

**23.3 Summary**

- According to Nelson the malady of underdeveloped economies can be diagnosed as a stable equilibrium level of per capita income at or close to subsistence requirements.
- If per capita income is increased above the minimum subsistence level, it encourages growth in population.
- Nelson uses a model with three equations First, there is an income determination equation.
- Population growth increases till it reaches its upper physical limit after which it declines.
- Nelson’s thesis advocates that if the country is to break the shackles of low level equilibrium trap, its rate of growth of total income must be higher than 3 percent per year.
- “ The population tends to rise when per capita income rises above minimum subsistence wage.”

### 23.4 Key-Words

Notes

- Trap : A clever plan designed to trick somebody either by capturing them or by making them do.
- Determination : The quality that makes you continue trying to do something even when this is difficult.
- Equilibrium : State of balance, especially between opposing forces.
- Demonstration : a public meeting or march at which people show people show that they are protesting against something.

### 23.5 Review Questions

1. What is income determination equation?
2. Explain the population growth income.
3. What are the reasons behind the trap?
4. Give some steps to avoid trap.

#### Answers: Self-Assessment

1. (i) Saving created (ii) population growth (iii) negative  
(iv) 3% (v) capital
2. (i) T (ii) F (iii) T (iv) F  
(v) T

### 23.6 Further Readings



- Books*
1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
  2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
  3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 24: Dualism and Dependency Theory

### CONTENTS

Objectives

Introduction

24.1 Dualism Theory

24.2 Kinds of Dualism

24.3 Kinds of Play and Extensions

24.4 Dependency theory

24.5 The Dependency Theory of Development

24.6 The Characteristics of Dependent Economy

24.7 Approaches to Dependency

24.8 The Marxian Theory of Dependency Theory

24.9 The Structuralist Theory of Dependency

24.10 Summary

24.11 Key-Words

24.12 Review Questions

24.13 Further Readings

### Objectives

After reading this unit students will be able to:

- Know about Dualism.
- Explain the dual kinds of play and extensions
- Explain the Dependency theory and dependency theory of development.

### Introduction

**Dualism theories** belong to the range of topics of the development theories. On the basis of the acceptance of at least two connected economic, social, technological or regional sectors in case of developing countries a pessimistic prognosis is particularly placed.

Often becomes from a “traditional”, subsistenzorientierten (i.e. on self-sufficiency) sector put on and a “modern” industrially organized sector gone out.

### 24.1 Dualism Theory

Dualism denotes a state of two parts. The word’s origin is the Latin *duo*, “two” . The term ‘dualism’ was originally coined to denote co-eternal binary opposition, a meaning that is preserved in metaphysical and philosophical duality discourse but has been diluted in general usage.

Dualism theories assume a split of economic and social structures of different sectors so that they differ in organization, level of development, and goal structures. Usually, the concept of economic dualism (BOEKE 1) differentiates between two sectors of economy:

The traditional subsistence sector consists of small-scale agriculture, handicraft and petty trade, has a high degree of labour intensity but low capital intensity and little division of labour; the modern sector of capital-intensive industry and plantation agriculture produces for the world market with a capital-intensive mode of production with a high division of labour.

The two sectors have little relation and interdependence and develop each according to its own pattern. The modern sector can be considered an economic enclave of industrial countries, and its multiplier and growth effects will benefit the industrial countries but have little effect on the internal market.

Economic, technological, and regional dualism are often the consequence of a social dualism, the absence of relationships between people of different race, religion, and language, which, in many cases, is a legacy of colonialism.

Development in dualism concepts is the suppression of the traditional sector by concentrating on and expanding the modern sector. In time, it is assumed that the trickle down effects will reduce and abolish dualism. In this line of thinking the main problem is capital formation because its degree determines the scope and speed of expansion of the modern sector. In general, agriculture has to provide the resources, labour as well as capital, for expanding the modern sector. In details, the strategies vary. Some authors, like LEWIS (14) and FEI/RANIS (5), assumed that a reduction of the labour force in agriculture, because of the widespread disguised unemployment, would not reduce agricultural production. The productive employment of these labourers in the modern sector would increase the total production of the economy and hence priority of investment in industry is necessary. Concentration on the modern sector led to an increasing regional disparity, rural urban migration, urban unemployment, a decrease in agricultural production, and hindrance in industrial development because of a lack of purchasing power in the rural areas. The anticipated trickle-down effects hardly ever happened. In praxis, development plans following this line of thinking led to failures like the early Indian development planning. Therefore, other authors, like JORGENSON (10), LELE (12), and MELLOR (17), emphasize the important role of agriculture at the beginning of development, i.e., preceding or parallel to industrial development in order to provide enough internal resources for the development process.



*Task* Describe the Dualism in your own words.

## 24.2 Kinds of Dualism

A **social dualism** is present e.g. if western social system beside the “traditionellen” native “imported” exists. With it often go an **economic dualism** of a supplying (“traditional”) sector with a substantially smaller modern sector of the economy, which aims at a small native group of buyers or for the export produced. A **technological dualism** exists with the parallel existence more modern and all technologies. The term **regional dualism** implies a division in two parts into developed and under development/regions left. The different kinds of dualism cause and complement each other often mutually.

Characteristics of the traditional sector are often small capital resources and the use of simple production engineering and organization along the extended family, like them in agriculture. handicraft, to find trade and small industry are.

### Political recommendations

Economics and development policy recommendations refer due to the Nichtverbundenheit and postulated Nichtverbindbarkeit of the sectors often on a one-sided promotion alone the modern sector (see also modernization theory).

**Notes**

Disagreement prevails with the question of the intensified international economic integration of developing countries into the world economic system. Dependency theoreticians reject this due to bad trading terms (*term OF trade*) for developing countries. Others see straight in the economic integration a chance for the overcoming of the dualisms.

### **24.3 Kinds of Play and Extensions**

A kind of play of the dualism theories is in 20<sup>th</sup> Century is enough popular dependency theory of the Raul Prebisch (see also center and periphery). A newer kind of play are the modernization theories.

#### **Criticism**

A main point of criticism at the dualism theories is the unsatisfactory explanation of the causes of the division in two parts into different sectors.

#### **Self-Assessment**

1. Fill in the blanks:
  - (i) The ..... subsistence sector consists of small-scale agriculture, handicraft and petty trade, has a high degree of labour intensity but low capital intensity.
  - (ii) Economy, technological, and regional dualism are often the consequence of a ..... dualism.
  - (iii) A ..... exists with the parallel existence more modern and all technologies.
  - (iv) ..... prevails with the question of the intensified international economic integration of developing countries into the world economic system.
  - (v) A main point of ..... at the dualism theories is the unsatisfactory explanation of the causes of the division in two parts into different sectors.

### **24.4 Dependency Theory**

Dependency theory is a body of social science theories. It contends that resources flow from a periphery of poor and underdeveloped states to a core of wealthy states, enriching the latter at the expense of the former. It is a central contention of dependency theory that poor states are impoverished and rich states are enriched, by the way poor states are integrated into the world system. In the next unit, you will be reading the Gandhian theory of development, which is based on Gandhian thought.

After studying this unit, you should be able to : explain the dependency theory of development, and the basic characteristics of a dependent economy; distinguish between the Marxian and non Marxian approaches of dependency theory; and narrate criticisms of dependency theory.

### **24.5 The Dependency Theory of Development**

Our discussion on the dependency theory of development is comprised of the characteristics of a dependent economy, approaches to dependency, and criticisms of dependency theory. Dependency theory evolved around 1950 as a reaction to some earlier theories of development. The main propounders of dependency theory are: Prebisch, Singer, Paul Baran, Paul Sweezy, C. Furtado, F H Cardoso, Gunnar Myrdal, A Gunder Frank, Girvan, and Bill Warren. Many of these scholars focused their attention on Latin America. The leading dependency theorist in the Islamic world is the Egyptian economist, Sarnir Amin.

Earlier theories held that all societies progress through similar stages of development. They say that at some time in the past, today's developed areas 39

**Theories of Development** were in a situation that is similar to that faced by today's underdeveloped areas.

Therefore, the task of helping the underdeveloped areas out of poverty is to accelerate them along the supposed common path of development by various means, such as investment, technology transfers, and closer integration into the world market. Dependency theory rejected this idea, arguing that underdeveloped countries are not merely primitive versions of developed countries; rather they have unique features and structures of their own. They are weaker members in a world market economy and the developed nations were never in an analogous position. They never had to exist under the patronage of more powerful countries than themselves. Dependency theorists argued, in opposition to free market economists, that underdeveloped countries needed to reduce their connectedness with the world market so that they might pursue their own path, more in keeping with their own needs, and less dictated by external pressures.

Hans Singer and Raul Prebisch, the prominent dependency theorists, observed that the terms of trade for underdeveloped countries, relative to the developed countries, had deteriorated over time. The underdeveloped countries were able to purchase fewer and fewer manufactured goods from the developed countries in exchange for a given quantity of their raw materials exports. This idea is known as the Singer-Prebisch thesis. Prebisch, an Argentinian economist at the United Nations Commission for Latin America (UNCLA), went on to conclude that the underdeveloped nations must employ some degree of protectionism in trade if they were to enter a self-sustaining development path. He argued that import substitution industrialization (ISI), but not a trade-and-export orientation, is the best strategy for underdeveloped countries.

The advocates of dependency theory believe that the theories of Smith, Ricardo, and the other European classical economists are not suitable to an analysis of the dualistic dependent structure of many nations such as Brazil, Mexico, and India. According to the dependency theorists, the less developed countries are to be understood as part of the global process. Their fate is merely to provide inputs for advanced nations. They provide low wage manufacturing under adverse terms of trade. Dependency analysis was built on the ideas of structuralists, more specifically, on the distinction between centre and the periphery made by Prebisch. The centre is viewed as the cause, and the periphery as the effect. Dependency theory found the causes for the lack of development to be external to the socioeconomic formations of the LDCs (Less Developed Countries). It does not treat dysfunctional institutions of the LDCs as the cause of backwardness. Internal institutional structures such as corruption levels, unproductive land holdings, concentration of wealth, and unresponsive political systems are never considered the causes of underdevelopment. Many dependency theorists advocate social revolution as an effective means to reduce economic disparities in the world system.

The basic premises of dependency theory are

- (i) Poor nations provide natural resources and cheap labor. They are export destinations for obsolete technology and for markets for the wealthy nations, without which, the latter could not have the standard of living they enjoy. Poor nations are at a disadvantage in their market interactions.
- (ii) Wealthy nations actively perpetuate a state of dependence by various means.

#### Dependency Theory

This influence may be manifested, involving economics, media control, politics, banking and finance, education, culture, sport, and all aspects of human resource development, including the recruitment and training of workers.

- (ii) Wealthy nations actively counter all attempts made by dependent nations to resist their influences by means of economic sanctions, and, possibly, by the use of military force. The poverty of the countries in the periphery is not because they are not integrated into the world system, or not fully integrated as is often argued by free market economists, but because of how they are integrated into the system.



Notes

Dependency theory was popular in the 1960s and 1970s as a criticism of modernization theory.

## 24.6 The Characteristics of Dependent Economy

After knowing the fundamentals of dependency theory, let us now discuss the characteristics of a dependent economy. Dependency is said to have been created with the industrial revolution, with the expansion of European empires around the world, and due to the superior military power and accumulated wealth of these empires. Some argued that before this expansion, the exploitation was internal, with the major economic centers dominating the rest of the country. The establishment of global trade patterns in the nineteenth century, allowed capitalism to spread globally. The wealthy became more isolated from the poor, because they gained disproportionately from imperialistic practices. This control ensures that all profits in less developed countries are remitted to the developed nations. It prevents domestic reinvestment, causing capital flight and, thus, it hinders economic growth.

The underlying conditions for dependency of any country are as follow : exporting firms are primarily owned by foreigners **iQ** exports are dominated by one, or a few commodities (iii) the export sector dominates the economy, and imports are larger in relation to GDP (iv) mineral and petroleum products are produced under conditions of vertical integration. The characteristics of a dependent economy are as follows **9** economic growth is not self activating **iQ** profits are normally repatriated, but not reinvested the production of export industries is dependent on imported inputs (iv) income, employment, and growth are determined by

- (a) the prices and the demand conditions of international market
- (b) the willingness of transnational corporation to invest
- (v) income, employment and growth are conditioned by

(a) changes in the prices and types of imports

Theories of **Deveplement b)** economic fluctuation abroad

(c) changes in taste and fashion

(d) changes in technologically created substitutes

vii) backward and forward linkages of export activities are very rare

(vii) foreign capital, foreign technology, and management **are** dominant economic actors.

According to Vernengo (2004), the **sine qua non** of the dependency relationship is not the Merence in technological sophistication as tditional dependency theorists believe. It is the difference in financial strengths between core and peripheral countries. In fact, the peripheral countries **are** incapable of **bornwing** in their own currencies.

### Self-Assessment

2. State whether the following statements are 'true' or 'false'.

- (i) Dependency theory evolved around 1990 as a reaction to some earlier theories of development.
- (ii) Dependency theory evolved around 1990 as a reaction to some earlier theories of development.
- (iii) The leading dependency theorist into the Islamic world is the Egyptian economist, Sarne's Amin.
- (iv) Dependency theory found the causes for the excess of development to be external to the socioeconomic formations of the LDCs.
- (v) Poor nations provide natural resources and cheap labour.

## 24.7 Approaches to Dependency

There are two main streams in dependency theory : The Structuralist stream, typified by the works of Prebisch, and Furtado; and the Marxist stream, developed by **Baran**, Sweezy, and **Frank**. Thus, two approaches are developed by two classes of economists. They are

- (i) the Marxian theory of dependency
- (ii) the Structuralist theory of dependency

Notes

### 24.8 The Marxian Theory of Dependency Theory

This theory was developed from a Marxist perspective by Paul Baran in 1957 and is detailed in his book, **The Political Economy of Growth**. Dependency theory shares many points with earlier Marxist theories of imperialism. It continues to attract interest from Marxists. Celso Furtado of Brazil was one of the first economists to use the term 'dependency' and to argue that development and underdevelopment are two aspects of one economic structure. Both Keynes and Myrdal greatly influenced his thinking concerning the link between the economy and power, the crucial role of the state, and the ways in which the international economy influenced, or constrained, the development process of national economies. After a political coup in 1964, Brazil strictly followed the development strategy of industrialization which generated a social exclusion process in the country. According to Furtado, however, development should be a social process. So, he argued for the necessity of incorporating Brazil's vast population of poor workers, farmers, and marginalized people into a process of inclusive social development. In his view, industrialization can unleash new social forces and pressures which bring about a process of inclusive social development. Being the head of National Bank of Brazil, Furtado focused on the northeast region and observed that the income gap between poor farmers and those residing in Sao Paul was greater than the income gap between the average income in Sao Paul and Europe in the 1950s. He created SUDENE (Superintendency for the Development of the Northeast), a Brazilian government agency created in 1959, which was designed to promote industrial development and land reform in the northeast region to counteract 'internal colonialism', as manifested in the exclusion of the northeast from Brazil's economic growth. According to Furtado, the northeast faced falling terms of trade for its commodity exports, and falling terms of trade in relation to its income earnings on the industrial goods bought from Sao Paul and Rio. Development and underdevelopment are one totality constantly produced within the structure of the economy. He maintained that there was a necessary link between FDI-led growth and rising internal inequality. To overcome dependence, the underdeveloped nations would have to create their own economic plans.

