ECO-04-15/16(A)

Institute of Distance and Open Learning
Gauhati University

MA/M.Sc in Economics

Fourth Semester

Optional: (A)
Population and Human Resource Development

Contents:

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Reprint : July, 2017

Syllabus for MA/M.Sc Economics
Forth Semester

Optional (A)
Population and Human Resource Development

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Paper Introduction:

This paper contains four units dealing with various issues of population.

Unit 1 : Basic Theories and Concepts

Unit 2 : Elements of Vital Statistics

Unit 3 : Economics of Education

Unit 4 : Manpower Planning

Unit 1 deals with the various concepts of and theories of population like the Malthusian theory, theory of demographic transition etc. Besides the also contains sources of population data and the characteristics of the Indian population as revealed by the latest census. Unit 2 is about the various measures of fertility, mortality and reproductivity. Further the unit deals with concept of infant mortality and the meaning, various columns and uses of life table. Unit 3 is about economics of education and its relationship with human resource development and economic development. Further this unit deals with the cost-benefit analysis of education, the criteria of financing education and financing of higher education in India and its various problems. In unit 4 the manpower planning and its various aspects like significance and problems of man power planning are discussed. Further the units discusses the Input-Output Method in Forecasting Manpower Requirement and the meaning and concept of brain drain and cost of brain drain.

Unit- 1
BASIC THEORIES AND CONCEPTS

Contents:

1.0 Introduction

Since time immemorial, scholars and thinkers have concerned themselves with the population question. There has always been difference of opinion, specially as they related to the size and growth of human populations. Sometimes a large and rapidly growing population has been considered to desirable as a source of nation's strength and wealth; while other viewed population growth as hindrance to a nation's growth. It is worthwhile to trace the thinking of different scholars with respect to population phenomena. The population theory can be considered to have changed in eighteen century with the published work of Thomas Robert Malthus. In this unit the various theories relating to population theories are discussed.

1.1 Objectives

This unit aims to provide the learner the knowledge the basic theories of population and various concepts associated with it. It includes the Malthusian

Theory of population, the optimum population theory and the Theory of Demographic Transition. Besides attempts has been made to identify the source of population data and idea of population pyramids and concepts and measurement of population change. The characteristics of Indian population as revealed by the latest census is also tried to identify.

1.2 The Malthusian Theory of Population

The Malthusian theory of population highlights the importance of population changes as an integral and dynamic factor in the organic development of the human society.

Thomas Robert Malthus (1766-1834) first made a systematic study of population in his book "An essay on the principles of population" as it affects the future improvement of the society. He laid two postulates in his book. First, food is necessary for the very existence of human being. And second, the passion between the sexes is necessary and will remain nearly in its present state.

It was assumed that there is direct positive correlation between population growth and standard of living. Further, law of diminishing returns operates agriculture. Taking these for granted Malthus, states that the power of population is indefinitely greater than the power of earth to produce subsistence. He further states that population when unchecked tends to increase in a geometrical ratio, whereas food supply increases in a slow arithmetical progression.

Given these two ratios, Malthus points out that population will double itself in 25 years i.e. in 150 years population can increase 64 times its original number, whereas food supply only 7 times. This creates imbalance between population and food supply. This is shown in the figure below.

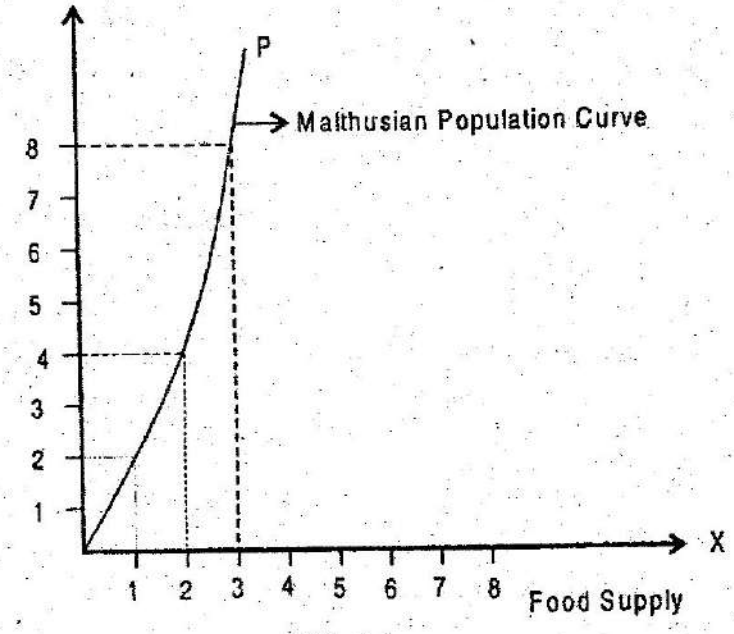


Fig. 1.1

In the figure, population growth in geometrical progression is measured on vertical axis and food supply in arithmetical progression is measured on horizontal axis. When the food supply is 1 population growth is 1, when the food supply is 2 population growth is 2 and when the food supply is 4, population growth is 8. Thus, an imbalance is created and this sort of imbalance raises the population curve upward.

But in the real world situation the population does not double itself in 25 years which according to Malthus is due to positive and preventive checks. These are powerful checks that are constantly in operation to obstruct population growth.

The preventive checks are applied by men to bring down or control birth rate. This includes moral restraint and vice as voluntary checks based on man's reasoning faculties. Malthus described moral restraints as assistance or postponement of marriage, and artificial restraints. If people fail to check the growth of population by preventive checks, positive checks operate in the form of misery, vice, famine, war, disease and other natural calamities which tend to reduce population by increasing death rate. Thereby, a balance between population growth and growth of food supply is achieved. According to Malthus, positive checks are crude and in a modern civilised society, preventive checks are always in operation.

Criticisms:

The Malthusian theory of population is criticised on the following grounds:

1. Michael Thomas Saddler criticised Malthusian theory of population on 3 main grounds.
   (a) According to Malthus, tribal wars arise out of pressure of population on land. But according to Saddler, such wars arise out from super-flows wealth.
   (b) According to Saddler, an addition to population will mean an addition to subsistence on the law of increasing returns. And Malthus was criticised as he overlooked the age-composition of the population.
   (c) Lastly, Malthus ignores immigration as a source of population growth.
2. Malthus is not consistent in the use of the terms food and subsistence. Sometimes, he refers food as the limiting factor of population; while again at other times he refers subsistence as the limiting factor.
3. There is no direct positive correlation between standard of living and population growth. As the standard of living rise people desire for a better standard of living and many will prefer a car to a baby.
4. Malthus ignores the effects of scientific innovations and discoveries which could fight the law of diminishing returns.
5. Malthus was afraid of too much of population growth. But he could forsee the beneficial aspect of population growth.

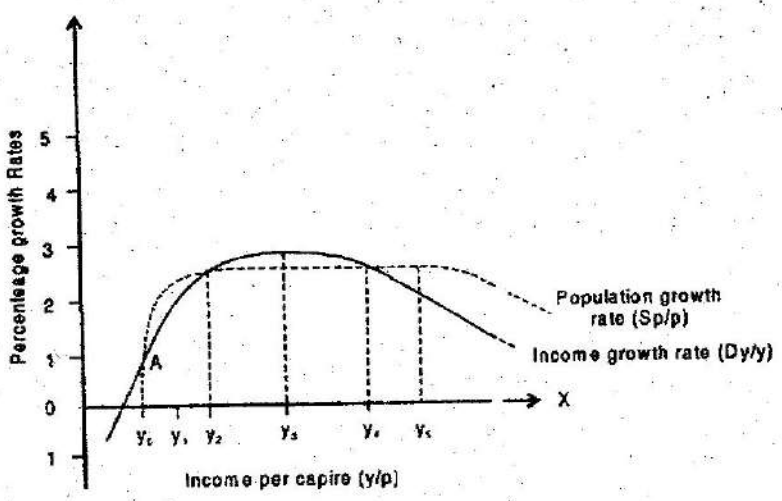
Despite weakness, the Malthusian theory of population cannot be said to be completely wrong. Malthus was correct when he pointed that rapid growth of population if not checked, human prosperity would suffer. Malthus can be credited for lifting the theory of population from field of social speculation to the field of social science. So, he is labelled as the "real father" of modern population study. So, his theory remains largely valid even today, as it had been in the past.

1.3 The Malthusian Population Trap

Malthus postulated a universal tendency for the population of a country, unless checked by dwindling food supplies to grow at geometric rate. At the sametime food supplies could expand only at arithmetic rate because of diminishing returns to the fixed factor, land. Because the growth in food

supplies could not keep pace with the growth of population, per capita incomes would have a tendency to fall so low as to lead to a stable population existing barely at or slightly above the subsistence level. Malthus contended that the only way to avoid this condition of "absolute poverty" was for the people to engage in moral restraint and thereby limit the number of their progeny.

Modern economists have called this Malthusian idea of a population as 'low-level equilibrium population trap' or simply the 'Malthusian Population Trap'. Diagrammatically, the basic Malthusian model can be illustrated by comparing the shape and position of curves representing population growth rates and aggregate income growth rates when these two curves are each plotted against levels of per capita income as shown in the figure below.



On the vertical axis, we plot the percentage changes, both positive and negative in the two principal variables under consideration i.e. total population and aggregate income. On the horizontal axis, are the levels of per capita income. The population growth curve is represented by "P/P and income growth curve by "Y/Y and levels of income by Y/P.

At a very low level of per capita income Y_0, the rate of population change will be nil, and a stable population will exist. Y_0, thus represents the concept of 'absolute poverty'. Birth and death rates are equal, and the population is barely holding its own absolute level. This situation is analogous to stage I of the demographic transition theory. At per capita income levels beyond

Y_0, the population size is assumed to increase under the pressure of falling death rates. This provides impetus for an expanding population i.e. stage II.

The population growth achieves its maximum rate, roughly 3.3% at a per capita income level of Y_2. It is assumed to remain at that level until much higher per capita income level is realized. Thereafter, in accordance with stage III of the demographic transition, birth rates will begin to decline, and the population growth rate curve becomes negatively sloped and once again approaches the horizontal axis.

Now, if aggregate income (total product) is rising faster, than by definition per capita income must be increasing. But if total population is growing faster than total income, per capita income must be falling. In the figure, the rate of aggregate income growth ("Y/Y) is assumed at first to be positively related to levels of per capita income, i.e., the higher the level of per capita income, the higher the rate of increase in aggregate income. Beyond a certain per capita income Y_3 in the figure in the figure, however, the income growth rate curve is assumed to level off and then being to decline, which is the point of diminishing returns in the Malthusian model.

The curves of population growth rate and income growth rate are so drawn that they intersect at three points A, B and C. Point A represents the Malthusian population trap level of per capita income Y_1. It is a stable equilibrium point as any small movement to the left or right of point A will cause the per capita income equilibrium point to return to Y_1. We know that whenever population is growing faster than income, per capita income must fall.

According to the neo-Malthusians, poor nations will never be able to raise much above their subsistence levels of per capita income unless they initiate 'preventive checks' on their population growth. In absence of such preventive checks, Malthusian 'positive checks' on population growth will inevitably provide the restraining force.

Besides, as seen in figure, point B is an unstable equilibrium point. If per capita income can somehow jump from Y_1 to Y_2 before Malthusian positive checks that their toll, It will continue to grow until the other stable equilibrium point C at per capita income level Y_4 is reached. Point B is an unstable equilibrium point in the sense that any movement to the left or right will continue until either A or C is reached.

Check Your Progress:

1. What is the basic thrust of Malthusian Theory of Population?
2. What is the Malthusian Population Trap as defined by the economist?

1.4 The Theory of Optimum Population

The theory of optimum population evolved out as strong reaction to the Malthusian theory of population, economists like Sir Edward West, Prof. Sedgwick, Dalton, Lord Robbins, Carr-Saunder were prominent advocates of this theory. This theory takes into consideration the entire economic aspects related to population, economic conditions etc and tries to lay down desirable norms regarding population optimum population refers to a state where the population is neither more nor less than the socially desirable level.

Unlike Malthusian theory, the optimum theory does not establish relationship between population and food supply. Rather, it is concerned with the relation between the size of population and wealth production. This theory is thus a practical theory which studies the population problem in the light of economic condition.

According to this theory every addition in population is not an evil because an increase in population is desirable or undesirable is governed by the prevailing economic conditions of the country. In an under populated country, an increase in population will be an asset, whereas in an already over populated country an increase in population is undesirable.

The concept of optimum population has been defined differently by different writers. According to Dalton, "It is that population that gives the maximum income per head." Again according Robbins, "Optimum population is that which makes maximum returns possible." According to Carr Saunder, "Optimum population is that population which produces the maximum economic welfare."

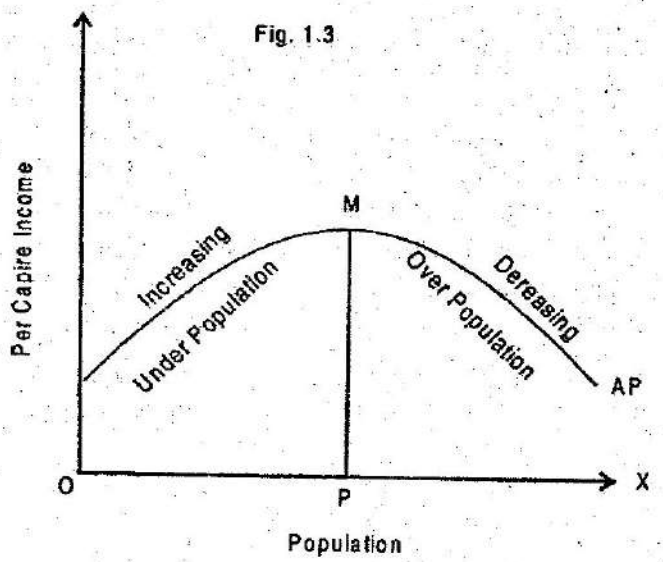
Thus, the optimum theory of population tries to identify that size of population of a country that is economically desirable and that which maximises per capita income.

Assumptions:

1. It assumes that the proportion of the working population to the total population remains constant as the population of the country increases.
2. It also assumes that the population rise takes place on the background of constant technology, natural resources and capital stock.

Given these assumptions population is to be seen as the manpower required for exploitation of the natural resources and promote economic growth. As long as the optimum point is not reached the nation shall not be able to exploit the natural resources properly and fully. On the other hand, when the population crosses that point, the nation would not get maximum return because the burden on other resources will tend to be heavy and become disproportionate. At the optimum point the resources are fully utilised which gives the ideal combination to factors of production. It also helps in suitable specialisation and division of labour. According to Cannon, at any given time an increase in labour is attend by increasing in labour is attended by increasing returns and beyond that point it is attended by diminishing proportionate returns. A given size of population will yield per capita income. So, long as population increase is accompanied by increase in per capita income, the increase in population is desirable. However, once the per capita income decreases with increase in population, it becomes undesirable for any further increase in population.

Fig. 1.3



In the figure, the size of the population is measured horizontally and the average product of labour vertically. As population increases, the average productivity of labour increase upto OP. At OP size the average productivity of labour is the highest i.e. PM. Beyond OP any further increase in population leads to a fall in the average productivity of labour. So, OP represents the optimum size of population and PM is the maximum real income per head.

Any departure from optimum population will result in a situation of maladjustment in the economy.

Dalton gives a formula to measure the degree of deviation from optimum point. The formula is—

$$M = A\text{-}0/0, \text{ where}$$

M is the maladjustment; A the actual population and O the optimum population. When M is greater than zero, i.e., M>0, when M is positive, the country is over populated. When M is equal to zero, i.e., M=), the country has optimum population. And when M is less than zero, i.e. M<0, negative, the country is under populated.

Criticisms:

The optimum theory of population is an improvement over the Malthusian theory of population, yet there are some defects which reduces its operational significance. Some of the shortcomings of the theory are pointed below—

1. It is based on the assumption that population change takes place under constant technology, neutral resources and capital stock. However, in a dynamic world they change very fast. As a result the optimum population is not a static point but shifting optimum based on the merger of science, technology and human knowledge and wisdom.
2. The population optimum from economic point of view may not be optimum from political or defence point of view.
3. The theory helps to find out the optimum population of a country at a given point of time. But does not give reason as to why or how population increases or decreases.
4. The theory over-emphasises the material benefits, but ignores other aspects like healthcare, education which effects economic development.
5. The theory laid maximum stress on production but ignores distribution. The rise in wealth may be concentrated in the hands of few persons and so although per capita income might register an increase, the people might still be miserable.
6. Other aspects of population growth like social, political and strategic aspects are ignored and much stress is laid on the economic aspect.

7. The theory cannot provide a basis for public policy of population growth as it presents only an economic definition of optimum population.

Thus, the theory of optimum population suffers from some serious defects. But at the same time there is no denial to the fact that it is definitely an improvement and step forward so far as the theories of population studies is concerned.

1.5 The Theory of Demographic Transition

The process by which fertility rates eventually decline to replacement levels has been portrayed by a famous concept in economic demography called the demographic transition. It is a Post-Malthusian development and it postulates a three stage relationship between economic development and population growth with economic advancement of a country, the population also passes from low growth to high growth and finally to low and steady growth. The theory largely depends on the process of demographic regulation which is based on the fact that every society has certain norms to guide population growth, which varies from place to place and time to time. Any society expecting four (4) or more children expects high population growth and those expecting 2 or more expects low population growth. The demographers have spoken of certain phases or stages of the theory of demographic transition. They refer to the demographic balance before, during and after the transition. With the typology, it is possible to categorise all populations of the world according to this three fold classification, with a further identification of sub-stages of the middle stage.

1. Pre-Transitional Stage
2. Transitional Stage
3. Post-Transitional Stage

1. ***Pre-Transitional Stage:*** In this stage, population growth is almost stationary, as both birth and death rates are very high though the death rates often fluctuate. During this stage, society has an agrarian peasant economy, with a traditional organisational system. In such a society, high death rates are achieved because of wars, famines, epidemics and chronic malnutrition, while high birth rates are supported by social norms and customs regarding marriage and reproduction, with a heavy accent on prolific child bearing.

2. ***Transitional-Stage:*** This stage can be sub-classified by identifying three types of situations.

(a) *Early Transitional Stage:* During this stage, death rates start decreasing, but birth rates continue to remain at a high level, with the result that the population grows rapidly. During this stage, society is successful in gaining considerable control over its death rates. But as a corresponding control over the birth rates is not achieved, the natural growth of population is very high.

(b) *Mid-Transitional Stage:* During this stage, death rates continue to decline and a decline in the birth rates begin. These birth rates are however higher than the death rtes, resulting in a fairly high rate of natural growth of the population.

