

# ECONOMICS

## 5<sup>th</sup> Semester.-Economic Development and Policy in India.

### Unit - two

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#### **Main Features of India's Population**

By demographic features we mean the characteristics of population like, size, composition, diversity, growth and quality of population etc.

To have basic understanding of the population problem of a specific country, one should have a complete knowledge regarding the basic features of population of that country.

#### **The following are features of India's population:**

##### **1. Large Size and Fast Growth:**

The first main feature of Indian population is its large size and rapid growth. According to 2001 census, the population of India is 102.87 crore. In terms of size, it is the second largest population in the world, next only to China whose population was 127 crore in 2001. India's population was 23.6 crore in 1901 and it increased to 102.7 crore in 2001.

In addition to its size, the rate of growth of population has been alarming since creative efforts.

New ideas may be excludable. Patent laws seek to give the 1951. At present, India's population is growing at a rate of 1.9 percent per annum; 21 million people are added every year which is more than the population of Australia. This situation is called population explosion and this is the result of high birth rate and declining death rate.

## **2. Second Stage of Demographic Transition:**

According to the theory of demographic transition, the population growth of a country passes through three different stages as development proceeds. The first stage is characterised by high birth rate and high death rate. So in this stage the net growth of population is zero. Till 1921, India was in the 1st stage of demographic transition.

The second stage is featured by high birth rate and declining death rate leading to the rapid growth of population. India entered the second stage of demographic transition after 1921. In 1921-30 India entered the 2nd stage, the birth rate was 464 per thousand and death rate was 363 per thousand.

In 2000-01, birth rate was 25.8 and death rate declined to 85. This led to rapid growth of population. India is now passing through the second stage of demographic transition. While developed countries are in 3rd stage.

## **3. Rapidly Rising Density:**

Another feature of India's population is its rapidly rising density. Density of population means to the average number of people living per square kilometer. The density of population in India was 117 per square km. in 1951 which increased to 324 in 2001. This makes India one of the most densely populated countries of the world. This adversely affects the land-man ratio.

India occupies 2.4 per-cent of the total land area of the world but supports 16.7 per-cent of the total world population. Moreover, there is no causal relationship between density of population and economic development of a country. For example, Japan & England having higher density can be rich and Afghanistan & Myanmar having lower density can be poor. However in an underdeveloped country like India with its low capital and technology, the rapidly rising density is too heavy a burden for the country to bear.

## **4. Sex Ratio Composition Unfavourable to Female:**

Sex ratio refers to the number of females per thousand males. India's position is quite different than other countries. For example the number of female per thousand males was 1170 in Russia, 1060 in U.K., 1050 in U.S.A. whereas it is 927 in India according to 1991 census.

The sex ratio in India as 972 per thousand in 1901 which declined to 953 in 1921 and to 950 in 1931. Again, in 1951, sex ratio further declined to 946. In 1981, sex ratio reduced to 934 against 930 per thousand in 1971. During 1991, sex ratio was recorded 927 per thousand.

The sex ratio is 933 per thousand in 2001. State wise Kerala has more females than males. There are 1040 females per thousand males. The lowest female ratio was recorded in Sikkim being 832. Among the union territories Andaman and Nicobar Islands has the lowest sex ratio i.e. 760. Therefore, we can conclude that sex ratio composition is totally unfavourable to female.

## **5. Bottom heavy Age Structure:**

The age composition of Indian population is bottom heavy. It implies that ratio of persons in age group 0-14 is relatively high. According to 2001 census, children below 14 years were 35.6%. This figure is lower than the figures of previous year. High birth rate is mainly responsible for large number of dependent children per adult. In developed countries the population of 0-14 age group is between 20 to 25%. To reduce the percentage of this age group, it is essential to slow down the birth rate.

## **6. Predominance of Rural Population:**

Another feature of Indian population is the dominance of rural population. In 1951, rural population was 82.7% and urban population was 17.3%. In 1991 rural population was 74.3% and urban population was 25.7. In 2001, the rural population was 72.2% and urban population was 27.8. The ratio of rural urban population of a country is an index of the level of industrialisation of that country. So process of urbanisation slow and India continues to be land of villages.

## **7. Low Quality Population:**

The quality of population can be judged from life expectancy, the level of literacy and level of training of people. Keeping these parameters in mind, quality of population in India is low.

### **(a) Low Literacy Level:**

Literacy Level in India is low. Literacy level in 1991 was 52.2% while male-female literacy ratio was 64.1 and 39.3 percent. In 2001, the literacy rate improved to

65.4 percent out of which male literacy was 75.8 and female literacy was 52.1 percent. There are 35 crore people in our country who are still illiterate.

### **(b) Low level of Education and Training:**

The level of education and training is very low in India. So quality of population is poor. The number of persons enrolled for higher education as percentage of population in age group 20-25 was 13 percent in 1982. It is only one fourth of the developed countries. The number of doctors and engineers per million of population are 13 and 16 respectively. It is quite less as compared to advanced countries.