Marx believed that capitalism is characterized by creative destruction. It has two effects : destruction, and regeneration. Paul Baran emphasized the destruction side of capitalism in underdeveloped countries. He did not find evidence of regeneration. Rather, the monopoly capitalism of the twentieth century, unlike the competitive capitalism of the nineteenth century, had a vested interest in maintaining backwardness and dependence in the periphery. Baran's analytical contribution led to the flowering of the pessimistic and stagnationist school of dependency in Latin America and Africa. He found that Indian social scientists, having experienced British imperialism, had developed concepts very similar to the dependency theorists of the late nineteenth century.

Baran's theoretical point of departure was an analysis of economic surplus.

He defined economic surplus as the mass of resources (actual and potential) which a society could have at its disposal, in order to facilitate economic growth. It is the amount that might be reinvested in productive ways to **Theories of Development** increase the future level of social output. This surplus is the residual from total income after society's basic needs for food, clothing, shelter, and human companionship have been met. But, this surplus may be grossly misused. It may be utilized to erect sumptuous and multiple residences for the rich, or it may be wasted through a variety of ways of conspicuous consumption. The military, or the church may make tremendous demands on the surplus, or it may be drained away by foreign power via plunder, or, by simple profit repatriation as a result of foreign control over less developed countries. The historical analysis made by Baran makes it clear that the sources of poverty of less developed countries are found in the extraction of this surplus under colonialism. Thus, colonialism blocked the potential for change. Backwardness and poverty is perpetuated in these regions. According to him, the oppression of the feudal lords was ruthless, but

Notes

tempered by tradition. It was further worsened by the domination of both foreign and domestic capitalists. According to dependency theory, the exploitation of the people is multiplied because the oppression and violence inherited from the feudal past is combined with the rationality and intelligent rapacity of the capitalists. The fruits of capitalism were not to raise productive wealth in many countries such as India. These fruits went abroad and served to support a parasitic bourgeoisie at home. People lived in abysmal misery, and they had no prospect of a better future. Poverty and underdevelopment continued. They lost their time honoured means of livelihoods, their arts and crafts. There was no modern industry to provide new ones in their place. They were thrust into extensive contact with the advanced science of the west, yet they remained in a state of darkest backwardness.

By reviewing the history of colonialism, Baran made the following conclusions

- (i) profit margins fall due to the workers demand for higher wages
- (ii) foreign capital becomes the targeted source of increasing state revenue (by imposing higher taxes and higher royalty payments, for example)
- (iii) foreign exchange control is imposed to curb the funds flowing out of the country as repatriated profits
- (iv) tariffs on imported wage goods are imposed to protect domestic manufacturing.

Theoretically speaking, the state could break this deadlock by opting for new programmes that would make import substitution industrialization (ISI) more successful and dynamic. But the state, in the backward regions, is incapable of making the decisions needed to move forward on any front of development ladder. Baran argued that political revolution is necessary to break this pattern. He argued that by following the capitalistic route, these countries are not expected to achieve Rostow's stage of 'high mass consumption'. Instead, these countries would head towards their economic and social graveyards. Thus, by following the socialistic route, the less developed countries could reasonably expect some relief from poverty.



*Did u know?* Baran's favourite example of the destructive effects of capitalism was that of India.

## 24.9 The Structuralist Theory of Dependency

There is a group of structuralist dependency theorists who are not Marxians.

They reject the perspective of stagnation. Amongst them, the most reputed writer was Fernando Henerique Cardoso, an active Brazilian sociologist and **Dependency Theory** economist of international repute. He argued that nations on the periphery suffer from a type of 'peripheral capitalism'. One of the important features of these economies is economic stagnation, or, in the words of Andre Gunder Frank, an eminent dependency writer, 'development of underdevelopment'. Cardoso says that the dependent countries are not stagnant. The societies and economies of the periphery are continuously evolving. There are three major stages in the economic history of LDCs.

The first is the agro-export stage of the colonial period, when economic dualism was prevalent. During this stage, precapitalist sectors of artisans, petty producers, and peasant producers accounted for the bulk of economic activity. At this stage, some sectors, such as precious metals, minerals, and tropical products are integrated with the world market. The production of these exportables takes place in modem and semi-capitalist enclaves.

The second is the stage of developmentalist alliances. After the Second World War, some LDCs experienced major transformation through import substitution industrialization (ISI). In this stage, a new social structure of accumulation is created which is based on the collective interest of industrial workers, peasants, and capitalists.

The third is a corporatist regime stage, where there are drastic curbs on democracy, unions, universities, and other areas of society where dissent might be encountered. The populist orientation of the second



Notes

### **24.12 Review Questions**

1. What are the characteristics of Dependent Economy?
2. Explain the term “Dualism”.
3. Give an overview of Dependency theory of development.
4. What are the types of dualism?
5. explain the Marxion theory of Dependency theory.

### **Answers: Self-Assessment**

1. (i) traditional (ii) social (iii) technological dualsim  
(iv) disagreement (v) criticism
2. (i) T (ii) F (iii) T (iv) F  
(v) T
3. (i) (a) (ii) (b) (iii) (c) (iv) (b)

### **24.13 Further Readings**



Books

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 25: Theories of Development: Classical Theories of Development

Notes

### CONTENTS

Objectives

Introduction

25.1 Adam Smith's Theory of Economic Development

25.2 Ricardian Theory of Economic Development

25.3 Malthusian Theory of Economic Development

25.4 J.s Mill's Theory of Economic Development

25.5 Marxian Theory of Economic Development

25.6 Summary

25.7 Key-Words

25.8 Review Questions

25.9 Further Readings

### Objectives

After reading this unit students will be able to:

- Know about the Adam Smith's Theory of Economic.
- Understand Ricardian theory of economic development.
- Describe the Malthusian theory of economic development.
- Learn the J.S Mill's Theory of economic development, etc.

### Introduction

The classical school of economic thought was formally propounded by Adam Smith, who is called 'father of Economics', Malthus, David Ricardo, John Mill and J. B. Say. Each thinker has put forward a view which is different from others but still has some similarities. Therefore these theories are grouped under one heading of classical theories of development. While Malthus and Mill emphasized on demand side; Smith, Ricardo and Say gave greater importance to supply side. This unit discusses the ideas of Adam Smith, David Ricardo, John Mill, Malthus and also Karl Marx.

### 25.1 Adam Smith's Theory of Economic Development

Adam Smith wrote a book 'An inquiry into the nature and causes of wealth of nations' which was published in 1776. The publication of this book gave birth to Economics as a separate discipline. Although he did not propose any systematic growth theory but his ideas that are expressed in his book do give an idea of how growth occurs in a country. Adam Smith gave a supply side driven model of growth that can be explained with a simple production function

$$Q = F(L, L_l, K)$$

Where Q is quantity produced, L is labour,  $L_l$  is land and K is capital. Since output is dependent on labour, capital and land, any growth in output ( $g_y$ ) is driven by growth in labour ( $g_l$ ), growth in capital ( $g_k$ ) or improvement in land ( $g_{L_l}$ ) and improvement in overall productivity ( $g_p$ ).

$$g_y = a(g_l, g_k, g_{L_l}, g_p)$$

Notes

Assumptions

1. Population growth was taken as an endogenous variable. It was considered to be a function of subsistence available to accommodate increasing work force.
2. Investment was also taken as an endogenous variable and was considered to be a function of rate of savings.
3. Land growth could take place either by conquest of new land via colonization which prevailed then or improvement in the fertility of old lands.
4. Specialization increases the productivity and enhances the rate of growth.
5. Smith assumed that there existed perfect competition in the market.



Notes

Technological progress can also take form of improvements in machinery and international trade which can act as engines of growth.

Main Features

1. **Natural Law:** Adam Smith strongly believed in the efficiency of laissez faire market system. He proposed maximization of self interest automatically leads to maximization of social interest. When each individual tries to maximize his own individual interest, he is led by an 'invisible hand'. When each individual will maximize his own wealth in a free Laissez faire economy, then all individuals, if left free, will maximize aggregate wealth. He supported free trade and criticized any form of government intervention.
2. **Division of Labour:** Division of labour increases the specialization of a worker and thereby increases the overall productivity. Division of labour : (a) increases the dexterity of every worker; (b) saves time of producing goods; (c) leads to invention of large number of labour saving machine. However, increase in productivity also stems from capital through improved technology which depends on the size of market.
3. **Process of Capital Accumulation:** Division of labour leads to capital accumulation and this capital accumulation leads to a higher rate of development. But it is capital accumulation which must precede division of labour because it will stimulate specialization. Smith assumed that only capitalists and landlords were capable of savings. Labourers could not save because of 'Iron Law of Wages' which states that at any point of time wages tend to equal to the amount necessary for subsistence of labourers. If it is more than this, then there will be increase in competition for employment and wages will decrease.
4. **Investment is made to earn Profits:** Classical economists stated that capitalists made investment in an expectation to earn profits on them and these expectations depended on the present climate for investment and actual profits in the present. Smith also proposed that profits tend to fall with increase in the rate of capital accumulation. As economy's capital stock grows, demand for labour force increases, it increases competition for getting labour which leads to increase in wage bill and thereby reduces profits.
5. **Interest:** Quantity of capital for lending will increase with the fall in interest rates and *vice versa*. Interest rates will fall with progress and prosperity and hence supply of capital will go up.
6. **Agents of Growth:** Smith believed that farmers, producers and business man are agents of economic growth. The function performed by these agents of economic growth are inter-related.



*Did u know?* Smith stated that the process of economic growth is cumulative. The process of expansion is not endless. Scarcity of natural resources finally stops growth.

### A Critical Appraisal Merits

- (a) It gives a thorough explanation of how growth occurs in an economy.
- (b) He explained the importance of capital accumulation, technological improvement, division of labour-increase in market size in the process of economic growth.

### Weaknesses

- (a) Smith's theory is based on the assumption of a rigid division of society between capitalists and labourers. The theory neglects the role of middle class.
- (b) In advanced society maximum savings are being generated from salary class however, he assumed labour can't afford to save.
- (c) Perfect competition does not exist in real life scenario. It limits the application of Smith's theory.
- (d) Smith neglected the role of entrepreneur and thereby the role of innovations in development.

### Self-Assessment

1. Fill in the blanks:
  - (i) Adam Smith wrote a book an inquiry into the nature and causes of wealth of nations which was published in .....
  - (ii) Smith assumed that there existed perfect ..... in the market.
  - (iii) ..... strongly believed in the efficiency of *laissez faire* market system.
  - (iv) Smith believed that ..... and ..... are agents of economic growth.
  - (v) ..... is called father of economics.

## 25.2 Ricardian Theory of Economic Development

Like Smith, Ricardo also never gave a systematic theory of development but gave his views in an unsystematic manner in his book 'The Principles of Political Economy and Taxation'. Ricardo gave his most important contribution in the form of his concept of diminishing returns to land.

### Assumptions

1. All land is used for the production of one crop say, corn.
2. Land is subject to diminishing returns to a factor;
3. Supply of land is fixed;
4. Labour and capital both are variable inputs;
5. Technology is given and remains unchanged;
6. Wage rate is equal to subsistence level;
7. There exists perfect competition in the market;
8. Wage rate and quantity supplied of labour is given and constant;
9. Demand for labour is a function of accumulations;
10. Capital accumulations occur from profits.

### Main Features

1. **Rent, Profit and Wages:** Ricardo defined rent as that portion of the produce of the earth which is paid to the landlord for the use of original and indestructible powers of the soil. The wage

Notes

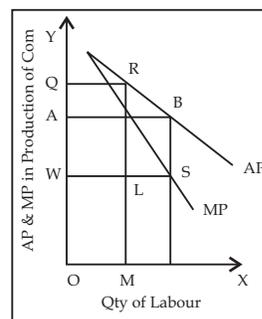
rate is determined by wage fund divided by number of workers employed at subsistence level. Ricardo opined that in total produce of the corn, the first payment is made to landlord; the residual is distributed between wage and profits (interest is included in profits). Had land been in unlimited supply and uniform it would have earned no interest.

2. **Capital Accumulation:** According to Ricardo, capital accumulation depends on following factors :
  - (a) **The Profit Rate:** Profit divided by capital employed gives us the rate of profit. As long as, rate of profit is positive, capital accumulation will continue to take place. Since depend on wages which in turn depend on the price of corn and fertility of land. Hence, profits and wages are inversely related.
  - (b) **Increase in wages:** If the cost of subsistence increases, wage rate will increase. With the increase in demand for food more land will have to be brought under agriculture. It will increase the demand for labour and wages will rise. With rise in wages, price of crop will also rise and hence rent will increase. But profits will fall leading to a decline in capital accumulation.
  - (c) **Declining Profits in Other Industries:** Ricardo took agriculture as the determining sector. The profits in agriculture determine profits in other industries. Therefore, the profit rate in both agriculture and industrial sector must be same.
3. **Other Sources of Capital Accumulation:** Ricardo states that higher will be the difference between production and consumption, higher will the rate of profits. Hence, capital accumulation can be increased by increasing production or by decreasing unproductive consumption. Productivity of labour can increase through technological progress and better organization. However, use of capital intensive techniques will lead to unemployment. Ricardo considered following as additional sources of capital accumulation :
  - (a) **Taxes:** Ricardo suggested that taxes should be levied to reduce conspicuous consumption as it is unproductive consumption and no how increases the productivity of labour. These taxes can be used by government for capital accumulation. The taxes which affect incomes of landlords or labourers were not favored by Ricardo.
  - (b) **Free Trade:** Ricardo is in favour of free trade as it promotes capital accumulation.

**Stationary State:** According to David Ricardo, in the long run, profits have a natural tendency to fall so that country ultimately reaches a stationary state.

Rise in profits → Rise in Capital Accumulation → Rise in production → Increased wage fund → Increase in population → increase in demand for corn and price of corn goes up → Demand for land increases → rent increases and profits and wages decrease → wage become equal to subsistence level

It is shown with the help of following figure. Labour is measured on x axis and AP and MP on y-axis. It is shown that as demand for labour rises, leading to-rise in wage bill from OWLM to OQRM, all profits disappear. Share of rent increased.



**A Critical Appraisal Merits**

- (a) He emphasized that growth of ago culture is important for economic growth because it supports industrial growth.
- (b) He emphasized the role of high rate of profit for economic development.
- (c) He gave due importance to foreign trade in economic development.
- (d) His theory is dynamic as it considers the effects of change in different variables on economic development such as population, wage, rent profit etc.

**Weaknesses**

- (a) Ricardo neglected the role of technology in economic development.
- (b) No economy reaches at a stationary state as claimed by Ricardo in which profits are increasing, production s rising and capital accumulation is taking place.
- (c) It is baseless to assume that wages can not increase above subsistence level.
- (d) Advanced countries have shown increasing returns for a long time proving the notion of diminishing returns to be wrong.
- (e) In today's world there is no economy where there is no government interference. Hence, the assumption of Laissez faire policy is invalid.
- (f) The theory does not distinguish between capitalist and entrepreneur and interest as a part of profits.
- (g) Ricardian theory is theory of distribution and not growth.
- (h) Land has alternative uses and can not be used only for the production of corn.



*Caution* Capital and labour are not fixed coefficients of production.

**25.3 Malthusian Theory of Economic Development**

Malthus in his book 'The Progress of Wealth' gave a more systematic theory of growth. Malthus in his theory of population states that unchecked population growth always exceeds the growth and the means of subsistence which makes means more and more scarce. He stated that population rises in geometric progression while food supply increases in arithmetic progression. There is thus disequilibrium between increase in population and food production and this inequilibrium is tending to be wider with time.

According to Malthus, this disequilibrium would create conditions of starvation and under nourishment leading to high mortality and low life expectancy. There could also be epidemics, famines, other man made and natural calamities. Malthus referred to these as 'positive checks' which follow inevitably if human beings do not take preventive measures. According to Malthus, preventive checks may be celibacy, late marriage, moral restraints etc.