(c) *Late Transitional Stage:* During this stage, death rates continue to be low and further declines are only slight. The important fact is that birth rates remain at a moderate level because of the widespread practice of birth control. With low death rates and low birth rates, the population growth is once again low.

3. ***Post-Transitional Stage:*** In this stage both the fertility and mortality rates are lowered as the knowledge of contraceptive is diffused and used universally.

Thus, these stages reveal that during the earlier stages of the demographic transition, population growth was regulated by mortality rates. Once mortality is brought to a substantially low level, it is fertility which regulates population growth. These stages reveal the transformation of a primitive high birth and high death rate and low income economy to low death rate and high income economy. Unlike other population theories, the theory of demographic transition is based on the actual demographic experience of western countries, moving from high mortality and fertility conditions of slow population growth to low mortality and fertility conditions leading again to slow population growth.

Earlier demographers such as Landry (in 1909) and Warren Thompson (in 1929) had attempted to construct a typology to describe the transition from conditions of high mortality and high fertility to conditions of low mortality and low fertility.

In 1947, C.P. Blacker attempted to identify the following five phase of the demographic transition:

1. The high stationary stage, characterised by high birth rates and high death rates;

2. The early expanding stage, with falling birth rates but rapidly decreasing mortality;

3. The late expanding stage, with falling birth rates, but rapidly decreasing mortality;

4. The low stationary stage, with low birth rates balanced by equally low mortality; and

5. The declining stage, with low mortality and deaths exceeding birth.

However, it was Frank W. Notestein, in 1945 who presented the theory of demographic transition in an almost mature form, with explanations for the changes in fertility. In that sense, he may be credited with expounding the theory of demographic transition. Notestein characterised three types of populations, according to their stage of demographic evolution.

1. Population in the stage of "incipient decline", where fertility has fallen below the replacement level or those approaching this stage.

2. Populations in the stage of "transitional growth", where birth and death rates are still high and growth is rapid, but the decline of the birth rate is well established.

3. Populations in the stage of "high growth potential" where "mortality is high and variable and is the chief determinant of growth, while fertility is high and thus far has shown no evidence of a downward trend. In these populations, rapid growth is to be expected as soon as technical developments make possible a decline in mortality.

Similarly, Sax had identified four stages involved in this demographic transition that has historically accompanied modern economic development.

The first stage, sometime called the high fluctuating stage, is marked by high fertility and mortality rates (about 35 per thousand) and by slow or intermittent population growth.

The second stage, also known as the early expanding or youthful demographic stage, when death rate beings to decline but birth rate lags considerably behind. This accelerates the growth of population.

The third or late expanding stage of population is characterised by declining fertility (about 20 per thousand) and with mortality declining more rapidly (about 12 per thousand). Natural increase rates tend to lie between 10 to 20 per thousand.

The fourth stage, also known as low fluctuating stage is characterised by low fertility (birth rates between 10 and 20 per thousand) balanced equally

by low mortality rates (death rates of 8 to 13 per thousand) the result is very low natural increase of population.

Again, according to Donald Cowgill there are five phases involved in the theory of demographic transition.

The first phase was described as "Primitive or Malthusian cycle", where the high incidence of rate of growth of population can be attributed to high birth rate and mortality was govern by natural factor.

The second phase was called the "modern cycle" where both mortality and fertility declines but the decline in mortality is more rapid than the fertility. As a result the population increases and when both these rates (i.e. birth rate and death rate) are equal the population becomes stable.

The third phase known as the "future cycle" or "baby boom" phase is characterised by stable but low death rates and changing birth rates with birth rates often exceeding the death rate. And as such this period was named as the "Baby Boom" phase.

The next phase was called the "probable cycle". This is often common to the under developed countries marked by high birth and death rates and birth rate often exceeding the death rates. Therefore, the rate of population growth becomes very rapid.

The last phase was called the "population cycle in the long run". The rapid growth of population is explained by increase in vital rates. In the long run the population growth will depend on the relative effects of the birth rates.

Criticism :

The theory of demographic transition is widely accepted as a useful aid in describing history. Its contribution is, however, considered to be of limited value.

It is to be noted that this theory is based on the actual experience of the changes in the vital rates in western countries during the various stages of their Industrial and economic development. However, the critics of this theory points out that the experiences of the various European countries were not uniform in the sense that the sequences of the stages as described in the statement of the theory were not the same.

Another criticism of this theory arises out of the fact that it does not provide a theoretical explanation of an important force, viz, fertility which brought about the demographic transition.

More over, it has been asserted that the theory of demographic transition cannot really be called a 'theory". For its does not fulfil an important criterion of any theory, i.e to extract fundamental processes from a phenomenon and identify the crucial variables in the process of the fertility decline. Therefore, it does not have any predictive value.

Although, the theory of demographic transition does provide a satisfactory framework and means for wider empirical generalisations, in the strictest sense of the term, the theory of demographic transition cannot really be considered as a theory.

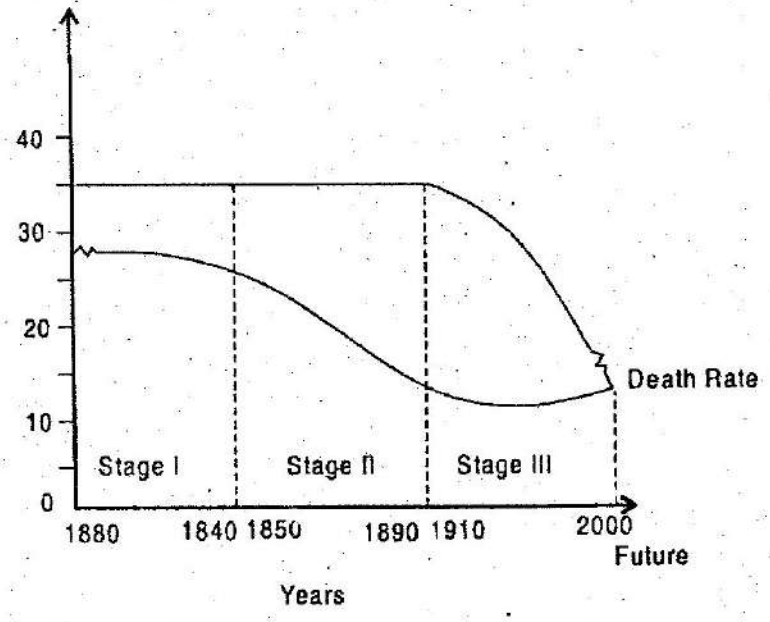
1.5.1 Demographic Transition In Developed and Developing Countries

The demographic transition attempts to explain why all contemporary developed nations have more or less passed through the same three stages of modern population history. Before economic modernization, these countries for centuries has stable or very slow growing populations as a result of a combination of high birth rates and almost equally high death rates. This was stage I. Stage II began to occur when modernization, associated with better public health methods, healthier diets, higher incomes and other improvements led to a marked reduction in morality that gradually raised life expectancy from under 40 year to over 60 years.

However, the decline in death rates was not immediately accompanied by a decline in fertility. As a result, the growing divergence between high birth rates and falling death rates led to sharp increases in population growth compared to past centuries. Stage II thus marks the beginning of the demographic transition. Finally, Stage III was reached when the forces and influences of modernization and development caused the beginning of a decline in fertility; eventually, falling birth rates converged with lower death rates, leaving little or no population growth.

The figure below depicts the three historical stages of the demographic transition in Western Europe.

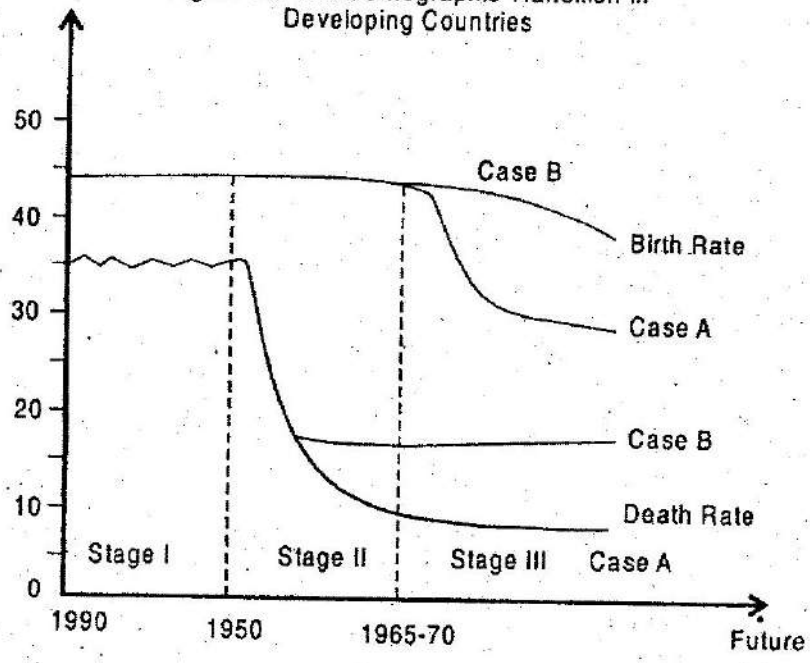
Figure 1.4 The Demographic Transition in western Europe



Before the early 19th century, birth rates hovered around 35 per 1000 while death rates fluctuated around 30 per 1000. This resulted in population growth rates of around 5 per 1000 or less than 0.5% per year. Stage II, was initiated around the first quarter of the 19th century by slowly falling death rates as a result of improving economic conditions and the gradual development of disease and death control through modern medical and public-health technologies. The decline in birth rates (stage III) did not really begin until late 19th century, with most of the reduction many decades after modern economic growth had begun and long after death rates began their descent. But since the initial level of birth rates was generally low in Western Europe as a result of either late marriage or celibacy, overall rates of population growth seldom exceeded the 1% level, even at their peak. But by the end of Western Europe's demographic transition in the second half of the twentieth (20th) century, the relationship between birth and death rates that marked the early 1800s had reversed, with birth rates fluctuating and death rates remaining fairly stable or slightly rising.

Again the figure below shows the population histories of contemporary developing countries, which contrast with those of Western Europe and fall into two patterns.

Figure 1.5 The Demographic Transition in Developing Countries



Birth rates in many underdeveloped countries today are considerably higher than they were in pre-industrial Western Europe, because women tend to marry at an earlier age. As a result, there are both more families for a given population size and more years in which to have children. Beginning in the 1940s and especially in the 1950s and 1960s, Stage II of the demographic transition occurred throughout most of the developing world. The application of highly effective imported modern medical and public-health technologies caused LDC death rates to fall much more rapidly than in 19th century Europe. Given their historically high birth rates, over 40 per 1000 in many countries, this has meant that stage II of the LDC demographic transition has been characterised by population growth rates well in excess of 2.0% per annum. With regard to Stage III, two broad classes of developing countries can be distinguished. In the figure in case A, modern methods of death control combined with rapid and widely distributed rises in levels of living have resulted in death rates falling as low as 10 per 1000 and birth rates also falling rapidly, to levels between 20 and 30 per 1,000. Countries, most notably Taiwan, South Korea, Costa Rica, China, Cuba, Chile and Sri Lanka have thus entered stage III of their demographic transition and have experienced rapidly falling rates of overall population growth.

But some developing countries fall into case B as seen in the figure. After an initial period of rapid decline, death rates have failed to drop further, largely because of the persistence of widespread absolute poverty and low levels of living, and more recently because of the AIDS epidemic. Moreover, the high birth rates as a result of these low levels of living causes overall population growth rates to remain relatively high. These countries, including many of those in Sub-Saharan Africa and the Middle-East are still in stage II of their demographic transition. Though fertility is declining, it remains very high in these parts of the world.

1.6 Population as Limits to Growth and as 'Ultimate Source'

Population as Limit to Growth :

Unrestrained population increase is seen as the major crisis facing humankind today. It is regarded as the principal cause of poverty, low levels of living, malnutrition, ill health, environmental degradation and a wide array of other social problems. Thus, incendiary terms such as "population bomb" or "population explosion" are now-a-days tossed around at will and they act as a constraint to economic growth or what is called as "limit to growth".

Theoretical Argument: The basic model that economists use to demonstrate the adverse effect of population growth is a simplification of the standard Solow-type neoclassical growth equation. Using the standard production function Y= f (K,L,R,T) i.e..., output is a function of capital, labor, resources and technology and holding the resource base fixed, we can derive the result that—

$$y - l = \alpha(k - l) + t \ldots\ldots(1)$$

Where, y= rate of GNP growth, I= rate of labor force or population growth, k= rate of growth of capital stock, α = capital-elasticity of output, t= the rate of technological growth.

Assuming constant returns to scale, equation (I) states that the rate of per capita income growth (y-I) is directly proportional to the rate of growth of capital-labor ratio (k-l) plus the residual effects of technological progress. Thus, in the absence of technological change, the higher the rate of population growth (I), the more rapid the growth of capital stock (k) must be (thus the greater concomitant saving and investment rate) to maintain constant levels of per capita income. But according to the neoclassical assumption, k is not independent of I but in fact is inversely related to I, (due to reduce savings implied by higher dependency burden effects of rapid population growth) that is higher is the value of I, lower is the value of k. Hence, it

follows that excessive growth of population acts as a limiting factor to economic development.

Empirical Argument: Evidence shows that rapid population growth lowers per capita income growth in most LDCs, especially, those that are already poor, dependent on agriculture and experiencing pressure on land and natural resources. High growth rate of population exacerbates the problems like unemployment, food crisis, malnutrition, higher morbidity, poverty, loss of valuable physical and human capital etc. Moreover, it also contributes to environmental degradation in the form of forest encroachment, deforestation, fuel-wood depletion, soil erosion, declining fish and animal stocks in adequate and unsafe water, air pollution, urban congestion etc. and thus acting as a threat to economic growth.

Population as the Ultimate Source of Growth :

The relationship between population growth and economic growth is quite complex. While, at one hand, it acts as a hindrance to economic growth, at the other, it is the ultimate source of growth. Population acts as the both instrument and goal of economic growth. As an instrument, population supply an essential factor service that makes other factors work viz labor and entrepreneurial ability. In this role, it determines the size of total output. On the other hand, all developmental activities are undertaken to provide a better living condition to human beings. We can summarize the role of population as the ultimate growth facilitating factor in the following ways—

i) Economic development depends upon the human ability to exploit natural resources. A growing population thus can act as a stimulus to growth by exploring and utilising the variety of un-utilized natural resources.

ii) Rising population paves the way for greater degree of specialization and division of labor and thus enables manifold increase in the productivity of a production unit efficiently.

iii) Most importantly, a rising population creates incentives to the production process by acting as units of consumption. The entire economic activities aim at fulfilling human needs. Therefore, with increase in population, demand for goods and services also increase and thereby motivates producers and investors to produce and invest more which further results in increased levels of income, employment, output and all other economic activities.

1.7 Sources of Population Data

The data required for the study of population are obtained mainly through three source:

(a) Population Census

(b) Registration of Vital Events, such as birth, deaths etc.

(c) Sample Surveys

(a) ***Population Census :*** The most fundamental source of data for the study of population is the population census. In modern times the very purpose it to produce statistical data on various aspects of any population. The word 'Census' is derived from the Latin word 'censere' meaning to value or tax.

A census of population is the total process of collecting, compiling, evaluating, analysing and publishing, at a specified time, to all persons in a country or in a well delimited part of a country. In other words, the enumeration of the entire population of a country or a region at a particular time is known as a census.

Salient Features of a Population Census:

A census implies that each individual is separately, but only once, enumerated and that some important characteristics of each person are separately recorded. The census covers a precisely defined territory, such as the entire country or a well-defined part of it. A reference period is pre-determined for the enumeration and the entire population is counted with reference to that point of time. A census is taken at regular intervals. For example from 1881 onwards, census in India has been taken at regular intervals of ten years.

Uses of Census:

Population census is the primary source of basic national population data required for administrative purposes and for many aspects of economic and social planning and research. In provides us with information on the trends in population growth, changes in the age and sex structure of the population, the course of morality and fertility, migration and urbanisation, etc. The census also contributes to our knowledge of the changes in the nation's occupational and industrial composition, in its levels of literacy and educational attainments, in its levels of living and other cultural characteristics

such as religious and languages. It is also useful in providing a base for drawing up samples for various kinds of surveys. Census data are also used for constructing life-tables and for analysing economic development. Besides the census data are also used for demarcation of constituencies and the allocation of representation on a democratic set-up. The census is thus an extremely useful source of knowledge and the information available through all over the world "contributing to a revolutionary expansion of global economic, sociological and demographic knowledge."

(b) Vital Statistics or Registration of Vital Events: The registration of vital events is another important source of population information. Therefore, it is essential to understand the terms "vital events", "vital records" and "vital statistics".

A person's entry into the world (by birth) and a person's departure from it (by death) are considered to be "vital events", for these events mark the beginning and end of a person's life. Again, "vital records" may be defined as those concerned with vital events or those which have recorded vital events, such as births, deaths, still births, marriages, divorces etc. The occurrence of vital event is reported by the persons concerned to the appropriate authorities.

In any society, births, deaths, marriages and divorces occur continuously. Hence, such events are continually recorded. This recording or registration of vital events is known as the "vital registration system". The registered events are compiled and the resulting statistics are known as "vital statistics". Along with the vital events, some ancillary information is also recorded. The vital registration system, which is also known as civil registration, is a important tool for studying the dynamics of population.

Uses of Registration of Vital Events and Vital Statistics to the Individual:

After a vital event is reported and registered, a certificate is issued to the person concerned. Such a certificate like the birth certificate etc are useful as a legal document having evidentiary value, providing the fact, the time and place of occurrence of a vital event.

The establishment of the identity of an individual, i.e, the proof of the fact of his/her birth, is one of the most important uses of a birth certificate. Beside being the best proof of a person's age, the birth certificate is also useful in establishing a person's nationality or citizenship for obtaining a passport. It is moreover, a legal proof for the establishing family relationship and is

especially useful for setting questions of inheritance or insurance claims. A death certificate is required for the disposal of a dead body and is useful for sett...questions of inheritance or insurance claims. A marriage certificate is useful for establishing the marital status of a person and the legitimacy of the children born of a marriage.

(c) Sample Surveys: The Demographic Sample Survey is another method of data collection for population studies. In a sample survey, information is collected only from a sample of the population, which is representative of the whole and from which conclusions are drawn by the use of scientific methods. In a country like Afghanistan where no census was conducted, population data were collected through sample surveys and some estimates were made of its size, growth, structure and characteristics. Even in countries where regular census operations are conducted, the need for collection of population data through sample surveys is felt, for a census is taken in most countries only once in ten years.

The collection of data through surveys has several advantages. The quality of data obtained through a sample survey is better than that obtained from a census because they are collected by a comparatively small number of well-trained interviewers.

Despite these advantages, sample surveys can never take the place of either census or of vital registration. Sample surveys, however are becoming increasingly useful to planners and administrators in many ways and the methodology of conducting survey has also improved over time.

Besides these three sources, the other sources of population data are- dual report system, population registers and international publications.

In a dual reporting system, each event of birth and death is enumerated by two independent procedures; one is the registration of births and deaths and other is the sample survey. The design of this system is based on an appropriated number of small geographic samples. For example sample registration system in India is a technique of the dual report system.

In some countries, such as Sweden, Finland etc, data about population can be obtained from continuously maintained population registers, in which the name of each person in the country is entered. Besides important migratory movements of individuals are also registered. These registers, are also used to obtain demographic information as current population size, internal migration, data on vital events etc.

Again, the United Nations and other international organisations periodically publish demographic data for the world and for different countries. Some

of the important publications are-Demographic year Book; Statistical Year Book; Epidemiological and Vital Records.

1.8 Population Pyramids

The composition of population in terms of its age and sex distribution as well as the trends in vital rates can be graphically presented. The distribution of a population by age and sex together is usually represented by a special type of bar graph called a 'population pyramid'. The pyramid consists of 2 sets of horizontal bar charts one for each sex which indicates either the number or proportion of person in each age group. Male and female age distribution are generally drawn on either side of vertical line.

In a pyramid, the male population is usually kept on the left hand side and female population on the right. The pyramid starts with the lower ages. Thus, the bottom bars usually represent the children under age 5. Usually a broad base indicates a high proportion of children, a rapid population growth and a low proportion of old age. This is a common characteristic of the developing countries of the world which produces a triangular shape for the pyramid. The pyramid is a very useful tool. It tells us at a glance both the structure ate a given date and the accumulated effects of past fertility, morality and migration.

Effects of Fertility, Morality and Migration on the shape and size of the pyramid:

When birth rate falls in comparison to a previous level, children constitute a smaller proportion of the total population than before. As a result the population pyramid has a comparatively narrower base. Infact, the base may appear smaller than the older age and the pyramid has 'Christmas tree' effect. A sudden rise in the birth rates, on the other hand, has the opposite effect on the age pyramid. The proportion of people in the younger age group increases and the pyramid assumes a much broader appearance in the base.

Again, a sudden decline in the death rates at any age tends to pass on to the higher age classes a larger proportion of the individual who have already been born. Contrary to this, where death rates are extremely high only a very small proportion of the people succeed in attaining the upper range of the population pyramid. A decline in the death rate enables the pyramid to become broader at the top.

The age-structure is again affected by the survival of persons to the age of reproduction. If death rates are high at the ages of infancy and early childhood, only a small percentage of the population is able to reproduce. Lowering the death rate at younger ages has the effect of increasing the survivorship to the ages of 20-45, the reproductive ages and as a result creates an indirect increment to the base of the population pyramid.

Migration can also affect the size and shape of the population pyramid. Migration streams contain a pre-ponderance of young adults. So, the typical affect of migration is to make it fatter in the middle, if the migration is inward and make it lean if the migration is outward.

Effect of Wars or Age Structure:

The age-structure is directly affected by war casualities which mostly the males in the younger age group war also affects the age structure because of the indirect affect they have on fertility. During a war, men in the armed forces are seperated from their wives for long period and this inhibits fertility. In the immediate post-war period there is often a baby boom because couple unite once again and marriages postponed because of war are solemnised.

Types of Population Pyramid:

There are five types Population Pyramid and we can classify the national population of the countries according to it.

1. Broad Base and Gently Sloping Sides :

This type of pyramids are typical in countries with high birth rates and death rates, and a low median age. The dependency ratio is also high because majority of the population is in the younger age-group. It represents the first stage of demographic transition. India's pyramid for 1951 population is of this kind until 1650 most if the European countries has this type of pyramid. But after that they exercised control over the births rates and death rates.

2. Broad Base and Sharply Sides :

In this type of pyramid the base is broader than that in the Type 1 which indicates high birth rates. The sides are more bowing sharply than type 1. It is typical of all countries which are growing rapidly

because of significant reduction in infant and child mortalatity rate. Therefore, more survivors are found. But they are not able to reduce birth rates significantly. It represents the second stage of demographic transition. The gap between death rate and birth rate. The mediam ages are falling in this countries due to the fact that larger population are in younger age group. Lowest median age infact is what it represents. This also represents high dependency ratio. Countries like Philippines, Brazil and Mexico falls in this category of population pyramid type.

3. Bee-hive type Pyramid:

The third type represents an old fashioned 'bee-hive'. This type of pyramid represents countries with low birth rates and low death rates and a high median age population. This type of pyramid represents country of Western Europe. Population of USA and Canada had this type of Population Pyramid before World War II. But after that these countries had a baby boom and experienced reversal in their fertility trend.

4. Bell Shaped Pyramid:

This type of population pyramid represents a reversal in fertility trends. After World War II USA and Canada experienced a rise in the birth rates and as a result the had a bell-shaped Population Pyramid. This type of pyramid could easily represent countries who had 100 years low birth rates and death rates, but faced reversal in their fertility trends. This type of population pyramid represents a transitional type of pyramid with high youth and child population. As a result the dependency ratio is also high.

5. Type 5:

This type of population pyramid represents a population marked by rapidly declining fertility rates. If this trend continues it would experience an absolute loss in population. Japan is the only country in this situation. The death rates are low and birth rates is reduced rapidly, which represents an elderly population. In 1930's many Western European Countries had this type of population. However, this type of pyramid is also transitional type and not of permanent type.

1.9 Population Change : Concepts and Measurement

Single most important fact about population is the rate of population change, because it not only affect the numerical increase and size, but also its composition in terms of sex and age. Different people attach different meaning

to population change. Everyone is affected by population change but none can ignore it. Just as a farmer is never satisfied with the weather conditions, no one is satisfied with the present rate of population growth. High population growth is always a concern for population explosion and insufficient economic growth. Similarly, low population growth us also a concern for insufficient human resource.

Components of Population growth:

There are basically three components of population change (or growth): Mortality, fertility and migration. Population change is a dynamic equilibrium between these forces. Population increases with the increase in birth rates and at the same time it is diminished by deaths of persons of all ages similarly there may be in-migration and out-migration leading to increase and decrease in the size of the population respectively. The population situation can be compared with the level of water in a tank filled by two up or increases the population and deaths and out-migration drains out or decreases the population.

Thus population change is not an unitary phenomenon it comprises of four major components i.e birth rate, death rate, inmigration and outmigration (or immigration and emigration). The balance between birth and death rates are termed as reproductive change or natural increase and that between immigration and emmigration as net migration. Thus, if the initial population count of a certain day is known and somehow the birth rates, death rates and migration could be traced than the population at some future time can be known. One of the simplest equation is demographic book-keeping equation.

Which is given as–

$$P_t = P_o + (B-D) + (Mi-Mo)$$

Where P_t is the later population count, P_o the initial population count; B is the birth rate and D the death rate; Mi the in migration and Mo is the out migration.

Measurement of Population Change:

Most nations measure population change by comparing the results of census which is normally conducted at a 10 years interval. So, the most simplest

measure of population change is the 'inter-censal change' which is given as-

Inter-censal change=Population of later census-Population of previous census.

For example in 1951 India's population was 3,56,879,394 and in 1961 it stood at 4,34,80,724t.

Therefore, inter censual change = Population of 1961-Population of 1951

= 434807245-356879394

= 77,92,7851

This represents the absolute amount of change. On the basis of absolute amount of change but the relative amount of growth cannot be compared. To know the relative amount of change another measure is used known as the 'inter censal present change'. This overcomes the deficiency of the absolute measure that they donot take into account the size of population that caused the growth. So, the inter-censal percentage change is given as-

$$\text{Inter censul percentage change} = \frac{\text{Inter censal change}}{\text{Population of earlier census}} \times 100$$

∴ For India the inter censal percentage change for the period between 1951 and 1961 us-

$$\text{Intercensal percentage change for India} = \frac{77,927,851}{356\,879\,394} \times 100$$

$$= 21.8\%$$

On the basis of inter censal percentage change the relative population growth in two countries can be compared. In symbol inter censal percentage change is nothing but $\frac{P_t - P_o}{P_o} \times 100$, where P_t is the later population and Po the earlier population.

However, when the interval between the census varies, it is useful to express growth in terms of percentage change per year or as an annual rate which is termed as 'the annual rate of population change'. The procedure and formula for the computation of the annual rate of population change is same with that inter-censal percentage change except for the fact that the interval for the former refers to exactly one year. The annual rate of change is thus the population increase during a year divided by the population at the beginning of the year. Thus, we have –

Annual rate of Population change $= \frac{P_t - P_o}{P_o} \times 100$

Where, Po is the population at the beginning of the year and P_t is the population at the end of the year. Usually, it is not possible to use the equation to computation of annual growth rates because data are not available for single years. In such a situation, it is possible to use the data for 2 successive census to estimate an average annual growth rate for the inter-censal period. This is done with the use of compound interest formula as–

$$P_t = P_o(1+r)^t \times 100$$

Or $$r = \left(\sqrt[t]{P_t / P_o} - 1\right) \times 100$$

Where 'Po' is the population of earlier census, 'P_t' the population of later census and 'r' the average annual rate of growth. Multiplying by 100 provisions fors expressing the change in terms of percentage.

Methods of estimating Inter-Censal Population Change:

There are two methods of estimating inter-censal population change viz (i) Component Method and (ii) Mathematical Method.

(i) Component Method : With an accurate count of two successive census 't' years apart and a correct record of births, deaths and migration in the interv..... years, the inter censal estimates can be made. If Po is the initial population; P_t is population after 't' years; B is the total number of births, D is the total number of deaths and M the net migration, then-

$P_t = P_o + (B - D) + M$, for any specified area. Now, the population for any interval 'i' is found by adding to the earlier census the total of natural increase i.e. B-D and net migration M for the intervening period from the census data to that year.

However, because of in accuracies of the basic data the growth of population between two successive census i.e (P_t-P_o) is generally different from the sum of natural increase and net migration i.e (B-D+M) over the inter censal period. This difference will found after correcting births and deaths for under registration. The difference is given as 'e' is known as error of closure, so that $C = (P_t - P_o) - \{(B - D) + M\}$. The error of closure may attributed to one or more sources viz. errors in census count, errors in adjustment for

under registration in births and deaths and error is estimating net migration. Inter census population estimates is made generally for July 1 of each year.

(ii) Mathematical Method: When the requisite data are available it is preferable to make inter-censal population estimates by the component because it takes into account the factors that affect population change from one year to the next.

Mathematical methods assume uniform yearly changes in the population. However, they avoid the problem of closure and also are more easy to apply. There is a reason to believe that population change rather uniformly during the inter-censal period a linear interpolation between successive census will usually produce satisfactory results.

Let, P_o is the initial population; P_t the population after t years; P_i is the population of the intervening period.

Now, change in the population from the initial period to the t^{th} period is (P_t-P_o) relative change in the t^{th} period is $\frac{(P_t-P_o)}{t}$. Therefore, relative change in the i^{th} period is given as-

$$\text{Relative change} = \frac{P_t-P_o}{t} \times i$$

$$= i/t\,(P_t-P_o)$$

Hence, the inter-censal population at the i^{th} period is given by-

$$\text{Inter-censal population} = P_i = P_o + i/t\,(P_t-P_o)$$

Linear inter population can be used not only for the total population but also for its segment such as age, sex, geographical area etc. Thus for any segment of the population S the inter censal population is given as-

$P_{is} = P_{os} + i/t\,(P_{ts}-P_{os})$.

1.10 Characteristics of India Population as Revealed by the Latest Census

India is the second most popular country after China. It has 2.4% of the total world land and 1.5% of total world income and supports about 17.5% of the total world population.

At the beginning of the 21st century India's population wad 236 million and according to 2001 census it has crossed the billion mark i.e. 1027 billion and still according to 2011 census it has further increased. While studying India's population we consider that it has four phases:-

1. 1901-1921: This was a period of stagnant growth and the annual growth in population was 0.19% i.e the first stage of demographic transition.
2. 1921-1951: This was period of steady growth and the rate of growth of population was 1.22%. In the year 1921, the population actually registered a decline from 252 million in 1911 to 251 million in 1952.
3. 1951-1981: It was a period of rapid high growth of population and the population growth wad more than 2%.
4. 1981-2001: It is a period of high growth but definite sign of slowing down with a growth rate of 1.97%.

The year 1921 is known as "the year of great divide". The cause of decline signifincantly was very high death rate. From 1921 the population is rising and the main reason for the increase in the growth rate was a sharp decline in death rate. In particular from 1951 onwards the population was increasing sharply.

Census 2011 was the 7th census operation post India's Independence and 15th in total since, it began in the year 1872. According to the report published by the census India in Mar 2011, the total population of the country was 1210.2 million of which 623.7 million were males and 586.5 million were females. The decade growth from the previous cens of 2001 was of a total of 181 million people. Presently, the most populated states of India are- Uttar Pradesh, Bihar, Maharashtra, West Bengal, Tamil Nadu and Madhya Pradesh. However, the absolute addition is slightly lower than the population of Brazil, the fifth most populous country in the world. The population of India, at 1210.2 million, is almost equal to the combined population of U.S.A., Indonesia, Brazil, Pakistan, Bangladesh and Japan put together (1214.3 million).

2001-2011 is the first decade, with exception of 1911-1921, which has actually added lesser population compared to the previous decade. The percentage decadal growth during 2001-2011 has registered the sharpest decline since indepence –a decrease of 3.90% points from 21.54% to 17.64%.

Gender Composition-Sex Ratio:

As per census 2011, overall sex ratio at the national level has increased by 7 points since census 2001 to reach 940 at census 2011. This is the highest sex ratio recorded since census 1971 and a shade lower than 1961. Among all the states and Union territories of the nation, Kerala and Pondicherry

has the highest sex ratio of 1084 and 1038 females per 1000 males. Three major states viz. Jammu and Kashmir, Bihar and Gujrat have shown decline in sex ration as compared to çensus 2001.

Literacy Rate :

Literacy rate is calculated based on the fact that how many among the total inhabitants are literate. As per Census 2011, literates constitute 74% of the total population aged seven and above and illiterates form 26% literacy rate has gone up from 64.83% in 2001 in 74.04 in 2011, showing an increase of 9.21%. The literacy rate for males and females works out to 82.14 percent and 65.46% respectively. The increase in literacy rate in males and females during 2001-2011 is in order of 6.88 and 11.79% points respectively. It is encouraging to note that out of the total literates added during the decade, females outnumbered male literates Ten States and Union territories viz. Kerala, Lakshadweep, Mizoram, Tripura, Goa, Daman and Diu, Pondicherry, Chandigarh, NCT of Delhi and Andaman and Nicobar Islands have achieved literacy rate of above 85%, the target set by planning commission to be achieved by 2011-12.

Density of Population:

Indian density of population has increased from 324 people per square km during Census 2001 to 382 people per sq. Km in 2011 Census. The state of Uttar Pradesh is said to be the most popular state of the Indian Republic and Lakshadweep being least populous.

Age Composition :

Broad base and tapering top, in demographic term it is termed as young population. India has one of the largest proportions of population in the younger age groups in the world. 35.3% of the population of the country has been in the age group of 0-14 years at the census 2001; 41% of the population account for less than 18 years of age. However in 2011 only 29.7% of the population was in the age group of 0-14 years; 64.9% in 15-64 years age group and only 5.5% in the age group 65 years and over.

Rural-Urban Population :

For the first time since independence, the absolute increase in population in urban areas is more than that in rural areas. Rural-Urban distribution was 68.84% and 31.16%. The proportion of rural population declined from 72.19% in 2001 to 68.84% in 2011. The slowing down of the overall growth rate of population is due to the sharp in the growth rate in rural

areas, while the growth in urban areas remains almost the same. The improvement in literacy rate in rural areas in however two times than that in urban areas.

Life Expectancy at birth:

Life expectancy is defined as the average number of years a person is expected to live at the time of birth. It depends on death rate; if death rate decreases life expectancy increases and vice-versa. In 1951 the life expectancy was 37 years but now due to the improvement in the standard of living the life expectancy has increased. In 2001 and 2006 life expectancy is 62.5 with female with higher life expectancy of 66 and males 63 years. According to 2011 census the life expectancy at birth of the population as whole was 67.14 years and that of males increased to 66.08 years and for the females it remained the same with just marginal increase of 68.33 years.

1.11 Self-Assessment Questions

1. Briefly explain the Malthusian Population Trap.
2. What is the basic thrust of the theory of optimum Population?
3. Draw a difference between the Demographic Transition In developed and developing Countries.
4. Explain briefly the sources of Population data.
5. What do you understand by Population Pyramid? Explain its types.
6. Write a note on the characteristics of Indian Population as per census 2011.

1.12 References/Suggested Readings

1. Bhende, A., and R. Kanitkar, "Principles of Population Studies."
2. Sinha, V.C., and Zacharia. E, "Elements of Demography".
3. M.P. Todara SE.C. Stephen, "Economic Development".
4. Census 2011

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Unit- 2
BASIC THEORIES AND CONCEPTS

Contents:

2.0 Introduction

Vital Statistics deals with birth, death, divorce and remarriage etc. By Vital statistics we mean the statistical explanation of live birth, death, foetal death, marriage, termination of marriage, adoption, legitimation, recognition, annulment and legal separation. Vital statistics data can be obtained from population census, adhoc demographic survey and registration of vital events. Vital statistics have very deep and profound significance in the life of the people and for the nation as it helps in analysing demographic trends in the

country. Besides it helps to know the future trends in population and make precise projection of future population.

2.1 Objectives

The objectives of this unit to give an idea of the different vital rates which includes various measures of fertility and re productivity as well as mortality. This unit also deals with the concept of Infant Mortality Rate and life table. This unit further gives insight on the uses of life table and different columns of a complete life table.

2.2 Fertility Meaning

The study of human fertility occupies a central position in the study of population for several reasons. Human fertility is responsible for biological replacement and for the maintenance of the human society. The growth of the population of the world depends entirely on human fertility. Any society replenishes itself through the process of human fertility. Thus, in population dynamics, fertility is a positive force.

2.3 Measures of Fertility

Fertility is a concept which is primarily concerned with number of live children born.