Malthus warns that there is nothing automatic about economic growth. Population growth by itself is not sufficient, to bring economic development. He says population growth cannot take place without proportionate or nearly proportionate increase of wealth. Secondly, even if population grows, it must also bring about increase in effective demand of labour which in turn depends on rate of capital accumulation.

**Effective Demand**

Malthus flatly repudiated 'Say's Law' which stated that "supply creates its own demand".

Malthus gave a different kind of circular flow of income. He states that national income is generated by investment, capitalists' consumption and workers' consumption. It can be shown as follows:

Notes

$$O = P + W$$

Or  $P = O - W$

Where, P is profit, W is wages and O is output.

Since wages are quite less, workers are not able to save at all. They spend their entire income on consumption. It is shown by  $C_w$ . Capitalists spend a portion of their income denoted by  $C_c$  and save the other portion denoted by I

Hence,  $O = C_w + C_c + I$

$$P = O - W \text{ or } C_w + C_c + I - C_w = I + C_c$$

Therefore, profits are equal to the sum total of capitalists' consumption and investment.

**Role of Capital**

Malthus gave a concept of Optimum propensity to save. He considered two aspects of savings. It increases investment but decreases consumption. To a certain level, the positive effect of saving i.e. increase in investment due to enlarged saving is greater and hence savings increase total output in the economy. But after attainment of optimum propensity to save, savings bring consumption down to such a low level that even investments start getting discouraged. Malthus advocated free trade and Laissez faire economy and that each individual is best judge of his personal interest.



*Task* Write the role of capital.

**Structural Change**

Malthus was the first economist who gave a germ which was later developed by Colin Clark that with the increase in the level of economic development structural changes of such type take place in the economy that reduces the relative importance of agriculture. Malthus believed that there are two sectors in the economy; agriculture and industrial sector; the former triggers the growth of the latter.

Malthus assumed that capital was invested in agriculture as long as it could profitably absorb it. After all arable land was brought into cultivation, stocked and improved; then there were no profitable investment opportunities in agriculture sector, then only industrial sector offered profitable opportunities of investment. If enough investment took place to absorb the increasing population; then cost of living of workers will, reduce on the land and wage rates will reduce in corns.

Malthus suggested that in underdeveloped economies remain underdeveloped because each sector constitutes the market for the other sector; thus if one sector is not able to expand it also hampers the growth in other sector. Hence, economy needs to follow Balanced Growth strategy to have any growth at all. He further explained that the poverty of agriculture sector in underdeveloped countries is the main cause of under development of industrial sector.

He explains the causes of poverty in agriculture. He said, large land owners have no incentive to do more intensive cultivation due to limitations of the market and peasants lack capital to do agriculture more efficiently.

Therefore, industrial sector remains limited in total size. It is capital intensive in nature and provides employment for relatively few people.

**A Critical Appraisal**

Malthus contribution in theory of growth is worthwhile. His repudiation of Say's Law of Market and bringing in the concept of effective demand is also appreciable. His theory is more valuable to under developed countries.

**Self-Assessment**

Notes

2. Multiple choice questions:

*Choose the correct option*

- (i) Who did give his most important contribution in the form of his concept of diminishing returns to land?  
 (a) Ricardo                      (b) Smith                      (c) Marshal                      (d) Malthus
- (ii) "The principles of political economy and taxation" is written by  
 (a) Smith                      (b) Ricardo                      (c) Marshal                      (d) Malthus
- (iii) "The progress of wealth" is written by  
 (a) Smith                      (b) Ricardo                      (c) Marshal                      (d) Malthus

**25.4 J.s. Mill's Theory of Economic Development**

J. S. Mill recognized economics as a science of welfare. His work was more subtle and original. He concerned himself with well being of men and women in society.

***J. S. Mill's Coherent Exposition of the Growth Process***

Mill defined in an orderly manner the three agents land, labour and capital followed by the degree of productiveness of his three productive agents. He propounded that however, land is subject to diminishing returns but innovations and inventions are capable of exercising an antagonistic influence on the law of diminishing returns to agriculture labour. He suggested innovations should include improved education of the working force, improved system of taxation, improved system of land tenure, preparing richer strata for constructive roles in society. He drew a sharp line between production and other human institutions.

***Population and Work Force***

Mill extended the basic proposition given by Malthus and Ricardo. He advocated a sustained public policy for family planning to ensure smaller family size; efforts must be made to popularize education and moving the society to a higher level of income. He believed in popularizing birth control. He even favoured that birth control policy can be made explicit. He further added that the productivity of labour depends upon the quality and quantity of other factors of production with which it must combine.

***Investment and Technology***

Mill distinguished between fixed capital and working capital. While dealing with profits, he categorized profits into three components interest, insurance against risk, and wages for superintendence. He also gave the determinants of a minimum profit rates and variations he suggested that there is a tendency of the profit in various sectors to reach towards equality. Mill is criticized by some economists like Schumpeter for not giving complete investment process.

***Business Cycles***

Mill propounded that the calculations of the producers and traders are imperfect. There are almost at all times, some commodities are in excess and some others are in deficiency. Rising prices may dupe the producers of riches. Mill believed that an almost periodical cyclical process operates in which individuals have made decisions in the conditions of imperfect knowledge of the market conditions, investment decisions of others in response to the future expectation of profit or loss.

***The Stages of and the Limits to Growth***

Rostow expressed Mill's dynamic analysis in the form of different cases:

**Case I:** When population increases with stationary capital and arts of production, there will be decline in real wages and rise in rents.

Notes

- Case II:** When capital increases with stationary population and arts of production, there will be rise in real wages, demand for food and rents but profits fall.
- Case III:** When population and capital increase equally, with stationary arts of production, there will be decline in profits and rise in rents; real wage rate will remain same.
- Case IV:** When population and capital remain stationary and arts of production progress, there will be decline in rents, rise in real wages and profits remain unchanged.
- Case V:** When population, capital and arts of production, increase together, there will be increase in rents only.

## 25.5 Marxian Theory of Economic Development

Karl Marx's contribution in the theory of economic development is critical because he provided his famous reproduction schema in a multi-sector growth model and introduced the concept of "steady-State" growth equilibrium. He also took labour as exogenous to wages. He proposed that wages are determined by the bargaining between capitalists and workers. However, the bargaining ability of workers depends on the number of unemployed labourers in the economy. He called it "reserve army of labour". He also advocated that savings and capital accumulation depends on profits.

### *Organic Composition of Capital and Surplus Value*

Marx proposed that in the long run profits tend to fall due to "rising organic composition of capital".

Organic composition of capital is the ratio of constant capital to variable capital. Constant capital means circulating capital like raw material. Variable capital means advancement to labour i.e. total wage bill. So, Marx gave total value of output as :

$y = c + v + s$  where  $y$  is output;  $c$  is constant capital;  $v$  is variable capital;  $s$  is surplus value.

Marx defined rate of profit is equal to

$$r = s / (v + c)$$

and,  $s = y - (c + v)$

Marx called  $s/v$ , the ratio of surplus value to variable capital as "rate of exploitation". Given  $r = s / (v + c)$ ; if we divide this equation by  $v$  on both sides, it will be equal to :

$$r = [(s/v) / (v / (v + c))]$$

Therefore, rate of profit is a positive function of exploitation rate ( $s/v$ ) and a negative function of organic composition of capital ( $c/v$ ).

### *Declining Rate of Profit*

Marx claimed that rate of profit tends to fall because  $s/v$  tend to be same and  $c/v$  tends to fall. In a static economy, when the surplus accrues to capitalists, they reinvest it and output expands. It exerts a pressure on constant labour supply pushing wages upward therefore  $v$  i.e. variable capital rises and  $r$  i.e. rate of profits fall. Rise in wages motivate capitalists to introduce labour-saving machinery and profits increase and unemployment increases.

### *It will have two effects*

- Variable capital will fall and constant capital will increase therefore,  $c/v$  remains constant.
- "Reserve army of labour" will affect wage rate and reduce it to subsistence level. Therefore, it declines further. It will increase  $c/v$  and the rate of profit will fall.

However, introduction of labour saving machinery and laying off of labour would mean rise in  $c$  and fall in  $v$  i.e. organic composition of capital rises. Therefore  $r$ , rate of profit falls.

### *Increasing Rate of Exploitation*

Capitalists make an effort to compensate themselves for this declining rate of profit by increasing the rate of exploitation. The rate at which labour is released is higher than the rate at which it is

reabsorbed. Therefore, it creates permanent technological unemployment. However, there is a limit to which this rate of exploitation can be increased.

As large firms will buy small firms, there will be concentration of capital in fewer hands. This in combination with the misery of labour would create giant crisis leading to destruction of capitalism as a whole.

#### ***A Critical Appraisal Strengths***

- (a) Smith, Ricardo and Marx all concluded that increasing share of rent in total output leads to declining rate of profits and results in stationary state.
- (b) It proved that capitalism can't sustain for long.
- (c) He explained class struggle through his version of economic growth.

#### ***Weaknesses***

- (a) Fall in profit is possible but not inevitable.
- (b) Marx's rate of exploitation is limited by the length of working day. It is not plausible.
- (c) Technological progress may not necessarily increase organic composition of capital.

#### **Self-Assessment**

3. State whether the following statements are 'true' or 'false'.
  - (i) Mill extended the basic proposition given by Malthus and Ricarde.
  - (ii) He did not believe in popularizing birth control.
  - (iii) Kari Marx's contribution in the theory of economic development is critical.
  - (iv) There is not a limit to which the rate of exploitation can be increased.
  - (v) Marx's rate of exploitation is limited by the length of working day.

### **25.6 Summary**

- The classical school of economic thought was formally propounded by Adam Smith, who is called 'father of Economics', Malthus, David Ricardo, John Mill and J. B. Say. Each thinker has put forward a view which is different from others but still has some similarities.
- Adam Smith wrote a book 'An inquiry into the nature and causes of wealth of nations' which was published in 1776.
- Like Smith, Ricardo also never gave a systematic theory of development but gave his views in an unsystematic manner in his book 'The Principles of Political Economy and Taxation'.
- Malthus in his book 'The Progress of Wealth' gave a more systematic theory of growth. Malthus in his theory of population states that unchecked population growth always exceeds the growth and the means of subsistence which makes means more and more scarce.
- Karl Marx's contribution in the theory of economic development is critical because he provided his famous reproduction schema in a multi-sector growth model and introduced the concept of "steady-State" growth equilibrium.

### **25.7 Key-Words**

- Efficiency : the quality of doing something well with no waste of time or money
- Accumulation : process to gradually get more and more of something over a period of time
- Interference : the act of interfering

Notes

### 25.8 Review Questions

1. Give the assumptions of Adam Smith's theory of economic development and describe the main features.
2. Critically evaluate the strengths and weaknesses of Smith's theory of economic development.
3. State the assumption of Ricardo's theory of development. Compare the Ricardian model with Adam Smith's theory of development.
4. Critically examine the contribution of Malthus to the theory of economic development.
5. Describe J.S. Mill's theory of economic development and briefly state his views on business cycles.
6. Compare Marx's theory of economic development with the Ricardian theory.
7. Explain Marx's theory of increasing rate of expansion and declining rate of profit in a capitalist economy.

### **Answers: Self-Assessment**

1. (i) 1776 (ii) Competition (iii) Adam Smith  
(iv) farmers, producers, businessman (v) Adam Smith
2. (i) (a) (ii) (b) (iii) (d)
3. (i) T (ii) F (iii) T (iv) F  
(v) T

### 25.9 Further Readings



Books

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 26: Schumpeter Model of Growth

Notes

### CONTENTS

Objectives
Introduction
26.1 Schumpeter's Theory of Capitalistic Development
26.2 Schumpeter's Theory as a Model of Evolutionary Growth
26.3 Some Neo-Schumpeterian Models
26.4 Summary
26.5 Key-Words
26.6 Review Questions
26.7 Further Readings

### Objectives

After reading this unit students will be able to:

- Know about the Schumpeter's Theory of Capitalistic Development.
- Describe the Schumpeter's Theory as a model of evolutionary growth.
- Learn the some Neo-schumpeterion models.

### Introduction

J.A. Schumpeter is an economist who emphasized the role of innovations in economic growth and development. Majority economists have claimed that perfectly competitive form of market gives the most efficient allocation of resources but Schumpeter favored imperfect competition because it gives a fertile ground for innovations. He is an economist who strongly defends monopoly for the freedom it gives for innovations and entrepreneurial activity. This chapter explains the views of Schumpeter on development in a capitalist economy and also some new theories which are an extension of Schumpeter theory.

### 26.1 Schumpeter's Theory of Capitalistic Development

All theories given by classical economists emphasized on the supply side of the production. They claimed that economic growth meant increase in productive capacity or supply of greater goods and services. Schumpeter was not different. But classical economists believed that output increases by increase in capital formulation; Schumpeter claimed it happens due to Innovations. According to Schumpeter, innovation means the ability of entrepreneurs to use the new ideas or invention to create a new combination of factor inputs which reduces cost and increases profits. In other words, innovation is the capability of organizers to use resources in a different combination which increases their efficiency. Schumpeter did not give so much importance to capital formation. He claimed that innovation in an economy is a continuous process. More effective innovation lead to more efficient utilization of resources and thereby higher profits. Innovations can take form of:

- (a) Introduction of a new good
- (b) Introduction of new method of production
- (c) Innovating a new market
- (d) Finding new source of supply of raw materia
- (e) Designing a new form of organization.

**Notes**

Schumpeter called his theory 'a creative destruction' because every new innovation makes the old things obsolete. And this creative destruction leads to a process of incessant revolutionary change from within. For example, telecommunication from landline to wireless, then mobile and now mobile is a mini computer and every new creation in the industry makes the older one obsolete.

Schumpeter had a different notion of competition. He understood competition to mean 'do or die'. It is always a win-lose game. He did not think of win-win situations. Schumpeter claimed if innovations stop, excess profits will eliminate and gradually there will be no competition at all. But entrepreneurs will undertake a thorough research and development activity to ensure continuity of excess profits.

All classical economists took mobilization of savings as a source of capital formation and economic growth. However, Schumpeter felt that innovations involve risk. So the funds for trying innovations come through credit. This credit is provided by the capital market. Hence, Schumpeter gave importance to existence of well organized capital market in the economy to ensure innovations and introduction of newer products, better technology and thereby enhanced output and increased rate of economic growth.

Schumpeter's theory is an endogenous theory. It takes capital formation as a social process through the working out of a system in which there is win-lose competition. He did not agree to Neo-Classical economists who restored to perfect competition and competition without rivalry.

The differences between views of Schumpeter and Neo-Classical Economists can be summarized as follows:

- (a) Neo-Classical Economists claim that there is perfect competition prevailing in the market and hence no super normal profits exist in the long run; Schumpeter claims the existence of monopoly (through intellectual property rights) and Monopolistic competition and super normal profits do exist.
- (b) Neo-Classical Economists discussed short run and a static model; Schumpeter discussed long run and a dynamic model.
- (c) Neo-Classical Economists claimed that there will more savings which will be better mobilized and bring about economic growth. However, Schumpeter explained two forces for economic growth; (a) availability of intellectual man power and organizers; (b) innovations and technological progress.



Notes

Schumpeter felt that it was innovations through which a producer could grasp a larger market share and not price war.

## 26.2 Schumpeter's Theory as a Model of Evolutionary Growth

Schumpeter did not use mathematical tools to find the quantitative relationships between innovations and critical economic variables. He never believed in rigid quantitative relationships as he based his ideas on innovations and dynamic nature of the economy, he did not make any rigid model based on any restrictive assumptions. His theory is descriptive and not mathematical in nature.