2.3.1 Crude Birth Rate

This is the most easily computed and the most easily understood measure of fertility. The crude birth rate is the ratio of the total registered live births in some specified year in a particular area to the total mid-year population of that area multiplied by 1000. It is computed in following manner-

$$CBR = \frac{\Sigma B}{\Sigma P} \times 1000 \text{ or } i = {}^{B}\!/_{P} \times 1000$$

Where, CBR is the crude birth rate in a particular year ΣB is the total number of live births during that particular year.

ΣP is total population in the middle of that year.

This rate is called crute because all the differences in the composition between population are ignored in calculating it. It is an important measure of fertility

for it directly points to the contribution of fertility to the growth rate of the population. However, it suffers from several defects.

Under in the ratio of total number of child birth is worked out in relation to total population which includes men and women above 49 years and children below 15 years. Infact fertility should be studied in respect of population between 15-49 years of age. So, crude birth is not a true measure of fertility.

Illustrarion :

Age Group	Female Population (in'000s)	No. Of Live Births
15-1	17	340
20-24	18	1,980
25-29	20	2,900
30-34	15	1,500
35-39	12	840
40-44	10	400
45-49	8	40
Total	100	8,000

Total Population is 4,00,000

How, $CBR = \frac{\text{Total live births}}{\text{Total Population}} \times 1000$

$$= \frac{\Sigma B}{\Sigma P} \times 1000$$

$$= \frac{8,000}{4,00,000} \times 1000$$

$$= 20 \text{ per thousand.}$$

2.3.2 General Fertility Rate

While computing crude birth rate (CBR), the denominator includes the total mid-year population. However, everyone in the total population in not expected to the risk of bearing children. Only women in the age group 15-44 or 15-49 is expected to this risk. Hence the refinement of the crude birth rate is introduced by relating the number of births to the number of women in the child-bearing age (15 to 44 or 49).

Thus, General Fertility Rate may be defined as the ratio of the total live births in some specified year in a particular area to the number of women in the child-bearing age, multiplied by 1000. It is computed as follows:

$$GFR = \frac{\Sigma \beta}{\sum_{x=15}^{44r49} f_{P_x}} \times 1000$$

Where, GFR is the general fertility rate in a specified year.

ΣB is the number of live births in that year.

$\Sigma^f P_x$ is the mid year population of women between the age of 15-44 or 49.

This rate if more refined than the crude birth rates because in addition to eliminating the influence of difference is size between population, it also eliminates the effect of certain compositional differences with might exist in the population being compared. Although the general fertility may be considered as a step forward in the direction of the refinement of fertility measures, it must be noted that it is not a very effective refinement, for it is related to all the women in the child-bearing age group. But fecundity i.e the physiological capacity to bear children during the child-bearing age group is not uniformly distributed since fecundity of women is not the same during the entire span of the child-bearing period, when the general fertility rate is computed this aspect is lost sight of.

Illustration:

Age Group	Female Population	No. Of Live Birth
15-19	21,000	420
20-24	24,000	2,400
25-29	27,000	4,050
30-34	30,000	3,000
35-39	24,000	1,680
40-44	18,000	900
45-49	6,000	60
Total	1,50,000	12,510

Solution:

$$GFR = \frac{\sum \beta}{\sum_{x=15}^{44-49} f_{p_x}} \times 1000$$

$$= \frac{12,510}{1,50,000} \times 1000$$

$$= 83.4 \text{ per thousand.}$$

2.3.3 Age Specific Fertility Rates

The age specific fertility rates for any year are obtained by dividing the number of births to mother of each age in that year by the number of women of this age in the population at that date and multiplying the figure by 1000. Women of different fertility period are grouped according to age 15-19, 20-24, 25-29, 30-34, 40-44, 45-49 age groups.

$$n^1x = \frac{n\beta x}{f_n \ \ p_x} \times 1000$$

Where, is the age specific fertility rate in the age group x to (x+n) in a specific period.

$n\beta x$ is the number of live children born to women in the age group x to (x+n) in that specific period.

$f_n \ \ p_x$ is the number of women in the age group x to (x+n) in that specified period.

Illustration:

Find the age specific fertility rates:

Age group	Female Population	No. Of Live Birth	Age Specific Fertility Rates
15-19	21,000	420	$\frac{420}{21,000} \times 1000 = 20$
20-24	24,000	2400	$\frac{2400}{24,000} \times 1000 = 100$
25-29	27,000	4050	$\frac{4050}{27,000} \times 1000 = 150$

30-34	30,000	3000	$\frac{3000}{30,000} \times 1000 = 100$
35-39	24,000	1680	$\frac{1680}{24000} \times 1000 = 70$
40-44	18,000	900	$\frac{900}{18,000} \times 1000 = 50$
45-49	6,000	60	$\frac{60}{6000} \times 1000 = 10$
Total	**1,50,000**	**12,510**	$\Sigma ASFR = 500$

Thus, ASFR for the age group 15-19 is 20 per thousand; for 20-24 is 100 per thousand and so on.

Age specific fertility rates are not affected by any variation in age structure and therefore, these rates may be considered to be refined. It is also possible to compute age specific fertility rates with reference to only married women. These rates are then called age specific marital fertility rates and are even more refined than age specific fertility rates, for generally it is only the married women who are exposed to the risk of bearing children.

2.4 Measures of Re Productivity

Measures of re productivity or population replacement are measures of natural increase expressed in terms of generation. Rather than a year or other other brief period of time. Two factors determine re productivity- natural increase and a generation.

Some commonly used measures of re productivity are- total fertility rate, gross reproduction rate and net reproduction rate.

2.4.1 Total fertility Rate

The total fertility rate is the sum of the age specific fertility rates of women in each, five-year age group from 15 to 44 or 49. The total fertility rate for each age group is given as–

$n'x = \frac{n^{\beta} x}{f_i P_x} \times 100$ which is nothing but the

ASFR.

Now,

$$TFR = \sum_{x=15}^{49} n'x$$

Suppose x=4, then we have

$$4^{i}x = \frac{4^{\beta}x}{4^{\beta}P_{x}} \times 1000$$

Then $TFR = 4 \times \sum_{x=15}^{49} 4^{i}x$

The total fertility rate is a hypothetical rate indicating the total number of children that would ever be born to a (hypothetical) group of women, if the group passed through its reproductive span of life with these birth rates in each year of age. The total fertility rate assumes that the women in this hypothetical cohort or group would survive till they reach the end of the reproductive period. As the total fertility rate is not affected by the age structure of the women under study, it is an effective summary rate for describing the frequency of child-bearing in a year. It is also useful when comparisons between the reproductive performances of two groups of women are made.

2.4.2 Gross Re production Rate

Another summary measure for measuring current fertility is gross re production rate. While the total fertility rate refers to the total number of children a cohort of women is expected to have, the gross reproduction rate is restricted only to the number of female children.

$$f_{i_x} = \frac{f\beta x}{f_{P_x}} \times 1000$$

Where, f_{i_x} is the Age specific fertility rate specific for female births.

$f\beta x$ is the female births in a specified age group in a given year.

f_{P_x} is the female population in the age group in a given year.

$$\therefore GRR = \sum_{x=15}^{49} f_i x$$

When age interval is 5 then

$$GRR = 5 \times \sum_{x=15}^{49} {}^{f}5_i x$$

The value of the GRR is about one half of that of the total fertility rate. As in the case of the total fertility rate, the gross re production rate too, assumes that women in the re productive age groups would survive till the end of their child-bearing period. This rate is generally used while comparing the current fertility of various groups.

The gross re production rate is an important measure in the study of replacement, which is concerned with the extent to which a group replaces its own number by the natural processes of fertility and mortality. The GRR indicates the number of daughters a cohort of women is expected to produce, if there is no attrition in the cohort due to mortality.

Now, it is assumed that-

$$\frac{f\beta_x}{\beta_x} = \frac{f\beta}{\beta} = k \qquad \text{(a constuntant)}$$

$$\therefore f\beta x = \frac{f\beta}{\beta} \cdot \beta_x$$

$$\therefore f_{i_x} = \frac{\frac{f\beta}{\beta} \cdot \beta x}{f_{P_x}}$$

$$\therefore GRR = \sum_{x=15}^{49} f_x$$

$$= {}^{f_\beta}\!/_{\beta} \sum_{x=15}^{49} \frac{\beta x}{f P_x} \qquad \text{(Per women)}$$

$$= {}^{f\beta}\!/_{\beta} \cdot \sum_{x=15}^{49} ik$$

$$= \frac{f\beta}{\beta} \times TFR$$

2.4.3 Net Re production Rate

It is not realistic to assume that all women in the cohort will survive up to the end of the child-bearing period. So, a refinement in the gross reproduction rate is introduced by taking into account of mortality of the women an the net re production rate is computed. The net re production rate indicates the number of daughters ever born to a cohort of women, if they give birth

according to the fixed schedule of age specific fertility rates and experience fixed age specific mortality rates up to the end of their child-bearing period.

The net re production rate (NRR) is given as–

$$\frac{1}{f_{1o}} \sum_{x=15}^{49} f_f x . f_L x$$

Where is the size of the cohort at birth.

$\sum_{x=15}^{49} f_f x . f_L x$ is the total number of female children that will be born to the cohort of 1000 women during their entire life time.

Thus, the Net Re production Rate measures the extent to which a cohort of newly born girls will replace their mothers under pre-determined scheduled of fertility and mortality.

2.5 Measures if Mortality

Mortality is one of the three components of population change, the other two being fertility and migration. The study of mortality is useful for analysing current demographic conditions as well as for determining the prospects of potential changes in mortality conditions of the future.

Various measures are employed in the analysis of mortality. Some of them are crude death rate, age specific death rate, standardised death rates, infant mortality rate and the expectation of life at birth.

2.5.1 Crude or General Death Rate

The crude death rate is the most simple and the most commonly used measure of mortality, which can be quickly calculated and at the same time, easily understood. Crude death rate is a measure of the fall in population which takes place as a result of death. Crude death rate may thus be defined as the ratio of the number of deaths which occur within a population at mid-year. It is computed as–

$$CDR = \frac{\Sigma D}{\Sigma P} \times 1000 \text{ or } m = \frac{D}{P} \times 1000$$

Where CDR= Crude death rate

ΣD = Total death in region at given time

ΣP = Total population of the same region during that year i.e midyear population.

The crude death rate is the most widely available measure of mortality. Though this summary measure is very useful indicator of the level of mortality in any population, it is not a refined measure and suffers from some lacuna. It is not suitable for inter regional comparisons because mortality varies from age to age. If age distribution differs from place to place any comparison of crude death will lead is misleading conclusions.

2.5.2 Age-Specific Death Rate

This is another measure of death rate. Age specific death rate of the population is classified under different categories according to age groups. Age specific death rate show the variations in the mortality with respect to various age groups of the same population. To formulate the idea mathematically we get–

$$n^m x = \frac{n^D x}{n^P x} \times 1000$$

Where $n^m x$ = Age specific death rate in a given region during a given period.

$n^D x$ = number of death in the age group x to (x+n) i.e number of deaths among the person with age x or more but less than x+n, in given region during the given period.

$n^P x$ = Total population of the age group x to (x+n) in the given region during the given period.

The death rates specific to age and sex overcomes the drawbacks of CDR, since they are computed by taking in the consideration the age and sex composition of the population. By providing variation in the death rate due to age, sex distribution of the population, ASDR provides more appropriate measure of the relative mortality situation in the regions.

However, ASDR is not of much utility for overall comparison of mortality condition prevailing in two different regions. Hence, it will not be possible to draw general conclusions regarding the overall mortality pattern of the two regions. Moreover, in addition to age and sex distribution of the population, social, occupational and topographical factor comes into operation, causing 'differential mortality'. ASDR completely ignores these factors. In order to eliminate such effects standardised death rates are computed.

2.5.3 Standardised Death Rate

Standardised death rate is a relative measure of death rate which provides the comparative death rates of two places or two different periods. The standardised death rate based on age specific death rates supplies a simple and accurate basis for comparing the death of different populations.

Standardisation can be of two types- (a) Direct standardisation and (b) Indirect Standardisation.

(a) Direct Standardisation : In direct standardisation, different age specific rates are applied to standard population. In this method the population distribution of any given locality is taken as the standard. Thereafter, the age specific death rates are multiplied with the standard population and the following formula applied.

$$SDR = \frac{\Sigma(P_s \times D_i)}{\Sigma P_s}$$

Where SDR = Standardised Death Rate

P_s = Standard Population

D_i = Age specific death rates of local population.

(b) Indirect Standardisation: Indirect standardised death rate consists of applying a standard set of rates to different population by age. Under this method the age specific death rate of a given locality is taken as the standard. Then the following formula is used to find out index of death rate-

$$\text{Index of Death Rate (Local Population)} = \frac{\Sigma P_i \times D_s}{\Sigma P_i}$$

Where P_i = Local Population

D_s = Standardised age specific death rates.

Therefore, the crude death rate of the standard place is obtained as follows:

$$CDR = \frac{\Sigma P_s \times D_s}{\Sigma P_s}$$

Crude death rate of the standard locality is divided by the index death rate to arrive at the correction factor:

$$\text{Correction factor} = \frac{CDR\ of\ S\tan dard\ \ population}{Index\ DR(Local\ Population)}$$

$$F = \frac{\Sigma(P_s \times D_s)}{P_s} : \frac{\Sigma(P_i \times D_s)}{P_i}$$

Finaliy, death rate of the local population is multiplied with the correction factor to obtain death rate.

$$SDR_i = CDR_i \times F$$

Where, means crude death of the local population and F means correction factor.

2.6 Concept Infant Mortality Rate

Infants are defined in demography as an exact age group namely age zero or children in the first year of life who have not yet reached age one (1). The infant mortality rate is generally computed as a ratio of infant deaths. Death of children (under age 1). Infant death registered in the calendar year to the total number of live births registered in the same year.

$$IMR = \frac{D_o}{B_t} \times 1000$$

Where IMR=Infant Mortality Rate

D_o = Number of deaths below age 1, registered during a calendar year.

B_t = Number of live births below age one registered during a calendar year.

The age specific fertility rate for age zero last birth date which has the same numerator has for its denominator the number of infants. However, it is well known that in general, the infants are grossly under enumerated in a population census. So, age specific death rate tends to be highly over stated. Further, mortality estimates of population by age are seldom obtainable annually. Therefore, infant mortality rate is generally used instead of age specific death rate as the measure of infant mortality. Infant mortality rate does away with the need for the data of population census or estimates. For the same reason the IMR can be computed for any population and for any time periods, provided only the number of infant deaths and number

live births are available. Besides IMR is a good index of level of living in any population.

2.7 Life Table : Meaning

The life table is an effective tool for analysing the forces of mortality in a population. The life gives the life history of a hypothetical group or 'cohort' as it is gradually diminished by death. It is a conventional method of expressing the most fundamental and essential fact about the age distribution of mortality in a tabular form and is a powerful tool for measuring the probability of life table gives a summary of the mortality experience of any population group during a given period and is very effective and comprehensive method for providing concise measure of the longevity of that population.

In the words of David. M.Heer, life tables provide the most complete picture of mortality in a given population. According to Donald Bogue, " the life table is a mathematical model that portrays mortality condition at a particular time among a population and provides a basis for measuring longevity. It is based on age specific mortality rates observed for a population for a particular year.' Such a table is constructed on the basis of death rate and this table also helps is preparing and determining average life-expectancy, based or age specific mortality trends. Thus, a life table shows the number of survivors from birth to successive ages and the average length of life on the supposition of age specific death rates applying throughout an entire generation.

2.7.1 Types of Life Tables

The life tables ate of two types–

(a) Cross-sectional or time specific; and

(b) Longitudinal or generation.

Cross sectional, life table employs data for a single cross-section of time to represent an entire generation while the longitudinal life table takes a real cohort group of people that began life during a specified interval and follows them in subsequent years, until all have died.

Furthermore, a life table could be complete or abridged in a complete life table single years of ages are taken while in an abridged life table ages are grouped in 5 or 10 years of interval, except in the initial years.

2.7.2 Uses of Life Tables

Life tables has been applied to a wide range of topics. It is widely accepted as important basic material in demographic and public health studies. In the words of William Farr, Life table is a biometer of the population.

1. ***Life expectancy (at birth):*** Determination of average life expectancy on the basis of present age specific mortality and is an important field wherein life tables are useful. It is used for making comparison at national and international levels.

2. ***Projection of Population:*** By using present mortality rate, it becomes easy to project population for a future date. Registered death rate does not meet this requirement. Life table is also useful in making hypothetical model of population and studying crude death and migration rates.

3. ***Estimation of Migration:*** Life table survival rates can be used for estimation of net migration by age in population. Given the age distribution of population at two dates and life table survival rates, one can easily estimate the number of survivors at various ages at a later date. The difference of the estimate of survivors and the actual enumerated population can be attributed to migration.

4. ***Hypothetical Stationary Population:*** Life table gives hypothetical stationary population with deaths and births in a cohort assumed to be the same and is equal to 1,00,000.

5. ***Comparison of Mortality:*** Two or more populations can be compared with greater accuracy by the values obtained from life table. Such comparison is possible only when we are considering the same places and times as mortality is invariably related to a particular base period.

6. ***Marriage Patterns:*** Using age-at-marriage information, the life table can show that marriage patterns have been changing and that these changes have been relatively steaty over quite a number of years. For younger age groups, the proportion married at each age is consistently lower.

7. ***Other uses:***

   (a) The appraisal of the accuracy if census enumerations and vital registration data.

   (b) Study of trends in age distribution of a population.

(c) Estimation of the size of future labour force.

(d) Forecast of the school-going population in connection with school building programmes.

(e) Computation of the probable number of future widows.

(f) Estimation of the probable number of future orphans in a community,

(g) Use in family planning-life table and life table principles have been widely used in the evaluation of family planning programmes.

(h) Multiple decrement life tables for socio-economic data. Multiple decrement life tables can also be prepared to analyse the various types of socio economic data.

2.7.3 The Different Columns of a Complete Life Table

There are eight columns in a complete life table. These columns of the life table are constructed as follows:–

1. ***First Column (x):*** In the first column the age is entered in serial order from zero to maximum, probable age (99) in whole numbers.

2. ***Second Column (l_x):*** This column shows the number of persons living at any specified age x in any year out of an assumed number of births say lo, usually called the 'cohort' or 'radix' of the life table.

3. ***Third Column (d_x):*** It is the number of dead persons between each age x and the succeeding year of age (x+1). In other words, it represents the number of persons among lx persons (attaining an precise age x) who die before reaching the age (x+1). Thus,

$$d_x = l_x - l_{x+1}$$

This column of the life table is of strategic importance because if all the entries in this column are known and the original cohort is also known, the entire life table can be constructed.