Schumpeter's theory also gives an explanation for business cycles. Business cycle refers to the up and down trend in business which has four phases: boom recession, depression and recovery. He claimed these ups and downs are recurrent in a capitalism system.

Schumpeter's theory is evolutionary in nature because he concluded that capitalism would eventually give rise to socialism. It is so because gradually, innovations itself will become monotonous and a routine activity.

Some times it is very much possible that new innovations do come but do not make the old ones obsolete. It will happen when there are respective merits and demerits of both. For example, even the

introduction of online coaching has not reduced importance of face to face learning sessions as both have their own respective merits and demerits. So Schumpeter's concept of creative destruction does not work.

Schumpeter believed money to have a vital and role in the economic system here he agreed to Keynes but he criticized Keynes for not considering the basic structural change in the economy in his theories.

In nutshell, Schumpeter's theory is dynamic, realistic and convincing but lacks any mathematical or quantitative means to have a definite relation between economic variables but this is also the merit of the theory as it makes it flexible.

When Schumpeter claims that gradually, with innovations capitalism will evolve into socialism, he recognizes that psychological fact that even innovations which are so creative become monotonous through repetition.



*Did u know?* He also agrees that socialism is the only economic system that can prevail in the long run.

### Self-Assessment

1. Fill in the blanks:
  - (i) J.A. Schumpeter is an ..... who emphasized the role of innovations in economic growth and development.
  - (ii) All theories given by ..... economists emphasized on the supply side of the production.
  - (iii) More effective ..... lead to more efficient utilization of resources and thereby higher profits.
  - (iv) ..... theory is evolutionary in nature because he concluded that capitalism would eventually give rise to socialism.
  - (v) Some times it is very much possible that new innovations do come but do not make the ..... ones obsolete.

## 26.3 Some Neo-schumpeterian Models

There are some models in which research and development process has been taken as a force for economic growth and development. These models also model growth as an endogenous process. Main point on which these Neo Schumpeterian models differ from each other lies in the way new technology comes into the picture.

### *A Comparison of Schumpeter's Theory with Grossman-Helpman Model*

Grossman-Helpman Model also considers innovation as an engine of growth. But this innovation comes about through an expanding variety of consumer goods. There is also an enhancement in knowledge. The model is based on formulation of product diversity in monopolistic competition in an article by two economists: Avinash Dixit and Joseph Stiglitz in the year 1977. They formulated the diversity in consumer goods by studying the behaviour of a typical consumer. Suppose, there are N different consumer goods and a typical consumer consumes them in amounts  $x_1, x_2, x_3, \dots, x_n$ . Then the utility function of this consumer is :

$$U = \sum_{i=1}^N X_i^\alpha \text{ with } 0 \leq \alpha \leq 1$$

**Notes** Let us assume that there are only three goods then

$$U = X_1^\alpha + X_2^\alpha + X_3^\alpha$$

Now if there are N goods with Prices are  $P_1, P_2, \dots, P_n$  and Budget equal to  $M_1$ , then

$$\sum_1 P_i X_i = M$$

Hence, the first order condition to minimize the utility of consumer that must be satisfied is.

$\alpha \times \alpha - 1 = \lambda p_i$  where  $\lambda$  is lagrange multiplies.

Grossman and Helpman extend this formulation on supply side and brings in the concept of optimization over time and hence making the model dynamic. When we optimize over a period of time, we do not choose a single optimal value of a variable quantity but we choose a variable function. In dynamic optimization, it is determined what the optimal magnitude of a variable is in each period of time.



Task

What are differences between view of schumpeter and New-classical economists?

**A comparison of Schumpeter's theory with Aghion and Howitt's theory:** Aghion and Hewitt's theory is based on Grossman and Helpman Model but incorporates the element of uncertainty into it. The theory incorporates the element of uncertainty in Research and Development also. They did not take an assumption of full employment. Nor did they use capital accumulation as a guiding force for growth. In a simplified economy, where there is one good and one factor of production, labour, final output can be represented by a function,

$$Q = Af(x)$$

In the economy some labour is engaged in research and development. Due to this, innovations take place overtime. Innovations bring interest income to the firms. Interest income of the firms are equal to current income *plus* expected capital gains.

### Self-Assessment

2. State whether the following statements are 'true' or 'false'.
  - (i) There are same models in which research and development process has been taken as a force for economic growth and development.
  - (ii) There is not also an enhancement in knowledge.
  - (iii) In dynamic optimization, it is determined what the optimal magnitude of a variable is in each period of time.
  - (iv) Grossman-Helpman model does not consider innovation as an engine of growth.
  - (v) Avinash Dixit and Joseph formulated the diversity in consumer goods by studying the behaviour of a typical consumer.<sup>5</sup>

### 26.4 Summary

- J.A. Schumpeter is an economist who emphasized the role of innovations in economic growth and development.
- All theories given by classical economists emphasized on the supply side of the production. They claimed that economic growth meant increase in productive capacity or supply of greater goods and services.
- Schumpeter called his theory 'a creative destruction' because every new innovation makes the old things obsolete.

- All classical economists took mobilization of savings as a source of capital formation and economic growth.
- Schumpeter did not use mathematical tools to find the quantitative relationships between innovations and critical economic variables.
- Schumpeter's theory also gives an explanation for business cycles.
- Some times it is very much possible that new innovations do come but do not make the old ones obsolete.
- Schumpeter believed money to have a vital and role in the economic system here he agreed to Keynes but he criticized Keynes for not considering the basic structural change in the economy in his theories.
- There are some models in which research and development process has been taken as a force for economic growth and development.
- Grossman-Helpman Model also considers innovation as an engine of growth. But this innovation comes about through an expanding variety of consumer goods.
- Aghion and Hewitt's theory is based on Grossman and Helpman Model but incorporates the element of uncertainty into it.

### 26.5 Key-Words

- Model : a simple description of a system, used for explaining how something works or calculating what might happen.
- Growth : the process of growing physically, mentally or emotionally.

### 26.6 Review Questions

1. What do you mean by the process of creative destruction? How is it related to investment in research and development?
2. How is schumpeter's vision of competition different from that of neo-classical economists.
3. Provide a critique of schumpeter's theory of development?
4. In what way can schumpeter's thory be considered a theory of evaluationary growth?
5. Describe the basic grossman-Helpman model of economic growth.
6. Discuss Aghion and Howitt's model of growth through creative destruction. In what way does their model differ from schumpetyer's theory?

### Answers: Self-Assessment

1. (i) economist (ii) classical (iii) innovation (iv) schumpeter's  
(v) old
2. (i) T (ii) F (iii) T (iv) F  
(v) T

### 26.7 Further Readings



- Books*
1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
  2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
  3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 27: Theories of Underdevelopment

### CONTENTS

Objectives

Introduction

27.1 Vicious circles of poverty

27.2 Methods to Break the vicious circle

27.3 The Big Push Theory

27.4 Theory of critical Minimum effort

27.5 The low level Equilibrium Trap Theory

27.6 Theory of social Dualism

27.7 Theory of Technological Dualism

27.8 Lewis's Model

27.9 Ranis and Fei model

27.10 Harris-Todaro Model

27.11 Summary

27.12 Key-Words

27.13 Review Questions

27.14 Further Readings

### Objectives

After reading this unit students will be able to:

- Describe the vicious circle of poverty and the methods to break the vicious circle.
- Know about the big push theory.
- Learn the theory of social dualism.
- Understand the Harris-Todaro model, etc.

### Introduction

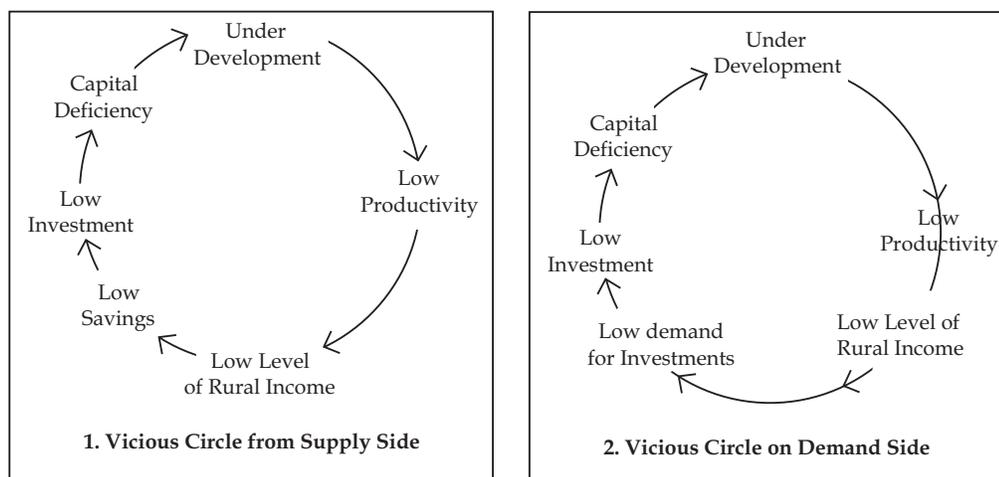
So far we have studied many growth models and many aspects related to development. But most of these models were suitable to the conditions of developed countries. During post World War II period many theories of economic growth developed that addressed the problems of under developed economies. Amongst various theories Ragner Nurkse is recognized the most for his exposition of vicious circle of poverty. Some notable theories are *Big Push Theory* propounded by Rosenstein Rodan; *Critical Minimum Effort Theory* propounded by Libenstein; *Low level equilibrium theory* given by Nelson; *Social dualism theory* given by Boeke; and *Technological dualism theory* given by Higgins and Lewis Model developed by Arthur W. Lewis. This chapter will elaborate each of these theories in detail.

### 27.1 Vicious Circles of Poverty

Vicious circle of poverty implies that poverty itself is the biggest cause of poverty. It explains poverty as a hen-egg phenomenon. It implies a circular constellation of forces that tend to act and react upon each other in such a way that a poor country continues to remain in the clutches of poverty. Technically

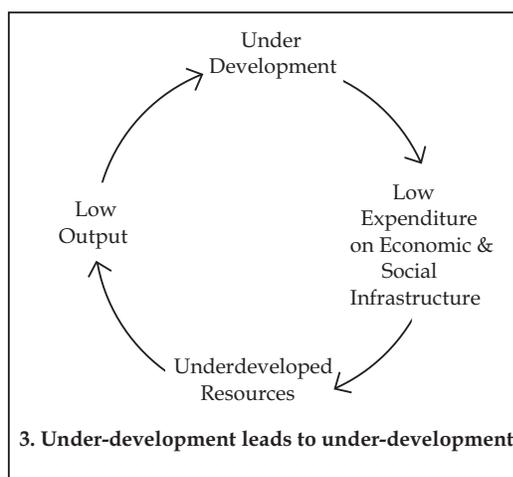
speaking, vicious circles are a set of inter-locking equilibrium situations that reinforce each other. Three such vicious circles were given by the profounders.

Notes



The first circle shows the vicious circle of low level of capital formation from supply side. In the UDCs, people have low productivity due to backwardness and therefore little is left after fulfilling the present consumption needs. This leads to low of savings and if savings are low, certainly the level of investment will also be low. It will lead to capital deficiency.

The second circle shows the vicious circle of capital formation from demand side. It shows that due to lower levels of income, entrepreneurs do not find it profitable to invest as they don't see any potential for the demand for the goods that they shall produce. It reduces the demand for investment funds. Lesser investment leads to low level of income and hence the economy falls into a vicious circle.



The third circle shows the overall vicious circle. The people with low level of incomes will be illiterate, unskilled and immobile which will reduce their ability to make efficient use of natural resources.

Notes



Notes

When resources will remain under utilized, the economy will continue to remain in the clutch of under development.

## 27.2 Methods to Break the Vicious Circle

There are two approaches regarding as to how an economy can break through the vicious circle. One is called 'Gradual Approach to Economic Development' and the other is called 'Big Push Approach to Economic Development'.

### *The Gradual Approach*

The gradual approach relies on market mechanism and private effort and believes in the saying that slow and steady wins the race. It advocates a step-by-step approach to economic development. It suggests that in the initial stages of development, it is advisable that an economy concentrates on agricultural improvements, social overhead capital and the establishment of small scale industry.

This approach strongly advocates that development must initiate from primary sector and will spill over to other sectors automatically through spill over effects. As the level of income increases in primary sector, it will have a higher effective demand for secondary goods and the services produced by tertiary sector. It will lead to increase in demand for capital goods to make manufactured goods.

### *The Big Push Approach*

The big push theory advocates that if we wish to ensure a minimum rate of development in the economy, we can't rely on automatic market mechanism. It requires an effort from the government's side. It needs a rapid and extensive capital formation in all the sectors. It rejected the idea that development can be self generating.

Advocators of big push theory claimed that unless the rate of increase in GDP is large enough, it will be eaten away by the increase in population leading to small or no change in per capita income. Therefore, development must exceed a certain 'critical minimum effort' that would enable economy to escape the gravitational pull of population increase. Some other economists argue that without a big push vicious circle of poverty can't be broken. Nurkse advocates such approach when he talks in his theory of balanced growth that in order to ensure a reasonable rate of development we need to make simultaneous large scale investments over a wide range.

## 27.3 The Big Push Theory

This theory was propounded by Prof. Paul N. Resenstein Rodan in 1943. Rodan claimed that a big push or a large all round minimum amount of investment is required to put a country on the path of sustaining development. In the words of Resenstein Rodan, "Launching a country into self-sustaining growth is a little like getting an aero plane off the ground. There is a minimum speed which must be passed before the craft can become airborne. Proceeding bit by bit will not add up in its efforts to the sum total of the single bites." Similarly, if the process of development has to be initiated, scattered and small efforts would not help but a big push in investment is required to be initiated.

He offered reasons for it in the form of four types of indivisibilities that every economy faces. These indivisibilities are:

- (a) **Indivisibility in the Production Function:** There are some factors of production which are indivisible and hence give increasing returns. Social overhead capital enjoys such indivisibilities as it is irreversible in time; it has long gestation period with a minimum durability. All these features of Social Overhead Capital make it obligatory to put a large scale initial lump sum investment that pushes up the level of investment.
- (b) **Indivisibility of Demand:** In UDCs, the size of markets is very small. The small size of market

increases uncertainty and thereby hinders capital investment in the economy. To increase the size of market and reduce uncertainty, a simultaneous large scale investment is required to be made in a number of industries.

- (c) **Indivisibility in the Supply of Savings:** As explained in vicious circle of poverty, low level of income does not let people save much. Therefore, investment at a very large scale is desirable which can lead to high increase in income and thereby savings.
- (d) **Psychological Indivisibilities:** These indivisibilities refer to the fact that small and isolated efforts are not noticed by people at large. It therefore, does not create a hope for better returns.

Therefore, a large chunk of investment in one go can lead to external economies and hence, lead to an increase in the rate of development.

### **Criticisms of the Theory**

The critiques of the theory claim that a big push in the economy will create many problems in the economy.

1. The theory suggests something which everyone knows by common sense but the hurdle in a big investment is lack of funds, skilled labourers, and availability of dynamic entrepreneurs.
2. Investment involves risk. Risk factor has been ignored by the theory. What if, investment does not produce expected returns?
3. The assumption of the creation of external economies by large scale investment is unrealistic and may not prove to be true. In short run, it may rather increase demand for resources and thereby increase input prices. In such case, investment will create diseconomies rather than economies.
4. The theory underestimates the importance of development in agriculture to bring about overall economic development.
5. It might get difficult for an underdeveloped economy with underdeveloped resources to supervise and efficiently manage with so many projects at one time.
6. Externalities certainly lead to reduction in cost but it does not always lead to increase in output. However, development must include reduction in cost as well as expansion in output. Therefore, the theory is incomplete.
7. In an UDC, government with narrow tax base may not have funds to invest. Private sector may also not afford big push due to lower levels of income. In such situations small investment proves to be a boon which is left un-discussed by Rodan.