4. ***Fourth Column (q_x):*** This column presents the probable mortality rate between every age and the succeeding age (x+1). In other words, q_x is the probability that a person of exact age

'x' will die within 1 year, following the attainment of that age.

Thus, $q_x = \frac{d_x}{l_x}$

5. ***Fifth Column (P_x):*** P_x indicates the probability of survival between the age x and x+1 i.e a person aged x survives up to age x+1. Thus,

$$P_x = 1 - q_x \quad \text{or} \quad P_x = \frac{l_x + 1}{l_x}$$

6. ***Sixth Column (L_x):*** L_x is the number of years lived, in aggregate by a cohort of l_o persons between age x and x+1.

$$L_x = \frac{l_x + (l_x + 1)}{2}$$

$$= \frac{1}{2}(l_x + l_x + 1)$$

7. ***Seventh Column (e_x^o):*** Measures the average life expectancy of the population of x years of age. In other words, it measures the average number of years a person of given age can be expected to live under the prevailing mortality conditions. It is also called complete expectation of life of a person attaining age 'x'. It is obtained by,

2.8 Summing Up

To summarise, we learnt that fertility in demography refers to the actual birth performance of the group of women or to the relative frequency with which the births occur i.e total population or in the population exposed to it. As for the measures of fertility, the first type of measure may be termed as period measures, for they are related to a particular period and are based on data referring to that period. The second type of measures of fertility refers to the re productive performance of women up to a certain point in time. Lastly, the third type of measures of fertility attempts to measure fertility indirectly on the basis of the age and sex distribution of the population. Besides, we have seen how the study of mortality and the various measures of mortality is useful for analysing current demographic conditions as well as for determining the prospects of potential changes in mortality conditions of the future. Further, life table was introduced which is effective for analysing

the forces of mortality in a population and the process of computation of different columns of a complete life table was also duly considered.

2.9 Self Assessment Questions

1. Differentiate between fertility and fecundity.
2. Describe in brief the various rates of fertility measurement.
3. Define TFR, GRR and NRR.
4. What is ASDR? How is the difficulty posed by ASDR dealt with?
5. What is a life table? Give its types.
6. Describe the different columns of a complete life table.

2.10 References/Suggested Readings

1. Bhende, A., and T. Kantikar, "Principles of Population Studies."
2. Sinha, V.C. and Zacharia, E, "Elements of Demography."
3. Gupta and Kapoor, "Fundamental of Applied Statistics."
4. Goon, Gupta, Das Gupta, "Fundamentals of Statistics". Vol. II

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Unit- 3

ECOMOMICS OF EDUCATION

Contents:

3.0 Introduction

The economics of education is a branch of economic theory and investigation which has developed rapidly since 1960's but has a much longer history. Several of the classical economists writing in the 18th and 19th century, including Adam Smith, Alfred Marshall and J.S. Mill, drew attention to the importance of education as o form of national investment and considered the question of how education should be financed. There has been a tremendous growth of research and publication in the area of the economics of education, including topics as the contribution of education to economic growth, the profitability of investment in education, the role of educated manpower in economic development, the costs of education, the finance of education and more recently studies of the effects of education on the distribution of income and wealth.

3.1 Objectives

The objective of this unit is giving a basic idea of economics of education and the relation of education in economic development and human resource development. Besides this unit tries to give a cost benefit analysis of education and the rate of return of investment in education. Further the unit deals with the adequacy and equity criteria of education. Lastly the chapter deals with the financing of higher education in India and the various problems associated with it.

3.2 Economics of Education- Meaning

Economics of Education as an area of study cannot be said to be a separate field of inquiry that is totally different from the ordinary economics. Economics of Education is the application of Economic principles, concepts, and laws to the process of Education. Economics of education studies human behaviour (in terms of human decisions), action(s) and reaction(s)) about schooling (Babalola, 2003).It further looks into how human behaviour affects economic development. Economics of education is one of the branches of ordinary economics, though, it is the study of how educational managers make official or approved choices from scarce available resources which is meant for the realization of the best possible educational outcomes. Economics of Education employs the use of some elementary concepts commonly used in labour economics, public sector economics, welfare economics, growth theory and development economics. World known classical economists like Adam Smith, Alfred Marshall, and John Stuart Mill had discussed education and development extensively, advocating for public investment in education. So, by the 1950s, economists gave attention to issues such as the relationship between education and economic growth; relationship between education and income distribution and also the financing of education. Economists analyse the production of education in this world.

The fundamental problem of economics of education is how the society, institution and the households make use of the limited human and material resources they have, to best satisfy their unlimited wants for education. The solution to the fundamental problem requires the application of certain economic concepts.

The study of economics of education includes private and social rates of returns to education, human capital and signaling theories of education, non-pecuniary benefits of education, education and economic development, contribution of education to

the economy, measuring educational expenditure, manpower planning, educational planning and human resource development, educational cost, cost analysis, educational production, educational effectiveness and efficiency, costs-efficiency and cost effectiveness, cost-benefit analysis and economics of teacher supply, educational and equity.

3.3 Education and Human Resource Development

The concept of human capital is central too much of the research in economics of education, and is also important in branches of economics which at times overlap with the economics of education, particularly analysis of the labour market and employment policy, the determinants of earnings, and the distribution of income. Many economists have pointed out that education and training create assets in the form of knowledge and skills which increase the productive capacity of manpower in just the same way as investment in new machinery raises the productive capacity of the stock of physical capital.

Population quality is derived genetic endowment and acquired abilities. Education is a major source of acquired abilities. During the several decades prior to the 1980's the concept of human capital has acquired a substantial place in the analytical mansion of economics. Economic growth is a consequence of additions to quantity and quality of the stock of capital which contribute to total income. The common view of capital is confined to material things. Physical capital, however, accounts for a small part of the total stock of capital in countries that have achieved a high level of per capita income. The vast improvement in the quality of most physical capital over time is the result of advances in knowledge. The value of the human capital is revealed in wages, salaries and in entrepreneurial rewards, along with the additional personal satisfaction derived from the acquired abilities by the people. In large measure, the quality of human capital is enhanced over time by advances in knowledge. The sock of human capital has been increasing at a higher rate than that of physical capital.

The formation of human capital by education has been high on the research agenda of an increasing number of economists because the effects of education on economic activities are pervasive. The acquisition of abilities and advances in knowledge is in substantial part a product of deliberate investment and such investment enhances the value of human time. The allocation of time is a major invasive part of economic activities. National income increases more than the increases in land, physical reproducible capital and man-hours. Investment in human capital forms a substantial part

of the explanation of increases in national income. The distinctive attributes of education in the formation of human capital are worth noting.

An individual's stock human capital cannot be sold, nor can it be given to someone else and to take advantage of human capital, an individual must do it in person. In acquiring human capital the individual must invest some of his or her own time along with resources. Human capital depreciates over time as does the physical capital. As in case of physical capital, not all forms of human capital turn out to be worthwhile investments. The choice is for individuals to make and it matters whether or not the choice is made wisely.

3.4 Education and Economic Development

Although economic development is conventionally defined in terms of a rise in real gross national product (GNP) per capita, a distinction can usefully be made between development and growth. Growth may involve neither major changes in factor inputs nor any transformations in existing institutions. By contrast, development presupposes a process of innovation in which new technologies will be generated and new input and output mixes will emerge. In sociological terms, it implies that major social and structural change will occur involving a process of institutional transformations in sectors that are only peripherally linked to the core of the economy.

Historically in the developed world and currently in the less developed countries development has involved the monetization of the local economies and progressive substitution of subsistence by exchange activities; a growth in the proportion of populations living in urban centers with the associated phenomenon of enhanced migration rates; the emergence of new systems of social differentiations based on occupation and income in contradiction to those based on primarily on lineage and descent; and, finally, the creation of new forms of polity based on the nation-state.

These transformations have not been uniform in all societies and for this reason the term "modernization" has less coinage in literature than formerly, conveying as it does the idea of unilateral evolution or societal convergences towards some general stage of modernity. However, the broader notion of the institutional transformations that are associated with development suggests that patterns of change are uneven: development is neither a smooth nor a continuous process and tension emerges as between institutional sectors that are undergoing differential rates of change.

As development proceeds, educational institutions, both formal and informal, undergo a corresponding shift in function. Within the so called traditional societies, education is concerned with transmission of received knowledge, the maintenance of broad societal consensus, and the perpetuation of existing patterns of social differentiation. These functions do not disappear as development continues but the balance shifts towards the utilization of educational institutions as agencies in the selection and allocation individuals and groups to various economic and roles and positions within the social structure. Thus education becomes an independent variable in the process of social change and as structural differentiation increases it emerges as a quasi- autonomous institution that can both facilitate or even impede the development process.

Research confirms that by 1800 literacy had been acquired by the vast majority of males and about one-third of adult females in countries of North America and northwestern Europe. The evidence suggests that during the 18th and 19th centuries a substantial literacy base was a necessary if not a sufficient prerequisite for the massive economic transformation that occurred in northern hemisphere. However, inter and particularly intra-national variations in the diffusion of schooling and literacy were substantial and continue to persist in more muted form. Further, the literature shows that substantial differences in levels of educational development cannot be explained primarily in terms of state initiatives but are to be seen largely as a result of a rise in public demand stemming from changes in economic environment and the emergence of more complex and interrelated national occupational structures. While not ignoring the significance of local historical and cultural circumstances, it is fair to say that the less developed world has followed a similar pattern. Educational expansion is initially consequent upon a degree of structural economic change having already occurred in economies, though it may, in turn, become a catalyst for further economic development. This suggests that the role of schooling as an instrument of economic development will be highly variable over time. The expansion of formal education may have a substantial payoff at some stages in the development process while at others its impact may be negligible in terms other development options that may be available.

In the two decades after the Second World War a climate of optimism concerning the putative economic benefits of educational investment led to a massive in educational provision in both the developed and less developed nations. In the former, growth occurred at the secondary and particularly tertiary levels but in less developed countries absolute enrollments in primary schools rose massively. Everywhere, however, rates of expansion were

greatest at higher levels. Integral to most expansionary policies was the notion that development not only involved rises in GNP per capita but that increased educational provision would be associated with the equalization of educational opportunities. Although regional or ethnic inequalities persist in muted form in developed nations in inequality of opportunity issue in them tended to focus on the relation between educational achievement and social background. However, in all societies it was anticipated that educational expansion would eradicate disparities ultimately stemming from social background of students. This issue has little to do with the degree of aggregate mobility in a society for this is overwhelmingly determined by the rate of structural and economic change, but rather concerns the extent to which educational achievement is influenced by social origins and how far final social or occupational position is predicted by achievement level independent of social background. Institutional or structural studies, of course, show that throughout the developed and less developed world educational access and continuance is correlated with social background.

In developed nations post war educational expansion was associated with rapid economic development and escalating occupational opportunities. The demand for educated manpower tended to keep pace with increasing supply and thus in cost-benefit terms private and social rates of returns remained constant or fell only marginally. However, given a current diminution in development rates there is evidence that average rates of return are falling though they may still vary significantly by type of education. It has, therefore, been contended that the current labour force is overeducated and a growing skepticism has emerged concerning the profitability of continued educational investment.

Although the economic literature presents a convincing argument concerning argument concerning the role of education in development, it remains relatively silent concerning what it is that schooling actually does to people that makes them more productive, nor has it been so concerned with those putative spillover effects of education which may contribute indirectly to development. Discussion on spillover effects has tended to focus on the relations between education and political development and schooling and population growth.

It has been asserted that insofar as economic development is facilitated by a political framework that provides an orderly process of transfer of power and low levels of political violence, the expansion of schooling should indirectly stimulate development. This inference is based on survey data pointing to a relationship between level of education and democratic political attitudes and also to cross-national studies which indicate that the political

stability. Moreover, in less developed nations education is neither associated with increased personal commitment neither to the nation-state nor to the existing political order. Basically, the evidence concerning education and political development is so unsatisfactory that the nexus between education and political and economic development is problematic in the extreme.

Likewise the literature on education and population growth is ambiguous in its implications. In spite of the literature concerning the negative effects of rapid population expansion there is evidence that a growth in population expansion there is evidence that a growth in population based on increased life expectancies is associated with an increasing rates of savings and capital formation and an enhancement of productivity. Other traditions have placed particular emphasis on the role of literacy and enhanced communication in development.

It must, however, be recognized that although research in social sciences has provided a series of plausible hypotheses concerning the intervening variables to explain the relationship between education and economic development, the direct policy implications of such research are by no means self evident. Indeed, one of the weaknesses of earlier developmental planning was that tentative research findings were used selectively to justify educational policies that had been decided upon for very different (often political) reasons.

3.5 Cost- Benefit Analysis of Education

The analysis of education expenditure has received a great deal of attention by economists. Education is viewed as investment in human resources. So, returns to education expenditure have been computed and the profitability of human investment relative plant and equipment investment has been assessed. However, this approach concentrates exclusively on the earnings generating effects of education. By disregarding other aspects it does less than justice to the role of education.

The cost-benefit analysis evolved in USA before World War II and it was measure the cost-benefit in multipurpose water resources projects. Later it extended to other fields like recreation, industries etc. But now it is used not only in USA but also in many other countries. The main reason for cost-benefit analysis is the scarcity of resources.

The cost-benefit analysis is also known as "rate of return" analysis and is similar in principle to the procedure followed in ordinary investment project evaluation. Cost- benefit is a practical way of assessing the desirability of

projects where it is important to take a long view and a wide view i.e. it implies enumeration and evaluation of relevant cost and benefits. For example, if a machine costs $10,000 to acquire, yields an annual constant income stream of $1,200, and has a life expectancy of 10 years, the rate of return of investing in this machine is equal to about 3 percent. This is found by solving the following expression for 'r'.

$$C = B_i / (1+r)^i$$

$i = 1, 2 \ldots\ldots\ldots\ldots 10$ where C= the cost of the machine, B=annual benefits and r = the rate of return.

If one considers investment in education instead, the estimation formula remains the same, although the symbols would now have a different meaning. In this case C would be equal to what the individual spends to educate himself, both in terms of direct costs such as tuition fees, as well as foregone earnings while studying. The benefits would be difference between what the individual would expect to earn as a university graduate rather than with a secondary school certificate.

The internal rate of return on an investment is one such criterion. The IRR on an investment is that rate which equates the present value of cash receipts expected to flow the investment over it life time with the present value of all expenditures relating to the investment. We equate present value of total cost to present value of total benefits; 'r' is that discount rate which equates these two.

Let us assume that for a particular investment project C_0 is the initial outlay and $C_1, C_2, C_3 \ldots\ldots C_n$ are a series of future outlays. Hence, the present value of the sum of all outlays (cost) can be expressed as follows-

$$I_c = C_o + C_1/(1+r) + C_2/(1+r)^2 + \ldots\ldots + C_n/(1+r)^n \text{ ---------- (1)}$$

In the above equation, 'r' is the market rate of interest which acts as the discount factor.

The project will also generate a series of cash flows over its effective life that must be similarly discounted back to the present, thus the present value of the total cash flows can be expressed as-

$$I_r = R_1/(1+r) + R_2/(1+r)^2 + \ldots\ldots + R_n/(1+r)^n + S/(1+r)^n \text{ ------- (2)}$$

In the above equation $R_1, R_2, R_3, \ldots\ldots\ldots\ldots, R_n$ are the series of cash flows received at the end of the respective periods over the productive life of the project, S is the scrap value at the end of 'n' years and I_r is the present value of the series of cash proceeds. Now by equating equation (1)

and equation (2), we arrive at the following equation which is the most common expression for the IRR approach.

$$I_c = I_r$$

$$C_0 + C_1/(1+r) + C_2/(1+r)^2 + \ldots\ldots + C_n/(1+r)^n = R_1/(1+r) + R_2/(1+r)^2 + \ldots + R_n/(1+r)^n + S/(1+r)^n$$

$$\text{Or} \quad C_o = R_1 - C_1/(1+r) + R_2 - C_2/(1+r)^2 + \ldots, + R_n - C_n/(1+r)^n + S/(1+r)^n$$

$$\text{Or} \quad C_o - [R_1 - C_1/(1+r) + R_2 - C_2/(1+r)^2 + \ldots + R_n - C_n/(1+r)^n + S/(1+r)^n] = 0$$

From the above analysis it is clear that IRR method involves the calculations of the rate of interest that will equate the present value of the cash outlays for an investment to the present value of the cash flows generated by the project. The estimated value of 'r' is referred to as IRR or the yield of the investment. This method is also known as Net Present Value (NPV). This is the general technique of cost-benefit analysis.

While analysis Cost-Benefit for education it is not always possible to measure benefit, because there are some indirect benefits of education may not be expressed in terms of money. And there is also opportunity cost involved in analyzing Cost-Benefit for education. The application of Cost- Benefit analysis in the field of education was initiated by Strumilin in 1929. From the later part of the 1950's economist like Schultz (1959, 1961), Bowman (1962), Lee Hansen (1963) and many others began the systematic application of cost-benefit to different level and types of education both in the developed and developing countries.

The cost-benefit in the field of education is conducted on the basis of the rate return approach, since the concept of IRR is more extensively used for evaluation of educational projects. The rate of return may be private or social. A calculation of the private rate of return to investment in education shows how profitable it is for an individual student, or his or her family to invest in education. On the other hand, the social rate of return provides a yard stick for evaluating education as a social investment. Another distinction is made between ex-post and ex-ante rate of return. An ex-post rate of return, as the name suggests, is one that refers to past investments. An ex-ante rate, on the other hand is the one expected to apply in the future.

The cost and benefits of education have both direct and indirect components.

3.5.1 Measurement of Costs

Costs can be classified as private and public costs. Further both the components have direct and indirect elements.

Direct private costs is that part of the cost borne directly by the student or his/her parents by way of expenditure on tuition and examination fees, cost of books, stationeries, uniform and other miscellaneous items. While calculating the average tuition fee per student any amount of scholarship that the student might receive should be taken into account. Similarly, the direct cost borne by students should be adjusted for any subsidies on the books and stationary purchased by them. Although for general courses, the cost of stationary is not very, it has been found that in case of professional courses the cost of stationary tends to be higher than that of books.

Indirect private costs, on the other hand, include opportunity cost of earnings foregone by the student in pursuing a particular level of education duly adjusted for the level of unemployment. The earnings foregone by a student during his/her course of study can be estimated from the 'age-earning profile' of those groups of students who have completed the previous level of education. The age earning profile shows the average life time earnings of workers with a particular level of education. Such profiles are calculated on the basis of the data collected from sample surveys of workers of different ages and with different levels of education at a point of time. It may be noted that time series data are more reliable for the preparation of age earning profiles. However, since it is difficult to procure such data, economists generally rely on cross-section data.

The direct public cost includes both capital and operating cost of educational institutions. This may include expenditure on the purchase of land, construction of educational institutions, salaries of both teaching and non-teaching staff and provision for other allowances. Another important item of public cost is the imputed rent which measures the annual value of buildings and equipments after making due allowances for the rate of depreciation.

Again, indirect public cost may be estimated as the value of the total goods and services foregone due to the allocation of scarce resources to that particular level of education. For example, the resources devoted to education might have been used to provide health care or could have been invested in other priority sector. Thus, at the micro level the opportunity cost of building a new university is the alternative projects that are foregone.

3.5.2 Measurement of Benefits

In similar manner benefits can also be classified as private and public costs. Further both the components have direct and indirect elements.

Weisbrod (1962) has classified the direct private benefits of education into the following categories-

(a) Direct financial returns accompanying levels of education.

(b) Financial option return which is the value of the option to receive further education and returns accompanying it.

(c) Non-financial options which include job options, on-the-job training option way-of-life options etc.

(d) Hedging options which is the increased ability to exploit changing job opportunities against the background of technological change.

The direct financial returns of education are measured in terms of the additional life time earnings of workers with a particular level of education compared with the earnings of those with the lower level(s).

The intangible benefits of education contributes to fuller life are included in the indirect private benefits. These indirect benefits include the current pleasure derived by a student from the learning process and the satisfaction derived from a more educated life. Besides, an educated person is rational and politically more intelligent. Besides education also contributes to a culturally more rewarding environment. The indirect private benefits are also associated with the satisfaction of being able to support ones family and enjoy a higher standard of living. Although not less important than direct private benefits, indirect private benefits are excluded while undertaking cost-benefit analysis of education, because of the difficulty of acquiring a suitable yardstick for measuring such indirect benefits.

The direct social benefits are measured in terms of additional life time earnings of a worker with a particular level of education compared to those with the lower level. Unequal education results in inequalities in distribution of income. Investment in education opens many opportunities for policy measures which are efficient in output oriented sense to reduce inequalities. Preferable in social grounds, investment in education offers a better chance for permanent escape from poverty.

The indirect social benefits are the ones which are external to the recipients of education. Such benefits are also known as externalities of education and can be regarded as the spillover effects of education. Indirect benefits can be the form of spillover income gains to other persons besides the receiver of the education, provision of an environment that stimulates research in science and technology, voluntary encouragement of lawful behavior, fostering of political maturity etc. however these are also not included in the measurement of Cost-benefit analysis because of the difficulty of obtaining

a meaningful yardstick for measuring indirect social benefits. Since indirect cost and benefits both private and social re intangible in nature so they are excluded in the calculation of cost-benefit analysis in the basis of IRR of education.

A review of the rate of return studies in 32 countries reveals that the rate of return to all forms of education is positive in most countries, and in general the rate of return to primary and secondary education is higher than the rate of return to university level of education. Besides, the private rate of return is consistently higher than the social rate of return, indicating that education is more profitable as an investment for individual than for the society as a whole. In general the rates of return were found to be higher in LDCs as compared to developed countries.

3.6 The Rate of Return of Investment in Education

There essentially exist three methods for estimating a rate of return to investment in education. Their particular utilization depends upon the availability of data or the degree of desired accuracy.

The Elaborate Method:

The two basic ingredients for any rate of return calculation are age-earnings profile by educational level and unit costs of each level of education. For asocial rate of return calculation one would like to have the value of marginal product of labour classified by educational level. As this is not readily available statistic in most cases, observed earnings have been used as a first approximation. Moreover one should ideally base the calculation on longitudinal wage data. But since such data are rare, one is confined to the use of cross-sectional data. This information takes the form of a 'W' matrix, the typical element being $[W_{th}]$, where 't' is the age of the individual and 'h' the educational level he has completed. The second ingredient of direct social costs takes the form of a 'C' vector, the typical element referring to the costs of the 'hth' educational level. These two items are the only necessary ingredients for a basic social rate return calculation.

The full social cost of a student year is found by adding the earnings of a graduate of school level 'h-1' to the direct cost of school level 'h', that is

$$[\text{Full annual social cost}]_h = C_h + W_{h-1}$$

• Then the social benefits of a graduate of school level 'h' are found by subtracting the earnings of a graduate of school level 'h-1' from the earnings of the graduate of school level 'h', that is

$[\text{Annual Benefits}]_h = W_h + W_{h-1}$

Annual costs and benefits are discounted to a common point in time and compared to each other. The discount rate which equates the sum of discounted costs to the sum of discounted benefits is the wanted rate of return to investment in school level 'h'. Algebraically, the rate of return is found by solving the following equation for 'r':

$$\sum (C_h + W_{h-1})_t (1+r)^{-t} = \sum (W_h + W_{h-1})_t (1+r)^{-t}$$

In this expression, 's' represents the length in years of school cycle and 'n' represents the expected working life of the graduate.

The Short-Cut Method:

As mentioned above, the fundamental ingredients to cost-benefit analysis in education are age-earnings profiles by educational level. In some cases, however, only average wages by school level are available. Under these circumstances a rate of return could still be computed through the following formula:

$$r_h = (W_h + W_{h-1})/s\ (C_h + W_{h-1})$$

Where, C_h is the direct annual cost of schooling, W_h is the average wage rate, and 's' is the length of the school cycle in years.

This formula is equivalent to estimating the return of an annual income stream obtained at a cost equal to the expression appearing in the denominator. The assumptions implicit in this formula are: first, the wage differential is constant throughout the individual's lifetime; second, the costs occur at one point in time; and third, the benefits last forever.

The Regression Method:

This amounts to fitting a Mincerian human capital earnings function to individual data on earnings(Y), years of schooling(S), and years of labour market experience (EX) in a semi logarithmic form:

$$\text{Ln } Y = a + bS + cEX + dEX^2$$

and interpreting the estimated 'b' regression coefficient as the average private rate of return to schooling. The reasoning of this procedure is that partial differentiation of Ln Y with respect to 'S' gives the definition of the short-cut-method-calculated rate of return, that is,

$$b = dLn\ Y / dS$$

or in discrete form for expository purposes

$$b = Ln\ Y_s - Ln\ Y_0 / \Delta S$$
$$= 1/\Delta S\ (1 - Y_s/Y_0)$$

Where Y_s and Y_0 refer to the earnings of those with 's' and '0' years of schooling, respectively.

Marginal rates of return to particular years of schooling can be arrived at by including the S-squared term in the last equation or a string of dummy variables referring to different levels of schooling.

3.7 Financing of Education: Public and Private Financing of Education

Education is not a purely public good. Education in almost all the countries is provided in both private and public sectors. Education consumes a significant amount of resources ranging from 6% to 10% of GNP. A certain level of educational provision is necessary for a country to attain a reasonably high rate of growth. A certain minimum level of educational provision is generally assumed to be necessary in order for a country to attain a reasonably high rate of economic growth. The distribution of educational opportunities to different groups of population has consequences for social justice. As a result of the size of educational activities in a country and because educational provision affects economic growth and distribution of income, systems of educational finance is likely to be complicated. This complexity is reinforced by the fact that education is carried forward in both public and private sectors. Education is described as a quasi- public good.

There are ideological differences in the question of how education should be financed. In particular how the financial burden should be shared between the government and individuals and what should be the balance between public and private sources of finance. This is a question which has both efficiency and equity implications. The question of how the financial burden should be distributed raises the question of public and private benefits of education. Measures of the rate of return to educational investment relate the public or private benefits to the cost of education. The social rate of

return measures the benefits that are enjoyed by the society as a whole compared with the total resource cost of education. The private rate of return includes the direct benefits that are enjoyed by the individuals compared to the cost which are borne by the individuals and his family.

The difference between the social and private rate of return thus reflects the degree of public subsidy of education; and since education is generally highly subsidized there is usually a wide gap between social and private rates of return. If individuals were expected to contribute a greater share of the cost of education themselves, by means of fees or some other forms of payment, then the gap between the social and private rate of return would be reduced. However, there are very few cases where individual students are expected to pay the whole of the costs of their education themselves and thus private rates of return exceeds the social rates of return.

In most countries a significant part of the cost of education at the primary and secondary stage are met out of general taxation or other government resources and students receive free schooling or pay low fees. In case of private schools fees may be high or even the only source of revenue. But in private schools also there is some degree of public subsidy, either by means of tax concession for institutions or direct grant-in- aid of teachers' salaries.

In many countries, fees are charged in institutions of higher education, but these are well below the true resource cost and therefore the social cost of education is higher. In addition many students receive financial aid in form of scholarships, grants or subsidies, loans which help to reduce the financial burden of fees or of the students living expenses. In either case, student aid reduces the private cost of education and therefore increases the private rate of return.

Education confers financial benefits to the individuals in the form of higher life time earnings. So the question of who pays for the education raises important issues of efficiency and equity. If educational opportunities are unequally distributed because of inequalities in the distribution of income and hence the capacity of individuals to finance investment in education, then this will perpetuate inequalities of income in future, since earning is related to a workers education. Thus, the question of who should pay for education is closely related to the question of equality of educational opportunity as well as the question of equity.

It has been seen the general effect of public subsidy for higher education is to promote rather than discourage inequalities of income. The reason is that those who are most likely to benefit from higher education are the children of upper income families and that subsidies for higher education involves a transfer of income from the average tax-payers to those who come from

higher than average income families and who may expect to earn higher than average income in future. However, when subsidies for lower levels of education are also taken into account, it is possible that subsidies for education may contribute to redistribution of income in developing countries, although it is not necessarily so.

3.8 Financing of Education: Criteria for Adequacy of Education Finance

During the 1960s and first half of the 1970s, adequacy was defined in terms of the percentage of gross national product devoted to education, and in terms of the share of the central government's budget spent on education. These kinds of measures are not thoroughly satisfactory, because they sometimes ignore private education and educational revenues generated in provincial and local authorities. Their meaning was also ambiguous because they failed to address the question of the efficiency with which a given government ran its educational programs.

Since late 1970s, following the leadership of the World Bank, a new set of adequacy measures has come to be accepted. These measures are intended to get somewhat closer to outcomes of educational systems. One measure is the proportion of the relevant age group enrolled in primary school. A second set of measures relates to balance by sex, that is, whether educational opportunities are provided to women. A third criterion of adequacy is the proportion of the age cohort enrolled in secondary school. The fourth criterion is the adult literacy rate.

To assure (a) near universal enrollment in the elementary grades, (b) sufficient retention in the elementary to supply a sizable and sexually balanced group of students for secondary grades, and (c) quality of instruction for the whole population to sustain lifelong literacy, it is demanded that teachers and classrooms be generously be available in both cities and rural areas. The objective by which adequacy of education is defined also require at least a minimum level of competence and commitment on the part of teachers. The requirements for real resources to meet standards of adequacy set, in turn, the financial requirements.

For the industrialized nations and nonindustarlized countries characterized by relatively equal distribution of income, the question of adequacy needs no further general discussion. However, when large part of the youth population is affected by a malnutrition, or poor health, or where many parents find it necessary to exploit the labour of their very young children,

then an adequately financed system of education, as defined by conventional standards, may fail to yield the objectives of educational adequacy. It may be necessary to expend public resources to protect the nutritional status, health, etc of students and intending students in order that they are physically able to benefit from the instruction offered to them in an adequately financed educational system.

3.9 Financing of Education and Equity

The effects of a search of equity in the design of mast systems of educational finance are so strong and the approach to finance of primary and secondary schools, on the one hand, and to finance of post secondary institutions, on the other, are sufficiently different that is necessary to distinguish clearly between these two main sectors of education.

In the administration of primary and secondary schools, most central governments seek an arrangement which is neither wholly centralized nor wholly decentralized. Complete centralization implies an excessive amount of bureaucratic delay in making decisions, and it entails, probably, incapacity to take proper account of changes in local needs and desired practices. Yet, complete decentralization destroys the capacity of the central government to direct local authorities to meet long range national needs for training personnel. A mixed system of provisions, one which is subject to decision rules about the presence of central powers and local powers, calls for financial arrangement within the category of intergovernmental fiscal relations. The general rule for distribution of funds is that the larger unit of government distributes funds to the smaller unit directly in accordance with the needs of students in smaller unit and, inversely, with regard to the fiscal capacity of the smaller unit of government.

Needs of students are measured in the first instance by a census of the age cohort eligible to attend a particular level of education. This age cohort may then be adjusted in various ways, and the more sophisticated the adjustments, the higher the degree of equity likely to be attained. Measurement of local financial capacity is ordinarily a simpler process. Having determined that of which the local tax base consists, whether income, trade, or property, a total is taken for this local area and the total is divided by the number of eligible students.

Using their estimates of local needs and local resources, the central government is likely to employ one of three main fiscal devices to link together central and local support for education. The first of these is called a "foundation program plan". The foundation program is a money figure representing the government's estimate of the cost of educating a typical student in a typical local authority.

The second main type of grant is known as "percentage equalizing". Under this arrangement the government agrees to share in the costs of a locally determined education budget and, using a complicated formula, to share local budgets in such a position that any two local authorities that levy the same local school tax rate are provided with the same sum of money to spend per student. In effect, the state grant equalizes local fiscal capacity, while leaving the decision about the size of the budget to local discretion. Obviously, the percentage share of state money will be higher in poor local authority than in a rich one.

The third main type of grant is the "weighted-population grant". This is the simplest arrangement of the three and the one that is the most flexible, that is, that requires least commitment of future resources on the part of the state. A given local authority's entitlement is that share of a state-determined appropriation which is equal to the local authorities' share of weighted population share.

There are two main approaches to the problem of equity in finance of higher education. In Europe and in most developing countries, the central government pays most of the costs of post secondary education, including student maintenance, and the necessary funds are distributed directly to the institutions. The systems are hierarchical, topped by one or more major universities, and grounded in various forms of technical institutes and institutions of further education. The intending student finds a place in the structure in accordance with his or her measured academic abilities.

In United States, the main support of higher education is found in a system of grants and loans made directly to students. Periodically, there is interest in shifting the cost of United States higher education from government and parents to students themselves, using device of "income- contingent loans". Through these loans students could borrow practically unlimited sums for their education and pay the money back over their working lifetime, relative to the extra income that is estimated to be attributable to their additional

schooling. Under conservative fiscal policy and high rates of inflation of costs of higher education, devices of this kind may well be adopted.

3.10 Financing for Higher Education In India and its Problems

The question is who should bear the burden of education, whether it is to be borne by state or by receiver of education or by the user of educated man power? If all of them bear the burden of financing of education, the answer is on the economic framework and planning of education. The economic framework can be classified into three types- capitalist, socialist and mixed economy type.

In the capitalist system, the means and resources are owned by the private index of course some state intervention. But the philosophy is 'least state intervention'. In the socialist framework the means of production and distribution are owned by state and so also the decision. As we have in India, means of production and distribution are owned by both state and private individual. The state positively intervenes with a view to achieve desired goals.

In India, state intervention to fulfill social and economic goals is-

- Removing disparities in the distribution of economic resources so as to ensure economic justice.
- Planning the process of economic growth in order to achieve social justice.
- Securing an equitable standard of living.

There are various instruments for achieving these objectives viz. mobilization and redistribution of resources through taxation expenditure; equitable production and distribution so as to achieve these goals and to enact laws to promote desirable activities and prevent undesirable ones.

Education is the basic input of human resource development. Education constitutes input instrument, it has its own significance in capital saving mixed economic framework. The provision for education is regarded as social merit good and it forms a part of national economic development. So, financing of education is complex. In a mixed economic framework the government take a major responsibility of funding education, with contribution from social groups and individuals being important. This leads to the questions as to who bears the burden of state financing for education and what is the share of burden by individuals (or social groups).

If the state bears the burden of financing education the question that arises is that- how are resources generated by the state? If it is through taxation, whether it is through direct or indirect taxation. If it is direct taxation whether the nature of taxation is progressive, regressive or proportional. And if the taxation is indirect, is it through the taxation of items of common consumption or luxury goods? The question relates to every section of the society. However in reality, it is the common people who finance the resources for education through indirect taxes. However, if the burden is shared by the students, individuals or other groups the central question is how much of tax should be shared by them?

➢ Structure of Education:

Education system is our country has been influenced by colonial rule. So, the education system evolve through historical courses three (3) specific ways

- Content of Education
- Organization of formal education system
- Financing of education

Content of Education: With the regards of content of education, it is the education received from parents, society and observation. Content education can be broadly classified into- education for state administration and state craft: education for self enlightment and human co-existence; education for business, commerce and economic administration; and education for professional skills like engineering, medical and law.

Till independence, it was the first two types of education that received more importance. But after independence the later two also received the same importance as the previous two.

Organization of Formal Education System: In earlier times, traditional religious institutions like the temples played an important role in setting up educational institution, which was influenced by social and religious reform bodies and philanthropists. Later on state as well as local bodies took the initiative to organise the education system.

Financing of Education: The pattern of financing has evolved over time and this pattern can be described as – contribution from society in form of donations to social and religious reform institution; contribution from primarily states in form of income earning assets and cash donations and donation by

colonial rulers from the revenue collected from public; donation or contribution from philanthropists; contributions by receivers of education; and education access charged from the people.

➢ **Post Independence Period:**

India with written constitution took upon itself the responsibility of educating its people. Under the directive principle of state policy it was indicated as- free and compulsory education up to age 14; promotion of educational and economic interest of schedule caste and schedule tribes and other weaker sections of the society; equality of opportunity for all; provisions of protective fee concessions and financial subsidy for weaker section; and reservations.

Thus, the constitution makes provision for state intervention and sound financial system with suitable funding policies. Education was initially under state list but was brought under concurrent list after the 42nd amendment of the constitution, which made provision and supported private education and state institutions. Government laid great stress on primary education.

➢ **Organisational Structure:**

The organizational pattern of education has changed much since independence. The pattern of education in last 4-5 decades are-

- Privately managed but government aided school and colleges.
- Privately managed school and colleges but without government aid.
- Central and state government managed school and colleges.
- Central and state government supported autonomous institutions like universities and other institutes of higher education.
- Adult education centers supported and managed both by private bodies and state.

➢ **Financing of Education:**

After independence the state governments provided greater financial support and help for education by mobilizing resources. To promote education for its people the government took certain policy measures as–

- Fee concession to the weaker sections of the society
- Financial subsidy to students belonging to schedule caste, schedule tribes and weaker sections of the society.
- Tax rebates to philanthropists and donors who contributes to educational development

- The state also regulated the fees and kept the fee rates low in also in the state managed educational institutions.