In spite of limitations discussed above, the contribution of theory can't be under estimated. It explained the pre requisite for development.

### **Self-Assessment**

1. Fill in the blanks:
  - (i) vicious circle of poverty implies that poverty itself is the biggest cause of .....
  - (ii) There are ..... approaches regarding as to how an economy can break through the vicious circle.
  - (iii) The big push theory was propounded by prof. Paul N. Resenstein Rodan in .....
  - (iv) There is a minimum speed which must be passed before the craft can become .....
  - (v) The gradual approach relies on market ..... and private effort.

## **27.4 Theory of Critical Minimum Effort**

The theory was formulated by Harvey Leibenstein. The theory relates per capita income to population growth adversely i.e. he considered population to be a shock or income depressing factor and per capita income to investment i.e. investment is a stimulant i.e. income generating factor. Hence, population is acting as a shock and investment as a stimulant. Growth can take place when the

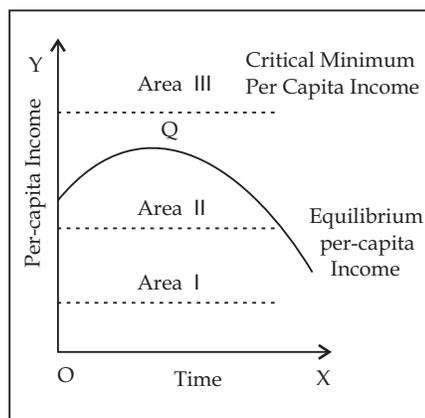
**Notes**

impact of stimulant dominates or overtakes the impact of shock. A small investment will increase GDP by a small amount which might be so less that per capita income instead of rising may even fall because of simultaneous increase in population.

It is necessary to ensure that an investment large enough takes place which can overweigh the negative impact of population growth.

Leibenstein believed that it is not mandatory that critical minimum effort has to be incurred in one go. It can be split into a series of smaller efforts. It can be explained with the help of a diagram.

In the diagram, time is taken on horizontal axis and per capita income is measured on vertical axis. Unless and until per capita income could be raised to a level OM which is minimum critical level, the economy will follow a growth path like PQR which shows that after a certain level, per capita income starts to fall because shocks are overweighing the stimulants. Therefore, income must be raised to OM level to ensure that stimulant overweighs the effects of shocks.



**Reasons for Critical Minimum Effort**

Leibenstein gave following reasons for requiring a critical minimum effort :

- (a) Unless and until economy operates at a scale minimum enough to utilize the indivisible factors to the fullest or to minimum level of efficiency, there will be internal diseconomies. These internal diseconomies will disappear only when scale of operations is increased to a certain level.
- (b) There are some external economies that can be availed only at a minimum scale of the industry.
- (c) A certain minimum critical effort is required to ensure that shocks will not overcome stimulants.
- (d) A large investment creates an eagerness amongst entrepreneurs to take risk, to spend on research and development and gives them a strong incentive for profit.

Hence, investment must be made at a larger scale and not in small bits for the positive forces to set in strongly.

**Criticism of the Theory**

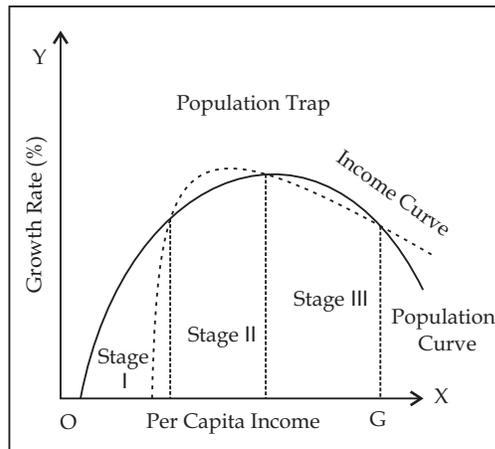
The theory is criticized on following grounds:

- (a) Leibenstein assumed population to be function of income but in practice it is seen and observed that population is a function of social attitudes, religious factors and educational attainments as well and not only per capita income.
- (b) Myint criticized Leibenstein for over-simplifying the relationship between per capita income and growth rate and not explaining the stages through which it passes in the process.
- (c) In UDCs level of foreign trade, foreign capital, international relationships etc. play an important role in determining the levels of development which are ignored by the theory.

## 27.5 The Low Level Equilibrium Trap Theory

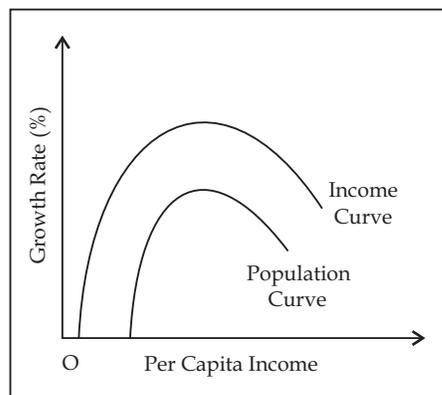
Notes

This theory was formulated by R.R.Nelson. The theory states that if per capita remains below a critical level, a population growth rate that exceeds the income growth rate will always bring economy back to 'Low Level Equilibrium Trap'. It is shown with the help of a diagram given below.



As long as per capita income is less than OD, Population is stable due to high levels of death as well as birth rates. They cancel out each other. After OD level of income, population starts to increase mainly because of fall in death rates. It continues till point  $t$  where population grows at a faster rate. After point  $t$  i.e. when per capita income is more than of, population starts to fall due to fall in birth rates until it reaches point  $s$  which is stable equilibrium. The situation when rise in population is more than rise in per capita income is called population trap. Following factors can explain the causes of this trap :

- A strong negative correlation between level of per capita income and rate of population growth.
- A low marginal propensity to invest;
- Scarcity of uncultivable arable land;
- Inefficient methods of production this trap can be avoided either by increasing the rate of per capita income, or by lowering the rate of growth of population or both so that the rate of increase in per capita income is always greater than the rate of population growth as shown below :



**Notes**

Nelson has put forward following suggestions to escape population trap:

- (a) Favourable change in socio-economic environment;
- (b) Levy a greater emphasis on smaller family and habit of thrift.
- (c) Government needs to take initiative to enlarge savings and control the size of population.
- (d) Resources should be used more efficiently to get better output from inputs.

**Criticisms of the Theory**

- (a) The correlation between per capita income and population growth rate is not so strong particularly in initial stages, as theory assumes.
- (b) The theory ignores many factors of development like the role of innovations, technology etc.
- (c) The theory does not make any distinction between short run and long run economic activities of the developed countries and under developed countries.
- (d) The role of state in population growth control as well as stimulating income growth rate is totally ignored.



*Did u know?* The theory is appreciated for its valuable inputs and explanation how rate of population growth eats away increase in per capita income.

## **27.6 Theory of Social Dualism**

Boeke developed a general theory of economic and social development in which he maintained that there are three characteristics of a society in economic sense.

These characteristics are the social spirit; the organizational forms; and the dominating techniques.

There can be society in which only one social system prevails. It is called a homogeneous society. Generally speaking, a society has more than one social system that prevails simultaneously. Such a society is called dual or plural society.

A dual society may have a simultaneous existence of advanced imported machinery and the indigenous production techniques. In India, the simultaneous existence of over ambitious urban and satisfied rural are one example of social dualism.

There is a difference between social dualism in eastern countries and in western countries.

- (a) When immediate needs of the people are met, then people are influenced more by social rather than economic goods. Therefore, needs of an eastern society are limited.
- (b) Goods in eastern countries are evaluated according to their prestige value rather than value in use.
- (c) Native industries are unorganized, characterized by low capital and ignorance of the market.
- (d) People lack initiative and organizational skill. Therefore, they indulge more into speculative activities rather than profit giving enterprises.
- (e) Urban development creates hindrance and is conflicting with rural development.
- (f) In eastern societies, foreign trade is expected to increase foreign trade.

Boeke recognized that we need to develop different theories for eastern countries as they are underdeveloped and the theories for developed countries are not applicable to it. He advocated gradual approach to development.

**Criticisms of the Theory**

Theory of social dualism is criticized on following grounds:

- (a) The assumption of limited wants is inconsistent.

- (b) The theory ignores the role of trade unions.
- (c) The explanation that migration is problematic is also not acceptable.
- (d) Social dualism is found in developed countries as well.
- (e) Like many other theories, this theory is also focusing on one dimension of development and ignoring others.

Notes



Task

Write the criticism of social dualism theory.

## 27.7 Theory of Technological Dualism

Benjamin Heggins, the founder of this theory, claimed that technological dualism implies coexistence of most modern techniques of production in advanced sector and the use of primitive or traditional techniques in an under-developed sector of the economy. The existence of such technological dualism has following implications:

- (a) Industrial sector is capital intensive and has fixed technical coefficients. There is little or no option of substituting labour for capital. As industrial sector expands with foreign capital, this sector is not able to create employment at the same rate at which population increases. It creates structural or technical unemployment in industrial sector.
- (b) The rural sector faces the problem that it is very difficult to increase output even by increasing the inputs i.e. labour or capital. In the initial stages neither capital nor labour is scarce. With the increase in population, land the form of capital in rural areas, starts to become scarcer. It creates excess pressure on the land with surplus labour. It creates disguised unemployment in this sector.

In nutshell, technological dualism creates technical and disguised unemployment in two sectors because of fixed factor proportion in industrial sector and growing population in rural sector.

### Criticism of the Theory

The theory has been criticized on following grounds :

- (a) Empirical study does not prove fixed technical coefficient in industrial sector.
- (b) Institutional and psychological factors in determining the price of the factors of production have been neglected.
- (c) Theory does not explain the extent of unemployment in two sectors.
- (d) The theory neglected the possibility of the labour intensive techniques in production.
- (e) Factor prices are determined by many factors and not only on factor endowments. Other factors affecting factor prices are ignored by the theory.

### Self-Assessment

2. Choose the correct option

(i) "Theory of critical minimum effort" was formulated by .....

- (a) Haruly Leibenstein (b) R.R. Nelson

(ii) "The low-level equilibrium trap theory" was formulated by .....

- (a) Harvey Leibenstein (b) R.R. Nelson  
(c) Boeke (d) Benjamin Heggins

(iii) Boeke developed .....

- (a) Theory of critical minimum effort (b) The low level equilibrium trap theory  
(c) Theory of social dualism (d) None of these

Notes

### **27.8 Lewis's Model**

W. Arthur Lewis, the founder of this theory, emphasized on structural transformation of primary subsistence labour surplus economy.

The model works in the following manner:

- (a) In UDCs, a large labour surplus exists with zero or even negative marginal product. Its supply is perfectly elastic at 'Subsistence-Plus' wage.
- (b) Since labour supply is perfectly elastic at subsistence wage rate, the new industries can be set up without altering wage rates. Initially it might require to train unskilled workers.
- (c) Since marginal product of labourers is higher than wage rate in industrial sector, it creates surplus of the entrepreneurs. This surplus is reinvested until marginal product of labour becomes equal to wage rate. Thereafter, labour supply becomes inelastic.
- (d) Initial Capital can also be arranged from bank credit.
- (e) The process of growth comes to an end due to any of the following factors :
  - (i) If all labour surplus is absorbed by the process of capital formation.
  - (ii) If increased demand for labour in capital sector leads to increase in wage rates.
  - (iii) If the rural sector adopts better techniques and reduces disguised unemployment.
  - (iv) If workers form trade unions in capitalist sector and demand higher wages.

#### ***Criticism of the Model***

- (a) The model is based on unrealistic assumptions.
- (b) There are some leakages in the process of conversion of disguised unemployment into saving potential.
- (c) Labour may be immobile due to social and emotional factors.
- (d) The model perpetuates unequal distribution of income and hence does not reconcile with welfare aspect of development.



*Caution* In nutshell, the exhaustion of surplus labour brings the process of development to an end.

### **27.9 Ranis and Fei Model**

The theory was formulated by John C. H. Fei and Gustav Ranis in 1964. The theory explains how surplus labour gradually shifts from primary to other sectors. The model is based on following assumptions :

- (a) Economy is facing technological dualism.
- (b) It is possible to transfer agriculture labour to non agriculture sector.
- (c) The labour is disguisedly employed in agriculture i.e. their MP is zero.
- (d) Funds are generated in agriculture sector to finance the projects in other two sectors.
- (e) The industrial sector makes use of labour intensive techniques so as to absorb maximum labour.

The model is explained by taking agriculture as a sector that is supplying manpower as well as funds for investment. The disguisedly unemployed labour is transferred to industrial sector, thereby income increases, it increases demand for industrial goods in agriculture market. Therefore, the movement of mass surplus labour from rural to urban or from agriculture to industrial sector is an essential condition for development.

**Criticism of the Model**

Notes

- (a) Labour is not so mobile due to socio-cultural factors.
- (b) Agriculture sector may not be able to generate surplus to finance industrial sector.
- (c) These days no economy is a closed economy as assumed by the model.

**27.10 Harris-Todaro Model**

The model was formulated by John R. Harris and Michael P. Todaro. The model explains that accelerated rural-urban migration has led to increased urban unemployment.

The four basic elements of the model are :

- (a) Rural-urban migration is influenced not only by economic but also by socio-psychological considerations.
- (b) The migration depends on expected and not actual wage difference.
- (c) The probability of finding a job in urban area is a function of urban employment rate.
- (d) Excessive migration over and above top opportunity growth rate in urban areas is bound to create urban unemployment.

**Implications of the Model**

1. The government must develop strategies to create an appropriate rural-urban economic balance.
2. It is advisable that industries should use labour intensive techniques.
3. More labour absorbing industries should be settled.
4. It is important to eliminate the factor prices distortions.
5. Various capital subsidies must be removed to eliminate factor price distortions.
6. A developing country must introduce an effective education system that will be able to meet the needs of rural development and create employment for perspective job-borders.
7. It is important to control populuion so as to avoid unemployment in the economy
8. Local self government can play a positive role in minimizing the rural urban migration.

**Relevance of the Model**

- (a) The model focuses on institutional determinants of urban wage rates.
- (b) It also explains the high cost of labour turnover.
- (c) High wage rates in urban areas enable urban employers to get high quality work force and greater productivity.

**Self-Assessment**

3. State whether the following statements are 'true' or 'false'.
  - (i) W. Arthur Lewis, the founder of Lewis's model, emphasized on structural transformation of primary subsistence labour surplus economy.
  - (ii) Ranis and Fei model was formulated by R. R Nelson.
  - (iii) Harris-Todaro model was formulated by John R. Harris and michael P. Todaro.

**27.11 Summary**

- Vicious circle of poverty implies that poverty itself is the biggest cause of poverty. It explains poverty as a hen-egg phenomenon.
- The gradual approach relies on market mechanism and private effort and believes in the saying that slow and steady wins the race.

**Notes**

- The big push theory advocates that if we wish to ensure a minimum rate of development in the economy, we can't rely on automatic market mechanism.
- In the words of Resenstein Rodan, "Launching a country into self-sustaining growth is a little like getting an aero plane off the ground.
- Leibenstein believed that it is not mandatory that critical minimum effort has to be incurred in one go. It can be split into a series of smaller efforts.
- Boeke developed a general theory of economic and social development in which he maintained that there are three characteristics of a society in economic sense.
- A dual society may have a simultaneous existence of advanced imported machinery and the indigenous production techniques.

**27.12 Key-Words**

- Phenomenon : a fact or an event in nature or society, especially one that is not fully understood
- Consumptions : the act of using energy, food or materials
- Homogeneous : consisting of things or people that are all the same or all of the same type

**27.13 Review Questions**

1. What do you mean by vicious circle of poverty? How does it work?
2. Distinguish between the gradual approach and the push approach to economic development.
3. State the Big Push Theory of growth. Also bring out its limitations.
4. State the theory of critical minimum effort. Also bring out its limitations.
5. State and explain the theory of low-level equilibrium trap. Also bring out its limitations.
6. State and explain the theory of sociological dualism. Also bring out its limitations.
7. State and explain the theory of technological dualism. Also bring out its limitations.
8. Critically examine Lewis Model of economic growth.
9. Critically examine Ranis and Fei Model of economic growth.
10. Examine the relevance and implications of the Harris – Todaro Model.

**Answers: Self-Assessment**

1. (i) poverty (ii) two (iii) 1943 (iv) airborne  
(v) mechanism
2. (i) (a) (ii) (b) (iii) (c)
3. (i) T (ii) F (iii) T

**27.14 Further Readings**



*Books*

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 28: Development Strategies: Allocation of Resources

Notes

### CONTENTS

Objectives

Introduction

28.1 Growth Strategy

28.2 Investment Criteria in Developing Countries

28.3 Marginal Per Capital Reinvestment

28.4 Application of Investment Criteria

28.5 Choice of Techniques

28.6 Approaches to the Choice of Technique

28.7 Summary

28.8 Key-Words

28.9 Review Questions

28.10 Further Readings

### Objectives

After reading this unit students will be able to:

- Know about the growth strategy.
- Understand the investment criteria in developing countries.
- Describe the marginal per capita reinvestment.
- Learn the choice of techniques, etc.

### Introduction

There are two approaches to development. One is within the framework of laissez faire economy. In such an economy, allocation of resources is done by invisible hands of demand and supply. But it is more relevant for developed countries. For developing economies, this approach is not justified as these economies do not leave development open to be determined by market forces rather make well planned strategies according to their expectations and motives. This unit deals with various criteria to take optimum decisions regarding allocation of resources.

### 28.1 Growth Strategy

First and foremost task for an economy is to determine the strategy for planning. Strategy for planning refers to identifying and establishing a system of ends or goals that may be pursued with definite techniques. Two important strategies for growth can be identified as:

- The Strategy of Balanced Growth:** Balanced growth implies that all sectors of an economy must grow in a harmonious manner, no sector should go far ahead of others or lack behind from them, no sector is facing shortage or surplus. Balanced growth has horizontal as well as vertical aspects.
- The Strategy of Unbalanced Growth:** This approach suggests that to start with an investment should be made in some selected areas, and gradually the economy will move from unbalanced growth to balanced growth.

## 28.2 Investment Criteria In Developing Countries

Adam Smith, father of economics, opined invisible hands of demand and supply are efficient and trusted fully in the market mechanism but this trust was based on the assumption of existence of perfect competition in the market. But in real world market there is not perfect but imperfect competition. In such an economic set up it becomes necessary to plan the allocation of resources. It can't be left for market mechanism. Now the problem arises to select an ideal criterion to judge the best allocation of resources. Some of the criterions offered by economists are discussed below:

### *Social Marginal Productivity (SMP) Criterion*

The criterion was formulated by A. E. Khan and was refined by Hollis B. Chenery. The criterion is based on Marginal Productivity Approach. It states that the allocation of resources will be optimum when social marginal productivity of such resource is same in all uses. As more and more labour is employed with fixed amount of other resources, according to the law of returns to a factor, the MP of labour starts falling after a certain stage. This criterion says that labour should be divided in different projects in such a way that its SMP is same in all projects. SMP is different from MP.

In other words, it is social value of national income measured in terms of shadow or accounting prices of the products produced by projects.

$$\begin{aligned} \text{SMP} &= \frac{X + E - M_i}{L} - \frac{K + M_d - O}{L} + \frac{r(aB_1 + B_2)}{L} \\ &= \frac{V - C}{L} + Br \end{aligned}$$

Where, L is increment in capital;

X is increased value of output;

E is added value of output due to external economies;

M<sub>i</sub> is cost of imported material;

V is annual value added domestically

K is capital cost

M<sub>d</sub> is cost of domestic materials;

O is overhead costs;

C is total social cost of domestic factors;

B<sub>1</sub> is effect of installation of project on BOP;

B<sub>2</sub> is effect of operation of project on BOP;

A is combined amortization and interest rate on foreign borrowings;

B is total BOP effects;

R is average over evaluation of national currency at existing rate of exchange.

Substitution between different projects would continue till the following equality i.e. reached.

$$\text{SMP}_x = \text{SMP}_y = \text{SMP}_n$$

Where *a*, *b*, *n* are different projects.



Notes SMP is average annual increment in national income.

### *Limitations of the SMP Criterion*

- SMP criterion concentrates on maximization of aggregate output but ignores following aspects:
  - Indirect effect of the expansion of entrepreneurship on quality of labour.

- (b) The effect of investment on saving habits.
  - (c) The effect of investment on future consumption patterns.
  - (d) The indirect effect of investment on rate of population growth.
  - (e) The effect of resource allocation on distribution of income.
2. SMP assumes that economy is experiencing diminishing returns to a factor, however, up to a certain level; it might be subject to law of increasing returns.
  3. SMP assumes that production technique remains constant.

#### ***Capital Turnover (or Capital-Output Ratio) Criterion***

This criterion was developed by J. J. and N. D. Buchanan. Capital turnover is the increase in output resulting from a unit investment in a project. In other words, it is percentage increase in output due to investment made in a project. Capital turnover = increase in national output divided by increase in capital stock.

It states that such technique should be chosen which yields the maximum output per unit of capital employed. In other words, projects which have low capital-output ratio should be chosen. Those projects which have shorter gestation period with a low capital intensity should be chosen because such projects will start giving returns at the earliest and the make resources available for reinvestment. For labour abundant countries this criteria is extremely useful as it will also generate maximum employment per resource in developing countries.

#### ***Advantages of Capital Turnover Criterion***

- (a) It will help to increase production by choosing less capital intensive projects with quick yielding returns. Hence, it will help to check inflation in the economy.
- (b) Generally less capital intensive projects don't use imported goods. It will reduce pressure on foreign exchange.
- (c) It will promote equitable distribution of income.

#### ***Limitations of Capital Turnover Criterion***

1. Projects with shorter gestation period may have high capital output ratio in the long run.
2. It does not consider supplementary benefits that generally flow with the projects having high capital output ratio.
3. In some industries, working capital requirement is more than fixed investment. In such cases, low capital output ratio may appear outwardly only.
4. A capital intensive technique can maximize the labour employed per unit of output in the long run. Hence, it is rejected that labour intensive projects will maximize employment in the economy.
5. This criterion does not consider factors other than investment involved in determining growth rate.

## **28.3 Marginal Per Capital Reinvestment**

### **28.3.1 Quotient (MRQ) Criterion**

This criterion was developed by W. Galenson and Harvey Leibenstein. The criterion states that the main aim of economic development in developing countries is to maximize not present but future output and consumption. It calls for maximization of saving rate and reinvestment.

**Meaning and Determinants of MRQ:** It is defined as the ratio of productivity per worker minus consumption per worker divided by capital per worker. MRQ depends upon :

Productivity per worker:

- (a) 'Wage goods' consumed per worker;
- (b) Capital replacement cost;

Notes

- (q) Increase in output due to exogenous factors;
- (d) Reduction in mortality;
- (e) Direction of investment.

The first five factors determine the total volume of investment available and sixth factor determines the purpose for which it will be invested.

According to this criterion, "the allocation of resources is optimum when MRQ of capital is equalized in its various alternative uses."

If capital labour ratio is increased, it will increase productivity of labour; which in turn will increase proportion of profits in the additional income generated. To put it differently, the projects with high capital intensity will increase productivity of labour and profits. Hence a higher rate of reinvestible surplus will be ensured. The formula for estimating rate of reinvestment is :

$$MRQ = \frac{P_m - e.w}{c}$$

Where, MRQ is Marginal reinvestment quotient;  $P_m$  is net output per machine;  $e$  is number of workers per machine;  $w$  is real wage rate; and  $c$  is cost per machine.

To get per capita MRQ the above equation can be divided by number of workers per machine i.e.  $e$  on both sides.

$$\text{Per capita MRQ} = \frac{pm/e - e.w/e}{c/e}$$

Where,  $pm/e$  is productivity per worker;  $c/e$  is capital-labour ratio;  $w$  is real wage rate.



*Did u know?* Maximum rate of reinvestment would be attained by the maximization of capital labour ratio. Wage rate also plays an important role in determining MRQ.

**Limitations of the Criterion**

1. The assumption of constancy of consumption over time is unrealistic. However, APC keeps falling with increase in incomes.
2. The principle contradicts with the principle of falling Marginal efficiency of capital as we increase the amount of capital investment.
3. The criterion ignores the role of fiscal policy in determining level of reinvestment.
4. It also ignores the effect of investment on BOP.
5. It advocates sacrifice of current consumption for future gains but social and religious attitude play a role in such decisions.
6. Capital intensive projects may create unemployment in labour abundant countries and hence may rather reduce reinvestment capacity of the economy.

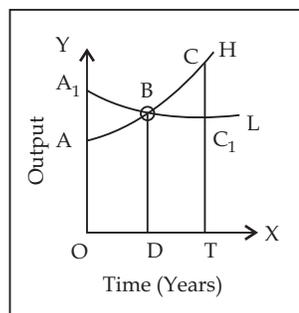
**The Time Series Criterion**

This criterion was developed by Maurice Dobb. As the name suggests, the criterion emphasizes on incorporating a finite time horizon to investment planning. This time horizon can be determined by the planner on the basis of his own value judgements. After the choice of time horizon, investment project can be chosen by comparing the total returns to the society from different projects, and the project that gives highest sum total of returns over chosen time period will be selected.

Let us assume that there are two investment projects A and B, A is capital intensive project. B is labour intensive project. In project A the returns are less than project B up to time period D. After it, project A gives returns that are more than the returns on project B. The time period in which the total

output from the two projects becomes equal is known as period of recovery. It is shown with the help of following diagram:

Notes



If the planner chooses any time period say,  $X$  then

- When  $X > T$ , capital intensive project A will be chosen;
- When  $X < T$ , then project B, labour intensive will be chosen;
- When  $X = T$ , either of the projects may be chosen;
- When  $X = 1$ , then the investor will be interested in maximization of current output, i.e. he will use capital turnover criterion and choose labour intensive project;
- When  $X = \text{infinity}$ , investor will use MRQ criterion, he will choose capital intensive project and maximize output at some future point of time.

#### Limitations of the Criterion

- Decision of time horizon is left on the judgment of planner and criterion does not give any guidelines to choose the appropriate time horizon.
- It is very difficult to know with precision the expected future returns of the projects.
- For shorter time horizon, it coincides with capital turnover criterion and with longer time horizon, it coincides with MRQ criterion and the criterion itself does not give any guidelines for choosing the optimum time horizon.

#### Leading Sectors Criterion

This criterion was developed by W. W. Rustow. He classified the economy into three sectors:

- Primary Growth Sectors:** These are the sectors where possibilities for innovation are high that yields a high growth rate and set in motion expansionary forces in other sectors of the economy.
- Supplementary Growth Sector:** These are the sectors where rapid expansion occurs in response to expansion in primary sector.
- Derived Growth Sectors:** These are the sectors where some fairly steady growth occurs in relation to growth of total real income, population, industrial production etc.

Growth in the economy is dependent on direct and indirect consequences of rapid growth in certain key sector.

Key sector is one which has:

- Enlarged effective demand for their products;
- High productivity;
- High capacity of generating reinvestible surplus;

Notes

- (d) Capacity of setting up chain of effective demand in other sectors of the economy;
- (e) Capacity to generate external economies which promote industrialization.

**Limitations of the Criterion**

1. It is difficult to identify key sectors as all the sectors are inter-dependent and any growth in one sector affects other sectors but degree of influence may variate.
2. As it includes some qualitative variables, it is not possible to measure the full impact of an investment.

**28.4 Application of Investment Criteria**

After discussing various investment criteria offered by different economists, we can conclude that there is one common limitation to all these criteria which makes it impracticable. It ignores the influence of non-economic factors in deciding about any investment project. For example, if a liquor producing firm is giving higher productivity than a milk dairy, it is advisable to shut down the milk dairy and start up a liquor firm as per these criteria. It does not consider social factors, like family systems, emotional stability, gender issues etc. An ideal investment criterion should, on the one hand, give a well defined economic testimony for deciding feasibility of investment and on the other hand, must pay some reasonable attention to non-economic factors.

**Self-Assessment**

1. Fill in the blanks:
  - (i) There are ..... approaches to development.
  - (ii) ..... and ..... task for an economy is to determine the strategy for planning.
  - (iii) ..... is father of economics.
  - (iv) The Criterion was formulated by A.E. Khan and refined by.....
  - (v) If capital labour ratio is ..... it will increase productivity of labour.

**28.5 Choice of Techniques**

**Meaning and Determinants:** Choice of technique refers to proportion in which factors of production are employed in any project. In fact, choice of technique is mainly a choice between labour intensive or capital intensive technique. However, there are also problems of selection of form of organization, division of labour but in this unit we limit the meaning of choice of technique to the labour intensity and capital intensity. The guiding principle is that technique should be chosen that maximizes the given objective function. The choice of technique depends on the following factors :

- (a) A technique with shorter gestation period is preferable.
- (b) The technique must not conflict with the objective function.
- (c) The chosen technique must be able to create wide external economies.



*Task* On which factors the choice of techniques depend?

**28.6 Approaches to the Choice of Technique**

**The Traditional Approach:** As per this approach, the objective of an entrepreneur is profit maximization. Hence, given the cost, the entrepreneur will choose a technique that gives maximum output or given the output, a firm will choose a technique that minimizes cost. Hence, this approach is based on the relative prices of the factors of production. But output must be evaluated at shadow prices. It must consider external economies and diseconomies created by investment.

**Limitations**

1. It is static approach and can't justify with dynamics of economic growth.
2. It does not emphasize on optimum growth path over a period of time.
3. This approach does not consider the future requirements of development.

**Maurice Dobb's Approach:** He recommended such techniques should be employed that has highest positive effect on the rate of growth. He claimed that in developing countries the 'real' constraints are surplus of wage goods and limited productive capacity in investment goods industries. Both these constraints guide us to prefer capital intensive techniques as labour intensive techniques will aggravate both these constraints. He believed that capital intensive techniques create more employment in the long run (however, this is not supported by empirical evidence). But it is not so infinitely.

**A. K. Sen's Approach:** Sen has developed a full fledged model for the choice of technique on the basis of following assumptions:

- (a) After being produced one, capital goods exist in perpetuity and are produced with labour alone.
- (b) There are two factors only, labour and capital.
- (c) Economy is subject to constant returns to scale.
- (d) All techniques have uniform gestation period.
- (e) Real wages remain constant irrespective of technique of production.
- (f) Workers consume their entire income and entrepreneurs reinvest their entire income.
- (g) Technology remains constant over time.
- (h) Sen divided economy into two sectors, the precapitalist family based agriculture sector and the state owned advanced sector. He called former as B i.e. backward sector and latter as A i.e. advanced sector. He assumed that labour supply to sector A is perfectly elastic and at subsistence wage rate because of unemployment in sector B.