The first two financial measures seek to redistribute resources through education to the weaker section of the society. The third measure helps to mobilize funds for education. The fourth measure enables the students of the weaker section to have access to higher education. The questions that arises in this context is that- who pays for the state resources? How tax rebates helps in mobilizing resources? Is the benefit accruing to donors are less than their contribution; and how far the resources contributed by donors are economical? How far low fee rates help the poor to get higher education? Finally, whether the resources are transformed from the rich and middle class or whether there is reverse transfer of resources to the rich appear middle class?

Mixed economy dictates state intervention through tax and fiscal policies. However, in India a large proportion of resources about 90% are raised through indirect taxation which is regressive in natures. So, the poor and the lower middle class bear the burden more and actually pay for the resources to finance education. So, in spite of low fee rates the poor cannot afford higher education. It is the student from rich and upper middle class who benefits from higher education. In short there is a reverse transfer of resources from the poor to the rich and so such income inequality is perpetuated.

➢ Policy of Tax Rebate and Private Contribution:

A donor will donate as long as the economic and non- economic benefits are high or equal to the amount of donation. There are some guidelines from the states point of view like- the resources mobilized through tax rebate are more than the amount the revenue lost owing to tax rebate; government must also see that the donors do not adversely affect the planning and development of education; donors do not use the institutions to serve their own interest.

Regarding the first guideline there is a feeling that the economic benefits enjoyed by the donors are greater than their revenue lost although there is no empirical evidence regarding this. As regards the second and third guideline also there are no empirical evidence and lack of supervision and

mechanism for governance of such institution. As such they serve individual or group interest.

➢ **Fee rates in Higher Education:**

This issue is somewhat complex. There are very few private universities, colleges and unaided colleges where fees are kept low. So, those from higher income groups who can afford high fees also go for low fee institutions. As such there is reverse flow of resources from lower income groups to higher income groups. This happens at the stage of human development.

In the employment of human resources, investment is incurred both in public and private sector. The human resource utilized in private sector just provides the maintenance cost without paying interest on those resources. While public sector provides both maintenance cost and interest income. So, the policy of low fee rates has actually helped private sector individuals to benefit out of public investment.

3.11 Summing Up

Most of the resources/finance for education comes from the state. State mobilizes 90% of the resources through taxation which is regressive in nature. So, the poor and middle class basically bears the cost of financing for higher education. There exist two types of institutions side-by-side-private high fee charging institutions and low fee charging government institutions. Adequate funds are available at the disposable of the private institutions and hence are in position to provide better education, whereas the government schools are disadvantageous position. Thus inequality is perpetuated in the job market also. Again as university education is highly subsidized, the investment on human capital is done at public cost. So, when this human capital is employed in private firms it supports the private firms' profits and private practioneries, nothing is ploughed back to the public.

In capitalist society, the receiver of education invests for their education. So, the higher salaries or fees charged by them afterwards are justifiable. But in a socialist society, funding is done from general public through indirect regressive taxation. So, it generally results in reverse flow of resources from the weaker to the richer section. Financing of education by other means can thus serve in reducing disparities and thus mobilize resources from higher income groups to lower income groups.

3.12 Self Assessment Questions

1. Explain the meaning of Economics of Education?
2. What is the need of Economics of Education in present time?
3. Explain the functions of Economics of Education?
4. What are the principles of Economics of Education?
5. Elaborate the role of education in human resource development.
6. Describe the relation between education and economic development.
7. Give an account of the cost-benefit analysis of education.
8. What are the various criteria for financing of education? Describe elaborately.
9. Give an account on the problems of financing of higher education in India.

3.13 References/Suggested Readings

1. G.Psacharopolous (ed), "Economics of Education" Perdgaman Press

2. Ian Beardwell and Len Holden (ed), "Human Resource Management-Contemporary Perspective", MacMillan

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Unit- 4

MANPOWER PLANNING

Contents:

4.0 Introduction

Educated man is one of the most crucial inputs in the economy is one of the most crucial inputs in the economy of any country, and in developing countries, where there is frequently a shortage of physical capital, the availability of skilled manpower may be particularly crucial. Recognition of the fact that education makes workers more productive, and the belief that shortages of skilled manpower represent one of the major constraints to economic growth in developing countries, has resulted in a great deal of research, efforts being devoted to the problems of forecasting demand for educated manpower. The idea that it is possible to forecast or project a country's manpower structure and then use the result as a basis for planning the scale of education in order to satisfy the economic needs of the country is not only appealing, but has also exerted powerful influence over educational planning in many countries, over a number of years.

4.1 Objectives

The objective of this unit is deal with the significance of manpower planning and the various problems associated with it. Besides, this unit also deals with manpower demand and supply and the various methodological issues

in estimating it. Further, the idea of brain drain and the cost of brain drain are involved. This unit also incorporates the input- output method in forecasting manpower requirement and the economic aspects of educational planning.

4.2 Manpower Planning-Meaning

Manpower Planning which is also called as Human Resource Planning consists of putting right number of people, right kind of people at the right place, right time, doing the right things for which they are suited for the achievement of goals of the organization. Human Resource Planning has got an important place in the arena of industrialization. Human Resource Planning has to be a systems approach and is carried out in a set procedure. The procedure is as follows:–

1. Analyzing the current manpower inventory
2. Making future manpower forecasts
3. Developing employment programmes
4. Design training programmes

Analyzing the Current Manpower Inventory- Before a manager makes forecast of future manpower, the current manpower status has to be analyzed. For this the following things have to be noted- Type of organization ;Number of departments ;Number and quantity of such departments ;Employees in these work units Once these factors are registered by a manager, he goes for the future forecasting.

Making Future Manpower Forecasts- Once the factors affecting the future manpower forecasts are known, planning can be done for the future manpower requirements in several work units.

The Manpower forecasting techniques commonly employed by the organizations are as follows:

i. **Expert Forecasts:** This includes informal decisions, formal expert surveys and Delphi technique.

ii. **Trend Analysis:** Manpower needs can be projected through extrapolation (projecting past trends), indexation (using base year as basis), and statistical analysis (central tendency measure).

iii. **Work Load Analysis:** It is dependent upon the nature of work load in a department, in a branch or in a division.

iv. **Work Force Analysis:** Whenever production and time period has to be analysed, due allowances have to be made for getting net manpower requirements.

v. **Other methods:** Several Mathematical models, with the aid of computers are used to forecast manpower needs, like budget and planning analysis, regression, new venture analysis.

Developing Employment Programmes- Once the current inventory is compared with future forecasts, the employment programmes can be framed and developed accordingly, which will include recruitment, selection procedures and placement plans.

Design Training Programmes- These will be based upon extent of diversification, expansion plans, development programmes, etc. Training programmes depend upon the extent of improvement in technology and advancement to take place. It is also done to improve upon the skills, capabilities, knowledge of the workers.

4.3 Manpower Planning- Significance and Problems

A well-prepared and motivated workforce is possibly the most important of the three intangible assets to support an organization's value creating processes.

Key to Managerial Functions- The four managerial functions, i.e., planning, organizing, directing and controlling are based upon the manpower. Human resources help in the implementation of all these managerial activities. Therefore, staffing becomes a key to all managerial functions.

Efficient Utilization- Efficient management of personnel becomes an important function in the industrialization world of today. Setting of large scale enterprises require management of large scale manpower. It can be effectively done through staffing function.

Motivation- Staffing function not only includes putting right men on right job, but it also comprises of motivational programmes, i.e., incentive plans to be framed for further participation and employment of employees in a concern. Therefore, all types of incentive plans becomes an integral part of staffing function.

Better Human Relations- A concern can stabilize itself if human relations develop and are strong. Human relations become strong trough effective

control, clear communication, effective supervision and leadership in a concern. Staffing function also looks after training and development of the work force which leads to co-operation and better human relations.

Higher Productivity- Productivity level increases when resources are utilized in best possible manner. Higher productivity is a result of minimum wastage of time, money, efforts and energies. This is possible through the staffing and its related activities (Performance appraisal, training and development, remuneration)

Need of Manpower Planning- Manpower Planning is a two-phased process because manpower planning not only analyses the current human resources but also makes manpower forecasts and thereby draw employment programmes. Manpower Planning is advantageous to firm in following manner:

1. Shortages and surpluses can be identified so that quick action can be taken wherever required.
2. All the recruitment and selection programmes are based on manpower planning.
3. It also helps to reduce the labour cost as excess staff can be identified and thereby overstaffing can be avoided.
4. It also helps to identify the available talents in a concern and accordingly training programmes can be chalked out to develop those talents.
5. It helps in growth and diversification of business. Through manpower planning, human resources can be readily available and they can be utilized in best manner.
6. It helps the organization to realize the importance of manpower management which uitimately helps in the stability of a concern.

4.4 Manpower Demand and Supply

The demand for teachers can be defined in the aggregate, as the total number of teaching positions funded by educational agencies (government/private and private aided) i.e., the number of teachers that all agencies put together are able and willing to employ at a given time. Total demand thus defined is the end result of a number of considerations leading to the establishment of teaching positions.

The main factors determining teacher demand in any particular year are the number of students enrolled in public schools, policies pertaining to curriculum and teacher-pupil ratios, prior commitments to employed teachers, educational agencies funding capacity, and the prices that must be paid for various types and qualities of teachers. Aggregate demand, however, is of little use in understanding the dynamics of demand for the teaching force or in designing policies to ensure an adequate supply of teachers. For these purposes, total demand must be specified in greater detail, i.e., disaggregated by teaching assignment and geographic distribution of the teaching positions.

More specifically, computations of disaggregated teacher demand should be stratified by subject matter, grade level, preparation for serving the special needs of students (especially handicapped students and those with limited English proficiency, region of the country, and urban city of schools within which teaching positions have been established. In addition, demand should be specified by the attributes of teachers desired, especially teacher qualifications (their training, degree level, licensure, and experience) and race/ethnicity. When specified at this level of detail, teacher demand can be compared with information about teacher supply to examine supply-demand relationships.

The supply of teachers in any year is defined, in the aggregate, as the number of eligible individuals available from all sources who are willing to supply their services under prevailing conditions. The supply includes qualified individuals who (a) currently hold teaching positions, (b) seek to enter the profession by applying for open positions, and (c) would apply for positions if suitable openings existed.

The main factors determining who is available to teach are considered to be the availability of teaching positions relative to the availability of positions in other occupations, teacher wages relative to wages in competing occupations, and working conditions in teaching relative to conditions in other occupations.

Unfortunately, no sources of data are capable of providing adequate information about the total supply of teachers thus defined (Gilford and Tenenbaums, 1990). What is known with reasonable precision is the annual number of teachers hired from among those available through several sources of supply. That is, the number of individuals continuing in public school teaching from entering public school teaching annually. The former group is often called continuing teachers, and the latter group is often called entering teachers or new hires. Collectively, continuing and entering teachers constitute the cohort of individuals employed as teachers (in short, the

teaching force), a group representing an unknown proportion of the potential total supply of teachers.

Aggregate information about the size of the teaching force is of only modest value for understanding teacher supply. In practice, it is virtually the same as aggregate demand. To be useful in understanding the teaching force, information is needed about various sources of supply of individuals hired as teachers, as well as about the composition and distribution of the teaching force. Information at this level of detail could then be related to comparable information about teacher demand in efforts to understand the degree to which teacher demand is being met by qualified individuals, as well as the sources of teachers that might be manipulated by policy in order to provide a more adequate supply. In practice, the term *supply* (as in teacher supply and demand) is typically used imprecisely. Instead of referring to total potential supply, the expression *teacher supply* is used loosely to refer to the composition of the actual teaching force, to potential sources of entering teachers such as recent graduates of teacher preparation programs, and to teacher supply shortages that occasionally occur in some subject matter fields at various geographic locations. The total potential supply of hireables individuals almost always equals or exceeds the number of available teaching positions. Therefore, in the aggregate, the size of the teaching force is usually determined by the demand for teachers as defined by the number of funded teaching positions, not by supply constraints.

4.5 Methodological Issues in Estimating Manpower Demand and Supply

The teaching force is distributed among public and private schools that vary by type, grade level, and location. A major concern and challenge is that teachers are maldistributed among schools in terms of qualifications, experience, race/ethnicity, and other dimensions of the teaching force. For example, high schools in large urban areas usually attract a teaching force that is less experienced, younger, and less well prepared to teach high school subjects than teachers hired at nearby suburban schools.

Therefore, information about the distribution of the teaching force needs to be presented in terms of teacher variables (such as qualifications) to understand fully how well the supply of teachers meets the demand for teachers at schools of various types, levels, and locations. Such analyses of the teaching force are possible with existing teacher data bases. Little is known, however, about the characteristics of applicants (from which entering teachers are selected) as a function of school location. Unless information

about applicants is known, it is not possible to determine whether the supply of teachers available to various schools is adequate, or whether difficulty in hiring qualified teachers is due to hiring practices or other factors. This distribution problem stems from teachers' behavioral response to schools location, one of the many variables affecting the supply of teachers available to a school. Supply obviously can vary from school to school since supply is a relationship between the numbers of qualified individuals who would be willing to teach and such incentives as the salary, working conditions offered, the location of the school, and other alternative career opportunities.

Another main factor behind teacher demand, namely change in pupil numbers due to population growth and expanded access to education. It looks at the size of primary and secondary teaching forces across the world and how numbers have changed over time. Patterns in population and pupil growth affect the aggregate demand for education which can lead to increases or reductions in staff size, especially at the primary level which is typically considered compulsory.

4.6 Forecasting Manpower Requirements: Meaning

Manpower forecasts have been made over time in several ways and for several purposes. National manpower forecasting covers manpower as an aid to educational planning. Although several approaches to national manpower forecasting have been developed and followed, all include a common theme. This is that shortages and surpluses of differently qualified groups of labour will constantly arise simultaneously in absence of planning. The result is detrimental to both individuals, who may lose income and morale, and to society as a whole since labour shortages result in a lower level of output and hence lower levels of present or future consumption than would otherwise be the case. Manpower forecasts con accurately estimate the future demands for labour and action can then be taken in time to ensure appropriate supplies. The removal of potential imbalances leads to increased national production and a higher level of average earnings. For the LDCs which aim to make fundamental structural changes in their economies, forecasting the shifts in demand for different skills is argued to be particularly necessary.

The theoretical rationale in the introduction of manpower forecasting is that the purpose of making manpower forecasts is to ensure that supplies of manpower are available when new requirements arise. As a result, manpower shortages and surpluses can be avoided and output increased. The two main reasons for manpower forecasts are- (a) the imperfections

and inadequacies of the labour market to cope with shortages and surpluses and (b) the limited possibilities of substitution. Forecasting future manpower requirements can create appropriate supplies and in turn provide the base for planning educational expansion.

Although a common rationale underlies all attempts to forecast manpower requirements, several different approaches have been taken, largely on account of varying data availability. The approaches used are employers' survey, international comparisons, lobour-output ratios, and Mediterranean Regional Project method. *Employers' Survey* is one of the simplest method of assessing manpower requirements is to ask employers directly to forecast their own levels of employment in the future. In absence of knowledge of past trends in labour market, governments of less developed countries have regularly used this approach. *International Comparisons* is another approach to forecasting manpower requirements, and one which again largely owes its existence to the lack of domestic labour market information, particularly in the LDCs, is the use of international comparisons. These may take the form of either time series data from a single country whose experience is regarded as particularly relevant or of cross-sectional data from a range of countries. *Labour- Output Ratios* have mainly been used for forecasting requirements in a single occupation and these have tended to be ones requiring high-level qualifications as doctors, teachers, engineers' etc. The approach is basically very simple and is founded on extrapolations of manpower per unit of output and level of output. A variant of the labour-output ratio approach is to forecasting manpower requirements is the use of density ratios.

Forecasting requirements for occupations individually and independently could result in the aggregate requirements being greater than the anticipated size of the total labour force. Thus attempts have been made to produce forecasting models that result in estimates of manpower requirements across the whole labour force simultaneously. The most widely known of these is that developed by Parnes for OECD's *Mediterranean Regional Project* which aimed to produce forecasts of manpower requirements up to 1975 for Italy, Greece, Turkey, Yugoslavia, Spain and Portugal as a base for educational planning.

4.7 Input-Output Method in Forecasting Manpower Requirement

Input-output analysis is a tool of economic science. It describes in figures production processes as in recipes: how much of each necessary ingredient is needed to produce one unit of a product. Since education may be

considered, especially from an economic point of view, as a production process, input-output analysis may also be applied to education. The input-output analysis emphasizes that goods need other goods for their production. Input –output analysis is a simplified picture of the production process, and assumes a number of rigidities i.e. nonadaptions, which may deviate from real production processes. Deviations occur if inputs can be substituted i.e. combined in other ratios than the recipes indicate.

Education may be seen as a production process and hence be described with the aid of input- output analysis. Part of the formal education process at the primary level may be described by inputs of teachers and kindergarten graduates, books and so on and by outputs of dropouts and those admitted at some secondary level. If 25 pupils are being taught by each teacher, the teacher-student ratio of 1:25 which constitutes an input- output. Instead of looking at a complete course of a primary school one can look at the teaching process in one grade. Figures of those who pass from grade one to grade two is known as transition figures and for lack of better knowledge they can be considered as constants, for instance, equal to last year's or those in another city or country.

Reasoning backwards one may also how to obtain 100 factory directors. In the United States there was a time (around 1900) when most of these were high- school graduates. By 1980, more than half of Fortune's 500 top managers were business school graduates; and many more than 500 such graduates would be need in order to select those who qualify for becoming one of those 500. This way of looking at that part of education is, quoting Psacharopoulos (1978), fading away. Related to this rejection of a fixed recipe of obtaining top executives is the fact that the educational specialization may vary from lawyers to engineers, alongside many non-university graduates.

In order to deal with input-output terminology for dealing with education processes, it should be used qualitatively only and fairly high rates of substitutions may have to be accepted. Such a qualitative approach could be useful as a reconnaissance for more fundamental research. Its first task would consist of enumerating the character of the education process. There is scope for stating that inherited personality traits of the students partly determine the process. Alongside these the environment impacts as those occurring in the family during a child's early years etc may be listed. Later on, the consecutive schools attended biological developments of the youngster and after school-leaving age, training on the job will play its role. After one or more decades paid leave for retraining may be added.

All these elements enumerated and some additional ones enter into what today the educational economists prefer to call a production function of the education processes undergone. Looked at this way the state of the art is at a low level, as the following example demonstrates.

Wide differences of opinion prevail on the impact of inherited personality traits on the degree of success of an educational process. Whereas some experts maintain that such genetic factors determine to a large extent what a given individual is able to attain, others point to learnability, of many characteristics needed for a given job. Learning processes vary with the curriculum, which refers to the type of school, both with regard to the level of schooling and to the general-specific nature of the education offered. Often-used levels of primary, secondary and tertiary level roughly corresponding to elementary school, high school and college. Increasingly a preprimary level has been added. There are important differences between secondary schools in different countries depending, among other things, on how many years of obligatory schooling exist. Other ways of indicating the level are simply expressed in terms of the age of the students. As for the nature of schools there is s distinction between general versus vocational education. The latter prepares for certain age groups of occupations and is specialized accordingly.

Technological and economic development from the simple levels existing one or more centuries ago, or in relatively primitive cultures, to modern industrialized societies have had an important impact on the learning processes needed to prepare children and youngsters for their jobs. One of the changes is often of the type "learning how" and "learning why". This is an incomplete description however. What is needed is more creativity and it remains to be seen whether even the most advanced curricula are appropriate to develop whatever elements of creativity are available. A host of, as yet, vaguely known components needed as inputs into an optimal educational process remain to be studied and developed.

4.8 Educational Planning and its Economic Aspect

The subject matter of economics as a science is the allocation of scarce resources among alternative uses. Since economics deals with supply and demand, economic considerations are increasingly used in many stages of the educational planning process. In the recent time the title 'educational planner' has been assigned to someone who by formal training is an economist, econometrician or statistician, rather than an educator. There are several reasons for this tendency. First, the majority of contemporary

crisis symptoms in education are economic or financial in nature. Second, schools are immediately affected by the economic environment within which they operate. Third, taking a long term perspective, schools can affect the economic environment itself. A further important reason for the current dominance of economics in the necessarily inter disciplinary field of educational planning is that it offers a systematic framework for the analysis of many components of the planning process.

One operational definition of planning in general, which can also be used in education, is (a) the examination of many feasible alternatives, and (b) the choice among them according to an objective. This definition can be splited to two separate components viz, positive which is component (a) and normative which is component (b). Besides this definition corresponds to the problem of constrained optimization in mathematics.

Formulating criteria also known as specifying the objectives in welfare function in economics deals with several distinctive objectives the educational planner might stipulate, such as to increase the level of achievement of secondary school, to accelerate the rate of economic growth etc. such criteria then become arguments on the right hand side of the welfare (objective) function the planner wishes to maximize. Another major normative assumption that has to be made in order to specify the social welfare function is what weights (c) to assign. Such weights are usually derived from country's political system.

The right hand side of the objective function must be expanded in order to be explicitly expressed in terms of policy (alterable) variables in the educational system. Such a set of variables might be the enrollment in the different levels of schooling in the country etc. once the objective function is specified; constraints are introduced in the form of equations. The solution to the constrained maximization problem can yield the optimal level of enrollments by level of schooling in order to maximize social welfare. Even if they are not blended in a social welfare function framework or used in constrained optimization, the modeling and derivation of the c-type weights is instructive on its own in educational planning. Such weights or equivalent ones, applied to the equity component of the function, document the intricate links between the educational system and the country's economy. As such, they provide important signals to the policy makers for action on different fronts in order to satisfy the adopted objectives.

The traditional involvement of economists in educational planning has been for the purpose of introducing an element of efficiency. Narrowly defined, the efficiency argument might refer to the improvement of input-output

relationships within the school system in producing graduates and minimizing dropouts. This is often known as the internal efficiency of the educational system, linking to the literature on educational production functions. However, in 1970s much emphasis was laid on external efficiency of the school system. This type of efficiency is in turn interpreted differently by different schools of thought in educational planning literature. According to the manpower requirements approach, the social benefit with the provision of education is the achievement of a given level of production. Hence, the planning of education should be geared to providing the kinds of qualifications key personnel should have in future for the efficient operation of the economy. According to the cost-benefit (or rate if return) model, efficiency takes the form of comparing the social costs and benefits of providing at the margin more of a particular type or level of education. If discounted benefits exceed the costs or if the social rate of return is higher than a criterion rate, this is interpreted by the educational planner as a signal for expansion. If the rate of return is low, the signal is read as the indication against the expansion of the particular level or type of education.

Cost- Effectiveness analysis is a special type of cost-benefit analysis, borrowed from military operations, in which the benefit is axiomatically given and no attempt is made to measure it. The analyst focuses instead on minimizing the cost to achieve the given objective. Again, equity considerations in education have been traditionally treated in sociology, as have the differential access to various schools by social class or family background and the role of education in determining life chances or who gets ahead. In economics, two separate, although highly linked, streams of analyses have developed in treating equity issues in educational planning. First, who pays- who benefits argument and second the role of education in equalising income distribution. The first topic was started by a public finance-subsidy study of the California higher education system by Hansen and Weisbrod (1969). It was found that because of public subsidization of higher education by the average tax-payer, the lower income families were paying for the education of the children of better-to-do families, since the latter had a greater tendency to send their children for higher educations. Several similar studies conducted in other states or other countries have produced mixed results on the alleged inequitable effects on higher education. The second topic relates to comparison between the distributions of educational attainment in the population to the distributions of incomes.

One of the most documented effects in the economics of education is the increasing level of earnings with the length of education. Hence, the provision of education has the effect of moving some groups of population from a

given income class to a higher one and so it affects the income distribution. Of special interest in educational planning is the effect of minimum- schooling legislation on income distribution. Studies in several countries have shown that raising the schooling- leaving age has a substantial effect on reducing the dispersion of earnings to the population.

Another criterion for planning an educational system is for the policy makers to try to conform what students and their families wish to study. This is known in the literature as satisfying the social demand for education, although it is often referred to more accurately as private or individual demand. The planning of an educational system based on social demand starts from a projection of school age population which is followed through the system by means of transition proportions. These are probabilities established from historical data on the number of students advancing from one level of education to the next.

4.9 Meaning and Concept of Brain Drain

The concept of brain drain is used to refer to the migration of highly skilled individuals trained in one country but take up residence and work in another. Such migration has taken place throughout history, but came to public attention during the early 1960s when the United States embarked on a major increase of expenditures on science and engineering in order to meet the Soviet challenge symbolized by the launching of Sputnik. These expenditures created an excess demand for highly skilled manpower that was met by immigration. At the same time, developing countries launched major efforts to industrialize and other industrial nations attempted to catch up with United States technological and scientific standards. The loss of highly skilled manpower frustrated these countries' economic development efforts and brain drain became a widely discussed political issue. During the late 1960s and 1970s the brain drain from developing countries to Western Europe and multinational organizations also became sizable and phenomenon was recognized as more general problem.

For economic science the brain drain is a component of two separate traditional fields of study: migration and human capital. The economics of the brain drain might be called less emotively the economics of international human capital flows. However, the use of the term brain drain is so well-established that it is advantageous to continue its use hare in the study of the broader phenomenon of unrecorded migration of human capital.

4.10 Brain drain in Under-Developed Countries

The "brain drain" of highly qualified workers from developing countries in the South to industrial countries in the North hardly existed until the 1960s. Before then, the South-North flow involved mainly manual workers and poorly qualified service personnel, who for the most part were encouraged to migrate under government-organised schemes and who complemented the highly qualified workforce in the industrial countries. The migration of professional and academically qualified staff, by contrast, occurred primarily between industrial countries and reached its peak immediately after the two world wars, when a large number of well trained workers and academic and professional specialists immigrated to North America from the economically weak countries of Europe. This migration was generally accepted, as it accorded with the expectations of economic theory that in an integrated international labour market migration would equalise excess supply and demand in different locations and that both economies would benefit. Since the sixties, however, qualified workers have also been emigrating from many Third World countries to find work in the industrial countries of the North, and have often remained there for the rest of their lives. This has been fiercely criticised, especially by the governments of the Third World countries concerned; not only did the migration of qualified workers appear to be a form of "reverse technology transfer" that deprived the less developed countries of a crucial and desperately needed factor for growth and development, it was also no longer accepted to be the result of the worldwide operation of the mechanism equalising supply and demand in the market for qualified workers but seen as the consequence of unfair competition from the powerful industrial countries - and especially the USA - at the expense of the weak developing countries.

Brain drain occurs most commonly when individuals leave less developed countries (LDCs) with fewer opportunities for career advancement, research, and academic employment and migrate to more developed countries (MDCs) with more opportunities. However, it also occurs in the movement of individuals from one more developed country to another more developed country. Brain drain is also known as human capital fight. To put in simple words, the highly educated or well qualified people, after completion of their studies, migrate from their native countries to more developed countries for better job opportunities and a higher standard of living. This phenomenon adversely affects the particular country from which these various skilled doctors, engineers and scientists are migrating. These skilled fellows migrate from developing countries (for e.g. India, Pakistan,

Bangladesh, China) to developed countries like USA, UK and become a resource for the developed country instead of their own.

The assessment of the economic and social consequences of the emigration of qualified people from Third World countries depends first on the level at which the question is considered - that of individual migrants or that of the entire economic societies of the countries of origin or destination - and secondly whether it is considered from the viewpoint of the industrial countries or that of the developing countries. At the level of the individual, it can be said unequivocally that emigration is the result of professional career planning by the potential migrants and that, if it is successful, on balance it brings them monetary and often also non-monetary benefits; if the decision to emigrate depends solely on the wishes of the migrant (and possibly his family) and if he acts rationally, he will decide to emigrate only if the expected benefits exceed the expected losses. As with intra-national migration, considerations of risk spreading and income stabilisation by diversifying employment opportunities also play a major role.' 1 Over and above the purely economic factors, general social variables - ranging from the migrant's relative position on the social scale to the institutional and political situation in the domestic environment - naturally also have additional importance. If it is assumed that the migration of qualified personnel is voluntary, as will generally be the case, emigration must be judged to be a profitable alternative for most qualified persons from Third World countries.

The country that experiences brain drain suffers a loss. In LDCs, this phenomenon is much more common and the loss is much more substantial. LDCs generally do not have the ability to support growing industry and the need for better research facilities, career advancement, and salary increases. There is an economic loss in the possible capital that the professionals may have been able to bring in, a loss in advancement and development when all of the educated individuals use their knowledge to benefit a country other than their own, and a loss of education when educated individuals leave without assisting in the education of the next generation. There is also a loss that occurs in MDCs, but this loss is less substantial because MDCs generally see an emigration of these educated professionals as well as an immigration of other educated professionals.

While it is easy to identify the ways in which brain drain can hurt economic development, the reasons that it may not be so bad, or may in fact be positive, are not so obvious. Yet, acknowledging and accounting for the positive spin-offs from highly skilled emigration is an important first step in getting to the bottom of the dilemmas brain drain poses. For a start, it is

worth noting that some of the simplistic assumptions made about brain drain may not actually hold. For example, some of those who migrate return, often with greater skills. Some of those who move from a developing country have received education elsewhere, subsidized by the host country or private means. By staying away after they finish studying, these students may not fulfill the potential contribution they could make to their countries of origin. However, the cost of their departure, at least in terms of the public purse in the sending country, may not have been large. In some cases, those who leave have been unemployed or underemployed at home, so their departure may not actually result in a huge loss to the sending country. For instance, the Philippine government continues to support its temporary contract-worker program so that unemployed, skilled workers can find work abroad. In other cases, the departure of skilled workers is compensated for by the arrival of skilled workers from another country. As described in a special chapter in the OECD's 2004 "Trends in International Migration", the classic case of this domino effect is of South African doctors moving to developed countries while being replaced by Cuban doctors.

At the theoretical level, economist Oded Stark and others have argued that brain drain may lead to positive results. Even in the poorest of countries (Cuba may well be a good example), the prospect of being able to emigrate may increase incentives to acquire education and skills and induce additional investment in education. When this domestic "brain gain" is greater than the "brain drain," the net impact on welfare and growth may well be positive. In other words, even in the presence of a brain drain, the average education level of those who remain may be higher than it would have been without migration. While economist Maurice Schiff and others have shown that Stark's thesis is by no means proven beyond doubt, it is important to note that brain drain need not have negative impacts on a sending country's stock of education and skills.

In addition, it is important to understand that brain drain can only tell part of the story about migration's overall impact on an economy or society. When all the other impacts of migration — such as remittances, inward investment, technology transfer, increased trade flows, and charitable activities of diasporas communities — are taken into account, the net impact may actually be positive. As discussed below, there is a pressing need to develop a more comprehensive balance sheet that can take into account all of these factors.

There is an obvious gain for the country experiencing "brain gain" (the influx of skilled workers), but there is also a possible gain for the country that loses the skilled individual. This is only the case if professionals decide to

return to their home country after a period of working abroad. When this happens, the country regains the worker as well as gains a new abundance of experience and knowledge received from the time abroad. However, this is very uncommon, particularly for LDCs that would see the most gain with the return of their professionals. This is due to the clear discrepancy in higher job opportunities between LDCs and MDCs. It is generally seen in the movement between MDCs. There is also a possible gain in the expansion of international networking that can come as a result of brain drain. In this respect, this involves networking between nationals of a country who are abroad with their colleagues who remain in that home country. An example of this is Swiss-List.com, which was established to encourage networking between Swiss scientists abroad and those in Switzerland.

Brain Drain Example: Russia

In Russia, brain drain has been an issue since Soviet times. During the Soviet-era and after the collapse of the Soviet Union in the early 1990s, brain drain occurred when top professionals moved to the West or to socialist states to work in economics or science. The Russian government is still working to counter this with allocation of funds to new programs that encourage the return of scientists that left Russia and encourages future professionals to remain in Russia to work.

Brain Drain Example: India

The education system in India is one of the top in the world, boasting very few drop-outs, but historically, once Indians graduate, they tend to leave India to move to countries, such as the United States, with better job opportunities. However, in the last few years, this trend has started to reverse itself. Increasingly, Indians in America feel that they are missing the cultural experiences of India and that there are currently better economic opportunities in India.

Combating Brain Drain

There are many things governments can do to combat brain drain. According to the *OECD Observer*, "Science and technology policies are key in this regard." The most beneficial tactic would be to increase job advancement opportunities and research opportunities in order to reduce the initial loss of brain drain as well as encourage highly-skilled workers both inside and outside the country to work in that country. The process is difficult and it

takes time to establish these sorts of facilities and opportunities, but it is possible, and becoming increasingly necessary.

These tactics, however, do not address the issue of reducing brain drain from countries with issues such as conflict, political instability or health risks, meaning that brain drain is likely to continue as long as these problems exist. If brain drain is not always bad, then limiting the movement of highly skilled people may not be necessary. Indeed, except for extreme cases, measures that restrict mobility are not the most effective responses to the causes or consequences of brain drain. In particular, measures aimed at reducing the recruitment of developing-country professionals in several sectors (notably health care but also in education) in some developed countries may only be a band-aid solution — and a bad one at that — for several reasons.

4.11 Cost of Brain Drain

The cost of brain drain can be analysed through the welfare effects which can be either short run or long run.

Short run Output Effects: When a country unexpectedly loses through emigration a highly skilled person there are likely to be short run adjustment costs since technologically optimal efficiency is achieved by the co-operation of human capital with physical capital and lobour in a mix determined by the state of knowledge and relative prices of the three types of inputs. The temporary losses can be reduced for any given technology if the departure of the skilled person is known in advance. In the extreme, there need be no adjustment costs at all. The argument in context of an individual firm or plant also applies in its basic outline to society as a whole, except that replacements of skilled persons cannot simply be hired from another job but requires time-consuming education and therefore may involve longer periods of inefficient operating procedures. However if emigration can be predicated, then it is possible to plan education in such a way that there are never any short run shortages of skilled people and the economy operates at all times with technologically optimal mix of human and real capital and labour.

In the real world, short run adjustment costs are likely to be minor and human capital losses have been quite predictable. Some analysts argue that in some countries, such as India, political processes or planning errors have resulted in an excess production of human capital for given knowledge and

physical capital and labour. In case of such countries short- run losses are nil since emigrating human capital was unemployed.

Long-run Output Effects: Long run output effects of the emigration of human capital can usefully be analysed with the help of what is known as the generalized theory of capital. According to this model, society can invest its stock of capital in knowledge, and human and physical capital. Markets, competition, and patent laws result in a tendency for the marginal productivity of each capital form to be equal and society's output to be maximized. The three forms of capital can be added up to find the overall endowment of labour with capital.

Now let it be that a country in efficient equilibrium with respect to the distribution of the stock of the three types of capital losses a certain amount of human capital and labour through emigration. A reallocation of society's remaining capital stock is likely to be necessary and may be assumed to take place. In new equilibrium that country's total output will be lower than before the loss of the labour and capital. However, under relatively simple and usual assumptions about the nature of the production function, total output per worker in the country may be raised or lowered or remain unchanged.

Welfare Effects: The brain drain became a source of public concern in the 1960s and continues to occupy discussions at the UNCTAD and other UN agencies because of the following perception of the welfare effects and inequalities. The population of a country taxes itself to finance the operation of institutions of higher learning or the study of citizens abroad. This collective investment in education is made in expectation of general returns to society. Moreover, a competitive selection process of education tend to provide education to most gifted and dynamic young people who are sources of leadership generally and carries of desirable genetic material.

Given these expectations of return from investment in education of young people, their emigration or failure to return from study abroad represents a serious loss. Basically, investments made on these people are wasted and what makes this waste particularly harder to take is that it involves greater inequities. Under this nationalistic view, the effects of the brain drain are often quantified by measuring the value of income earned by brain drain migrants in their countries of new residence. This sum is then considered to represent the inequitable transfer of resources from poor to the rich nations.

However according to the internationalist view, in a world without externalities and government-financed education the emigration is one or a small number of highly skilled persons leaves unchanged the welfare of

those left behind because the migrants take along an equal valued contribution and claim to output. In the country of immigration, the brain drain migrants contribute to output is exactly what they are paid and use as claim on the output. Therefore they do not alter the incomes of the people there. However the migrants raise their own income.

4.12 Self Assessment Questions

1. Bring out the significance of manpower planning. What are the problems associated with it?
2. Write a note on the methodological issues involved in estimating manpower demand and supply.
3. Bring out the economic aspects of educational planning.
4. Give the concept of brain drain. What is the cost of brain drain?
5. Describe a method of forecasting manpower requirement.

4.13 References/Suggested Readings

1. G.Psacharopolous (ed), "Economics of Education" Perdgaman Press
2. Ian Beardwell and Len Holden (ed), "Human Resource Management-Contemporary Perspective", MacMillan

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