**Statement of the Model:** The problem is to make a choice between two alternative techniques of production H and L, the former is capital intensive and the latter is labour intensive. The model makes the choice of technique contingent on the investment criterion chosen for allocation of investment resources.



**Caution** At a point where Marginal cost of capital = marginal benefit from capital is the optimum capital intensity.

**Choice of Technique and Investment Criteria**

- (a) **Capital Turnover criterion or Social Marginal Productivity Criterion:** With this criterion, such technique should be chosen which maximizes current output of consumer goods with a fixed volume of investment. Therefore, with this criterion labour intensive technique is preferable to capital intensive technique.
- (b) **MRQ Criterion:** If in allocating reinvestible surplus, MRQ criterion was employed, then technique H will be chosen as it generates maximum surplus over consumption from reinvestment though it will employ lesser labour.

**Criticism:** Sen's model has been criticized on following grounds:

1. All assumptions of the model are very unrealistic which limits the use of model in real life.
2. The model ignores many factors affecting choice of technique like uncertainty, input prices, natural resources, government policies, social factors etc.
3. Some times there may be no choice at all when there is only one unique technique of production.
4. The model does not consider that labour supply may be a constraint. If such a constraint is

**Notes**

**Notes**

introduced in the model, then optimal capital intensity would be different than the one given in the model.

**Self-Assessment**

2. State whether the following statements are 'true' or 'false'.
  - (i) Choice of technique refers to proportion in which factors of production are employed in any project.
  - (ii) Maurice Dobb's did not recommend such techniques should be employed that has highest positive effect on the rate of growth.
  - (iii) Sen divided economy into two sectors.
  - (iv) Son's model has not been criticized.
  - (v) As per the approach, the objectives of an entrepreneur is profit maximization.

**28.7 Summary**

- There are two approaches to development. One is within the framework of laissez faire economy.
- First and foremost task for an economy is to determine the strategy for planning. Strategy for planning refers to identifying and establishing a system of ends or goals that may be pursued with definite techniques.
- Adam Smith, father of economics, opined invisible hands of demand and supply are efficient and trusted fully in the market mechanism but this trust was based on the assumption of existence of perfect competition in the market.
- The criterion was formulated by A. E. Khan and was refined by Hollis B. Chenery. The criterion is based on Marginal Productivity Approach.
- As more and more labour is employed with fixed amount of other resources, according to the law of returns to a factor, the MP of labour starts falling after a certain stage.
- It states that such technique should be chosen which yields the maximum output per unit of capital employed.
- This criterion was developed by Maurice Dobb. As the name suggests, the criterion emphasizes on incorporating a finite time horizon to investment planning.
- The problem is to make a choice between two alternative techniques of production H and L, the former is capital intensive and he latter is labour intensive.

**28.8 Key-Words**

- Harmonious : friendly, peaceful and without any disagreement
- Assumption : a belief or feeling that something is true or that something will happen, although there is no proof
- Intensive : involving a lot of work or activity done in a short time

**28.9 Review Questions**

1. What do you mean by investment criterion? Why are these required?
2. Critically examine the social marginal productivity criterion.
3. Explain in brief capital turnover criterion. What are its limitations?
4. Make your own evaluation of marginal per capita reinvestment quotient criterion.
5. Critically examine the time series criterion.

6. What is leading sector criterion? What are its limitations?
7. Identify the drawback common to different investment criteria.
8. What is the problem of choice of techniques? State the traditional approach to it.
9. Examine Mourice Dobb's approach to the problem of choice of technique.
10. Examine sen's model of choice of technique.

Notes

**Answers: Self-Assessment**

1. (i) two (ii) first, foremost (iii) Adam Smith  
(iv) Hollis B. Chenery (v) increased
2. (i) T (ii) F (iii) T (iv) F  
(v) T

**28.10 Further Readings**

Books

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 29: Cost-Benefit Analysis

### CONTENTS

Objectives

Introduction

29.1 Private and Social Costs and Benefits

29.2 The Concept of Shadow Price

29.3 Discounting the Future

29.4 Distributional Concerns

29.5 Government Regulations

29.6 Summary

29.7 Key-Words

29.8 Review Questions

29.9 Further Readings

### Objectives

After reading this unit students will be able to:

- Know about the private and social costs and benefits.
- Understand the concept of shadow price and discounting the future.
- Learn the distributional concerns and government regulations.

### Introduction

Cost Benefit Analysis (CBA) as the name suggests, is a techniques in which we analyse the costs involved and benefit expected in any given project, decision, policy etc. If benefits exceed the costs, accept it as it is efficient. If it is other way round, reject it. CBA can be used to measure not only monetary costs and benefits but the element of non-monetary cost and non-monetary benefits can also be incorporated.

Somewhere, profits are the one most important criterion to accept or reject a project. Profits are the difference between costs and benefits. But an important point to be noted is that costs are to be incurred in the present but benefits will flow only in the future. However, some costs may also be involved for the future. Therefore we need to calculate Net Present Value (NPV) of the benefits expected. Even NPV of various possible projects have to be compared to choose the best available option.

### 29.1 Private and Social Costs and Benefits

As said earlier, costs and benefits may be monetary or non-monetary. Non-monetary costs and benefits can be quantified through various techniques and then a proper C-B analysis can be done. In order to convert private costs into social costs, we need to include the costs that are borne by the society as a whole. For example the higher rate of growth that the countries are enjoying today is taking place at the cost of environment which is being borne by the society. Private and social costs and benefits are different in following ways:

- (a) Private costs does not consider the benefits and costs accruing to all sections of society but only the ones that they are getting.
- (b) There are distortions in prices within the system which motivate private producers not to bother from social point of view. The two measures of distortion are (i) Effective Protection rate which is the ratio of difference between value added at domestic prices and that at the world prices.  $(VA_d - VA_w)/VA_d$ . If domestic prices and world prices are equal, the effective protection ratio is zero and hence no distortion but it is not so in reality. Higher is the ratio, higher is the distortion.

Notes

There are many examples of such social costs which make private costs lower than social costs. Say, when government is giving minimum support price for some particular crops, farmers are motivated to grow more of it. For example, increased growth of rice due to its high MSP has reduced water table in Northern India and at the same time there is shortage of those crops which are not covered by MSP policy. When a flyover is constructed, other than the cost of material and inputs, the biggest social costs involved are the traffic problems it creates till completion time.

When railways is charging a high price for freight transport, much of the freight has shifted to road transport which has led to inefficient utilization of resources as railways cost less than road transport.

Social benefits also bring about distortions in the sense that we are not able to avail the social benefit to the fullest. For example, when a private firm is advertising a contraceptive, it is also creating awareness for family planning. It is a social benefit for which society does not pay the private firm.

Similarly, if industries are not given land on subsidized rates they might find it non viable to start an industry. While doing CBA of such projects we must include not only the profits of the organizer, but also the employment this industry is generating, output it is giving to the consumers, cost of subsidy being borne by the government.

## 29.2 The Concept of Shadow Price

Ravi Kanbur developed the idea of shadow price. The shadow price of a good is the net impact of social welfare if the supply of the given good is increased by one unit. He made use of 'Social Welfare Function' to evaluate inter-temporal and inter-personal distribution of consumption. It considers growth as well as distribution. The former indicates the transfer of resources from present to the future; the latter indicates the transfer from the rich to the poor.

Shadow Price can be calculated by following the principles given below which are developed by Little and Mirrlees and Squire (1974) and Van Der Tak (1975):

1. The shadow price of the goods which can be freely traded should be based on world prices.
2. The shadow price of the goods which can't be freely traded should be based on marginal social cost of production.
3. The shadow price of factors of production is estimated by considering the irrespective opportunity cost in their alternative uses.



Notes

While calculating shadow price, the impact of income distribution should be explicitly incorporated.

### Limitations in Computation of Shadow Price

1. For including non-monetary costs and benefits, subjective judgments are involved.
2. Data may not be available; even when it is available, it may not be reliable.
3. Different groups may have different consumption expenditure which may affect shadow price.

Notes

**Self-Assessment**

1. Fill in the blanks:
  - (i) somewhere, profits are the one most important criterion to accept or reject a .....
  - (ii) Profit are the difference between ..... and .....
  - (iii) There are many examples of such social costs which make ..... costs lower than ..... costs.
  - (iv) ..... developed the idea of shadow price.
  - (v) The former indicates the transfer of resources from present to the future, the latter indicates the transfer from the ..... to the .....

**29.3 Discounting the Future**

When we do cost-benefit analysis, the costs involved may have to be incurred in the present or future. Similarly the expected benefits also take place in the future. This gives rise to the problem of an appropriate discounting factor that gives us the accurate present value of the future costs and benefits. NPV can give us the net present value of future benefits but social rate of discount is different from market rate of discount. When there is involvement of government and existence of taxes, the rate that is applicable is:

$$\Delta S(1 + r) + \{\Delta C(1 + r)/(1 - t)\} - \Delta S - \Delta C/\Delta S + \Delta C .$$

Where *r* is rate of interest;

T is rate of tax;

S is savings

C is consumption.

There are other problems also in estimating social discount rate:

- (a) Returns for future period are not known for certain.
- (b) Some costs can be known only once the project is over. For example, cost of cultural erosion.
- (c) Some social benefits are also conceivable only on the completion of the project. For example, creating awareness for any disease.



*Did u know?* Sometimes, when individuals themselves do not invest in education or health, as they may not be sure of the benefits, it is advisable that the government should provide for subsidized education or free health care to avail of the benefits that the whole society will get from this investment.

**29.4 Distributional Concerns**

While doing cost benefit analysis of any project, we must also consider the impact of the project on distribution of income. Whether it will benefit well off section more leading to increase in inequalities of income; or the poorer section and thereby reducing inequalities of income; or the benefits are being shared equally. According to Alfred Pareto, if any project makes someone better off without making anyone else worse off it should be accepted. But if poor section remaining at the same level and richer section is better off by a project, inequalities of income will increase. It will have welfare implications for the project. For example, the recently launched Reliance Metro in Delhi, might not have worsened the poor section and have better off the well off section but the same funds had an opportunity cost. Marginal utility is more for the poor than rich. Utilitarian approach suggests that the project which brings maximum good to maximum people is most efficient. Any project which makes poor section worse off has imposed a social costing terms of class struggle and increased crime rate. According to

Rawlsian perspective, a project is worth if it benefits the poorest of the poor section of the society. Hence, both utilitarian perspective and Rawlsian approach strongly recommends that the transfer of resources from the luxuries of the rich to the basic needs of the poor will maximize the gains of the society.

Notes



Task

Write about distributional concerns.

## 29.5 Government Regulations

What has been suggested above can be attained through utilitarian approach and Rawlsian perspective can be attained through government regulations. With a view to maximizing social benefit, government should :

- Take care that resources of the economy are fully and deficiently utilized.
- Follow progressive tax structure to reduce the gap between the rich and the poor.
- Minimum wage act must be enacted and implemented
- Make an effort to minimize external diseconomies.
- Spend sufficiently on education and health.
- Prices must be kept under control.
- Give suitable incentives to motivate private sector to undertake projects which may not be profitable but are socially desirable.
- Give suitable tax incentives to promote savings, investment, exports and industrialization.

### Self-Assessment

2. Choose the correct option

(i) Who can give us the net present value of future benefits?

- (a) NPV                      (b) UGC                      (c) CBSE                      (d) NCERT

(ii) Minimum wage act must be enacted and .....

- (a) minimize                      (b) implemented                      (c) diseconomies                      (d) none of these

(iii) spend sufficiently on education and .....

- (a) wealth                      (b) education                      (c) health                      (d) none of these

## 29.6 Summary

- Cost Benefit Analysis (CBA) as the name suggests, is a techniques in which we analyse the costs involved and benefit expected in any given project, decision, policy etc. If benefits exceed the costs, accept it as it is efficient.
- There are many examples of such social costs which make private costs lower than social costs.
- When railways is charging a high price for freight transport, much of the freight has shifted to road transport which has led to inefficient utilization of resources as railways cost less than road transport.
- Ravi Kanbur developed the idea of shadow price. The shadow price of a good is the net impact of social welfare if the supply of the given good is increased by one unit.
- When we do cost-benefit analysis, the costs involved may have to be incurred in the present or future.
- While doing cost benefit analysis of any project, we must also consider the impact of the project on distribution of income.

Notes

### 29.7 Key-Words

- Monetary : connected with money, especially all the money in a country
- Distortion : process to change the shape, appearance or sour of something so that it is strange or not clear
- Marginal : Small and not important

### 29.8 Review Questions

1. What are the reasons for the divergence of private costs and social costs?
2. Explain the concept of shadow prices.
3. Discuss the method of discounting in cost-benefit analysis.
4. How would you address the problem of distribution in cost benefit analysis.
5. State some important areas in which the government intervnes in developing countries.
6. Let government is planning the construction of a flyover on a crowded crossing. Evaluate this project using cost-benefit analysis.

### **Answers: Self-Assessment**

1. (i) project (ii) costs, benefits (iii) private, social  
(iv) Ravi Kanbur (v) rich, poor
2. (i) (a) (ii) (b) (iii) (c)

### 29.9 Further Readings



*Books*

1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

## Unit 30: Role of Planning

Notes

### CONTENTS

Objectives

Introduction

30.1 Meaning and Features of Planning

30.2 Need for Planning

30.3 Nature and scope of Planning

30.4 Democratic, Decentralized and Indicative Planning

30.5 Micro-Level Planning

30.6 Plan Models

30.7 Summary

30.8 Key-Words

30.9 Review Questions

30.10 Further Readings

### Objectives

After reading this unit students will be able to:

- Know about the meaning and features of planning and need for planning.
- Learn the nature and scope of planning.
- Understand the micro-level planning etc.

### Introduction

This chapter discusses the role of planning in economic growth and development. Adam Smith claimed that two invisible hands of demand and supply are efficient to do the best allocation of resources, but it did not happen so. So a need for central planning was realized. Planning can be defined as a mechanism whereby an economy develops a directed action plan to attain pre-determined goals and pre-determined means to carry them out. Without planning, growth and development cannot be compressed in any economy; whether it be developed economy, developing or under developed. Whenever we plan, it has to be time bound. Suppose, India says that our plan is to attain 100% literacy rates but does not say by when they are aiming to attain it; it will not make any sense. Rather, it should go like that India has planned to attain 100% literacy by 2020. Also we need to decide about the nature of planning. Then we need to develop a suitable plan model.

### 30.1 Meaning and Features of Planning

Planning can be defined as an instrument to bridge the gap between the realistic and idealistic situation. Planning is a conscious and not a coincidental activity. Planning is opposite of market. In a market system nothing is happening consciously but is an outcome of the forces of demand and supply. But planning envisages what to happen and makes action plan for how will it happen.

Two basic elements of planning are:

- (a) **Goals:** Goals of various countries vary from each other. Even the goals of country vary time-to-time. A plan document may aim at attainment of one goal or many goals which may be

Notes

complementary or conflicting in nature.

- (b) **Means** : The two means of attaining goals are policies and instruments. Policies describe the outlines of actions for the fulfilment of plan goals. Policy formation is to be done keeping in mind socio-economic-political-religious-environmental factors. Instruments are defined as the qualitatively and quantitatively defined means of action by which it is intended to achieve the plan goals. These instruments may be fiscal instruments like taxes and subsidies; Monetary instruments like bank rate, LRR etc. or Economic instruments like better infrastructure.

*Features of Planning*

- (a) **Institutionalized Activity**: Planning is an institutionalized activity that means there is a proper body which has resources and power to make plans and to execute them. Planning involves following steps:
  - (i) Making plans;
  - (ii) Decision-making regarding how these plans will be executed;
  - (iii) Implementation of plans;
  - (iv) Keeping control on their execution.
- (b) **Quantified Goals and Resources**: Economic wants are unlimited but means are limited; hence an economy needs to quantify the goals and resources that are required to attain them. For example, we can't say India has planned to increase its GDP; it has to be quantified like India has planned to increase its GDP by 8% in twelfth FYP.
- (c) **Programmed Action**: A programme of action is necessary to attain whatever an economy plans for. Suppose, India has planned to increase its GDP by 8% in twelfth FYP, now it needs to develop a thorough action plan how will it be attained.
- (d) **Periodic Action over a Definite Area** : We also need to keep a check from time to time whether the plans we prepared are working successfully in their respective areas; if there are any loopholes, they can be rectified immediately.



Notes

Planning has to done by a government authority as it gives direction to the economy which society at large will accept. Government planning authority must consider social costs and benefits involved with all plan options.

### 30.2 Need for Planning

'Failure to planning is planning to failure'. The need for planning can be understood from the above statement. Various convincing arguments put forward for the need for planning can be catagorised into:

- (a) Economic Factors
- (b) Non-Economic Factors.

*Economic Factors*

1. Planning is a tool to make optimum utilization of resources and this is the central issue in the field of economics-optimization.
2. Planning takes our attention on the areas which demand immediate solution or policy formulation for example, census survey of 2011, is demanding planning authorities to have a national policy for correcting adverse sex ratio.
3. In order to stimulate the rate of capital formation, an economy needs to plan the policies and instruments to enhance savings and motivate people for investment.

4. Planning helps to address economic issues which may have social impact as well like literacy levels, sex ratio, high infant mortality rate, poverty etc.
5. Planning helps to justify the interest of future generation and ensures that market gives enough opportunities to economic agents to perform their economic activities most efficiently. It also helps in increasing productivity of the economy and thereby takes care of the interests of future generation.
6. Planning helps to keep an eye on the data and the extent to which economy is performing up to the expectations.

Notes

#### *Non-Economic Factors*

1. **Symbol of Sovereignty** : Planning is taken as a symbol of sovereignty by the newly independent nations. Through planning, these nations aim to attain a national personality and a dignified position in world politics and economy.
2. **Optimism Associated with Planning**: Planning also brings about optimism that we shall learn from our past and do the best in our present to make our future bright and beautiful.

### 30.3 Nature and Scope of Planning

Economic planning is practiced in all types of economic systems but the difference lies in role and scope.

1. **Planning in a Socialist Economy**: Socialist economy survives on economic planning. Hence, economic planning is more thorough and totalitarian in this type of economic system. It is of imperative nature i.e. the implementation is provided for along with its formulation. Production units have to follow directions for planning.
2. **Planning in a Capitalist Economy**: In a capitalist economy, no direct enforcement of rules and regulations is done but indirect controls are adopted. Hence, planning is more indicative in nature. Since planning is indicative, it may not achieve its targets to the fullest.
3. **Planning in a Mixed Economy**: In this type of economic system, planning has to be a judicious mix of inductive and imperative; totalitarian and democratic. It has to make use of both direct and indirect controls to attain its goals.

#### **Self-Assessment**

1. Fill in the blanks:
  - (i) Planning can be defined as an ..... to bridge the gap between the realistic and idealistic situation.
  - (ii) The two means of attaining goals are ..... and .....
  - (iii) Failure to planning is planning to .....
  - (iv) The need for ..... can be understood from the above statement.
  - (v) ..... economy survives on economic planning.

### Decentralized and Indicative Planning

#### *Democratic Planning and Totalitarian Planning*

When a plan is prepared, next step is to think of the methods by which it will be put into action. There are two methods by which a plan can be implemented.

- (a) Planning by direction or Totalitarian approach
- (b) Planning by inducement or democratic planning.

Notes

**Planning by Direction or Totalitarian Approach**

In planning by direction, directions are used for plan implementation. These directions are generally legal and binding on the economic agents. Hence, it is compulsory for the economic agents to follow the orders and instructions.

**Advantages of Totalitarian Planning**

- (a) More successful as rules and regulations are followed strictly.
- (b) Clear and precise.
- (c) Element of compulsion makes it more practical and workable.

**Disadvantages of Totalitarian Planning**

- (a) **Imbalances:** Such planning may create surplus in one sector and shortage in other. This is because a single human mind or a group of human minds can never coordinate so effectively as invisible minds of demand and supply chain.
- (b) **Rigidity:** If on implementation stage, some loopholes of planning come into the picture, planners are generally reluctant to back out their orders. Even if they are not eluctant, it is difficult to reverse the directions, once they are given.
- (c) **Standardization:** Standardization freezes the possibilities of improvements in these goods and thereby reduces the rate of technological improvement.
- (d) **Bureaucracy:** Bureaucracy leads to loss of democracy, efficiency, red tapism etc.

**Planning by Inducements or Democratic Planning:** When instead of legally binding the economic agents to follow the directions, planning authority makes use of monetary incentives; it is called planning by incentives or induced planning. They do not take form of laws but change the market price of goods and factors of production. They lack in precision but give liberty to the economic agents.



*Did u know?* Planning by inducement is more democratic and gets easy acceptance from the public at large.

**Advantages of Planning by Inducements**

- 1. It helps in elimination of or at least reduction in surplus.
- 2. It has been possible to make the adjustments in planning according to change in taste and preferences, technology, availability of resources etc.
- 3. Standardization is not required as there is competition in the market which forces each producer to provide quality good in order to survive in the market.
- 4. The implementation of planning does not require supervision or a team of experts. It gets implemented automatically through market forces of demand and supply.

**Disadvantages of Planning by Inducements**

- 1. There is no certainty of attaining desirable and expected outcomes.
- 2. Results come out very slowly.
- 3. In some situations, this planning does not work at all. For example, say we want to have an efficient public transport system; we can't rely on planning by indumenta but need to develop it through planning by direction in the form of DMRC or Green line buses.

**Centralized Planning and Decentralized Planning:** Centralized planning is a system of planning in which there is a central authority or central office which does the planning for the country. It does not mean that all decisions are made by central office but generally the decisions of national level interest for the economy are taken by the central office.

Decentralized planning is a system of planning in which there is dominance of market in decision-making. All major decisions are taken by the market through the forces of demand and supply.

In a capitalist or mixed economy, there is dominance of decentralized planning as market is dominating in these forces. Through planning, either centralized or decentralized, prices of goods as well as factors of production particularly capital are to be increased in case of excess demand and opposite is true if there is excess demand.

**A Comparative Analysis of Centralized Planning and Decentralized Planning:** Generally speaking, merits of one form of planning are demerits of the other form because they are based on opposite forces.

- (a) **Compatibility:** Centralized planning assures full compatibility (only theoretically, there are practical problems). Decentralized planning does not ensure whether the planned outcome will be supported by market forces. There may be a gap between what the plan requires and what the market does.
- (b) **Adjustment Difficulty:** Due to the fact that there are uncertainties about the reactions of the market reaction in case of decentralized planning, adjustments in planning are made difficult. However, in centralized planning it is not so.
- (c) **Non-Planning:** Some extreme thinkers have claimed that decentralized planning is not planning at all. They claim it on the ground that the choices take on the contents of the market and not that of non-market determined forces. Planning is ex-ante but the reactions of demand and supply forces can't be anticipated.
- (d) **Difficulties of Calculations:** In decentralized planning there is a big problem in collecting data and making calculations to announce appropriate policies.
- (e) **Inadequate Control and Information:** Practically, the biggest hurdle in centralized planning is non-availability of data and lack of control on economic agents.
- (f) **Rigidity and Bureaucracy:** On implementation stage, some loopholes of the plans may come into the picture. But, in practice, rigidity and inflexibility develops. Therefore, centralized planning may fail.

#### *Indicative Planning and Imperative Planning*

Indicative planning, as the name suggests, only indicates what is desirable but does not enforce anything on economic agents. On the contrary, imperative planning not only indicates what is desirable but ensures through its policies and instruments that the economic agents behave as per the desirability. For example, in India family planning programmes are indicative in nature but one child norm by China is imperative.

**Indicative Planning:** Planning aims at coordination of economic units. There may be three approaches to coordination:

- (a) **Forecasting Approach:** In this approach, individuals or groups are given information about probable and desirable future. On the basis of such information, makes the future path of the economy transparent and comparatively certain. But the problem is it coordinates in the model of the economy but leaves the implementation out of the picture.
- (b) **Policy Approach:** Policy approach coordinates the activities of the government and the other economic units by making use of policy variables. It coordinates policy making of government and thereby affects rest of the economy.
- (c) **Corporate:** It seeks coordination of the behaviour of the economic agents who have market power; the relation between public and private activities. This form of planning has an endogenous strength for its implementation.

Notes

**Imperative Planning:** In this type of planning the implementation is planned along with the formulation of plans. In other words, plan document does not only tell what is to be achieved but also how is it to be achieved. Therefore, it is also called directive planning. This enforcement of plans into action can be through command system or price system.

- (a) In the command system, directions are given to the economic agents who are obligatory to be followed and binding on them.
- (b) In price system, such instruments are used which affect market price and thereby influence market forces of demand and supply.

### 30.5 Micro-Level Planning

Planning at micro level i.e. regional or sector or industrial level is called micro level planning. There is a need for micro level planning for following reasons:

#### *Rationale of Micro-level Planning*

The rationale of micro-level planning is found in following arguments:

- (a) **Special Needs:** Can Central Government planning be effective in tackling the problem of people's backward attitude in sending their daughters to school in a village, or the problems that a flood or cyclone prone area has. No. there is a need for planning at regional level.
- (b) **Special Capabilities:** Certain regions have special capabilities due to availability of some natural resources or skilled labour, or better infrastructure etc. Development of these capabilities to the optimum will not only help in the development of these regions but also in national development. For example, hill stations have special potential for tourism industry; if developed to the optimum it will help in increasing growth rate of the country.
- (c) **Regional Differences:** There exist wide regional differences in culture, socio-economic factors, resources, level of development and political factors of various regions. These must be considered to make optimal use of regional resources.
- (d) **Regional Industries:** Micro-level planning helps to develop regional market and other resources for regional industries.



*Caution* Micro-level planning helps to get the maximum cooperation from the regional people; rather they may also take initiative of making and implementing the plans.

#### *Problems in Micro-Level Planning*

1. Lack of mobility of resource.
2. Coordination between regional plans and national plans.
3. Marketing facilities for regional.
4. Problems in relocating shiftable industries.

### 30.6 Plan Models

Plan models set out the quantitative relationships among the variables (endogenous to the model) in the process of economic growth. There are three types of models; descriptive models, development models, planning models.

*Elements of Planning Models*

Notes

1. **Objectives of Economic Policy or Dependent Variables:** A plan must have a clearly defined (in quantitative terms) time bound goals. These goals are the dependent variables of the model.
2. **Instrument or Independent Variables:** These are the means i.e. policies or tools through which plan will be put into action and implemented. Values of independent variables are exogenously determined by the planner.
3. **The Functional Relationship:** The goals (dependent variable) and Instruments (independent variable) are functionally related to each other in the form of coefficients. Given the value of independent variable, planner can estimate the value of dependent variable.



Task

What are the elements of planning?

*Types of Planning Models*

- (a) **Aggregative or Macroeconomic Models:** When a planning model is developed for the economy and not sectors or industries, it is called macro economic model. Macro economic models do not into Sectoral details.
- (b) **Sectoral Models:** These models can be:
  - (i) **Single-Sector Project Models:** Such models help in formulation of plan for a single sector say primary. Once separate single sectors models are developed for all the sectors, they can be merged to see whether resources are sufficient for their implementation.
  - (ii) **Complete Main-Sector Model:** These models cover the entire economy by differentiating the economy into main sectors. The model should be realistic and consistent.
- (c) **Comprehensive Inter-Industry Model:** These models use input-output technique for setting Sectoral targets and ensuring their internal consistency; and linear programming for optimization objective.

*Factors Affecting Choice of Planning Models*

1. **Stage of Development:** Low stage of development-macroeconomic model is more suitable. High level of development inter industry planning model is more suitable.
2. **Institutional Structure:** Which of the two sectors dominate-private or public is also a determining factor.
3. **Availability and Reliability of Data:** Detailed planning model demands availability of reliable data.
4. **Resource Constraints:** Resources are always a constraint in the choice of an appropriate model.

*Uses of Planning Models*

1. Help to test consistency and optimality of plans.
2. Act as a framework for the evaluation of projects.
3. Help in choice of policies for plan execution.
4. Help to develop functional relationship between economic variables.

*Criticism of Planning Models*

1. Planning models ignore socio-cultural-religious-political factors.
2. Assumption of 'other things being equal' makes model unrealistic.
3. Due to isolation of economic variables, important correlations may be overlooked.

Notes

4. In many economic situations, quantification is impossible. These models do not work in such situation.

**Self-Assessment**

2. State whether the following statements are 'true' or 'false'.
  - (i) When a plan prepared, next step is to think of the methods by which it will be put into action.
  - (ii) Results come out very fastly.
  - (iii) A plan must have a clearly defined (in quantitative terms) time bound goals.

**30.7 Summary**

- Planning can be defined as an instrument to bridge the gap between the realistic and idealistic situation.
- Planning is an institutionalized activity that means there is a proper body which has resources and power to make plans and to execute them.
- Economic wants are unlimited but means are limited; hence an economy needs to quantify the goals and resources that are required to attain them.
- Planning is a tool to make optimum utilization of resources and this is the central issue in the field of economics-optimization.
- Planning helps to keep an eye on the data and the extent to which economy is performing up to the expectations.
- Such planning may create surplus in one sector and shortage in other. This is because a single human mind or a group of human minds can never coordinate so effectively as invisible minds of demand and supply chain.
- Centralized planning is a system of planning in which there is a central authority or central office which does the planning for the country.
- Due to the fact that there are uncertainties about the reactions of the market reaction in case of decentralized planning, adjustments in planning are made difficult. However, in centralized planning it is not so.
- Indicative planning, as the name suggests, only indicates what is desirable but does not enforce anything on economic agents.
- Can Central Government planning be effective in tackling the problem of people's backward attitude in sending their daughters to school in a village, or the problems that a flood or cyclone prone area has.
- Plan models set out the quantitative relationships among the variables (endogenous to the model) in the process of economic growth.

**30.8 Key-Words**

- Planning : the act or process of making plans for something
- Role : the function or position that somebody has or is expected to have in an organization
- Indicative : showing or suggesting something

**30.9 Review Questions**

Notes

1. What do you mean by planning? Bring out its essential elements.
2. Highlight the major feature of planning.
3. State both non-economic and economic reasons that bring out the need for planning.
4. How does the nature of planning differ in different economic systems?
5. Distinguish between democratic and totalitarian planning. Also weigh their relative merits and demerits.

**Answers: Self-Assessment**

1. (i) instrument           (ii) policies, instruments  
(iii) failure           (iv) planning           (v) socialist
2. (i) T                   (ii) F                   (iii) T

**30.10 Further Readings**

- Books*
1. A.P. Thirlwall, *The Economics of Growth and Development*, Vol-I. Caterloury, UK, 1995.
  2. Michael P. Todaro, *Economic Development*, Pearson Education India, 2002.
  3. J.S.L. McCombie, Roger William Vickerman, *Growth and Economic Development*, Edward Elgar Publishing.

**LOVELY PROFESSIONAL UNIVERSITY**

Jalandhar-Delhi G.T. Road (NH-1)

Phagwara, Punjab (India)-144411

For Enquiry: +91-1824-300360

Fax.: +91-1824-506111

Email: [odl@lpu.co.in](mailto:odl@lpu.co.in)