### **(c) Low Life Expectancy:**

By life expectancy we mean the average number of years a person is expected to live. Life expectancy in India was 33 years. It was increased to 59 in 1991 and in 2001, life expectancy increased to 63.9. Decline in death rate, decline in infant mortality rate and general improvement in medical facilities etc. have improved the life expectancy. However life expectancy is lower in India as compared to life expectancy of the developed nations. Life expectancy is 80 year in Japan and 78 years in Norway.

## **8. Low Work Participation Rate:**

Low proportion of labour force in total population is a striking feature of India's population. In India, Labour force means that portion of population which belongs to the age group of 15-59. In other words, the ratio of working population to the total is referred to as work participation rate.

This rate is very low in India in comparison to the developed countries of the world. Total working population was 43% in 1961 which declined to 37.6% in 1991. This position improved slightly to 39.2% in 2001. That means total non-working population was 623 million (60.8 percent) and working population was 402 million (39.2%). Similarly low rate of female employment and bottom-heavy age structure are mainly responsible for low work participation in India.

## **9. Symptoms of Over-population:**

The concept of over-population is essentially a quantitative concept. When the population size of the country exceeds the ideal size, we call it over-population.

According to T.R. Malthus, the father of demography, when the population of a country exceeds the means of substance available, the country faces the problem of over-population.

No doubt, food production has increased substantially to 212 million tonnes but problems like poverty, hunger, malnutrition are still acute. Agriculture is overcrowded in rural areas of the country which is characterised by diminishing returns. This fact leads to the conclusion that India has symptoms of over-population. Indian low per capita income, low standard of living, wide spread unemployment and under-employment etc. indicate that our population size has crossed the optimum limit.

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## **Population Growth and Economic Development: A Close View**

### **Different Views on the Role of Population Growth:**

Population growth plays a conflicting role in the development process of a country. It helps economic development and it retards economic development.

To the Greek philosophers, about 2,500 years ago, population growth was undesirable as it adversely affects economic development. Plato (427-347 B.C.) suggested that the member of citizens of a country should be kept fixed at 5,040 on the ground that this number is divisible by any number from 1 to 12 except

He desired that the country's population must not exceed beyond certain level. Sir William Petty presented an optimistic outlook on population growth. Adam Smith also regarded the growth of population as the basis of wealth. But the classical economists, Especially T.R. Malithus, sounded an alarm bell of rising population growth in a country.

However, Mlthus ' argument came under severe attack at the hands of Karl Marx and F. Engles.

### **Relationship between Population Growth and Economic Development:**

The relationship between population growth and economic development may be summarised in the words of Robert McNamara—the past president of the World Bank. He described it as 'the most delicate and difficult issue of our era... It is

overlaid with emotion. It is controversial. It is subtle. Above all, it is immeasurably complex.

Mao Zedong once remarked that “A country’s greatest wealth is its people.

### **On the same vein, the then Prime Minister Mr. Pitt of England declared in the 18th century:**

“A man could enrich his country by producing a number of children, even if the whole family were paupers.” All these suggest that not only there is no conflict between population growth and economic development but also an increase in population is necessary for increase in wealth and development. But, antithesis to this is the Malthusian version which regards population growth as the number one barrier to economic development. Neo-Malthusians attribute all of the world’s modern problems of underdevelopment to massive population growth.

Thus, there is a conflicting role between population growth and economic development. It can act both as a stimulus and as an impediment to growth and development. Such conflicting roles suggest that the relationship between population and economic development is intricate, complex and interesting.

### **Benefits of Population Growth:**

#### **Population growth helps the process of development in the following ways:**

First, an increasing population means an increase in the number of working population who can function as active participants in the process of economic growth and development.

It is to be noted that labour, assisted by necessary tools and implements, was always and still is the greatest productive asset of nations. A growing population leads to an increase in total output. The sheer arithmetical increase in population creates work as well as incentives for production that impacts upon output and productivity quite favourably. Indeed, this argument is empirically important in addition to theoretical reasoning.

Secondly, a growing population means a growing market for most goods and services and we know that division of labour is limited by the extent of the market. A potentially expanding market may stimulate entrepreneurs to invest more and more in capital goods and machinery. Business activity will be spurred

as a consequence. And more income and employment will be created in the process. Moreover, it will provide an outlet for the products of efficient, large scale, mass- production industries. The net effect may be favourable to the country.

Of course the size of the domestic market of country does not only depend on the number, but also on the per capita income level. But given the same low level of income per head, a country India offers a more favourable environment setting up heavy capital goods industries which depends so much on the economies of scale their success. In contrast, a thickly populated country with a small population base such as Sri Lanka seems to be especially handicapped by the all size of its domestic market.

Population growth has been a favourable factor in stimulating growth in many a country in; last two centuries, when vast areas remained largely unsettled. Even in the USA, in the 1930s, was apprehended that a slowing down of the rate population growth would lead to long run secular) stagnation. The vast secular boom in the post-industrial revolution England had been largely induced by the unparalleled rise in population’.

Thirdly, an arithmetic increase in population permits in reaping economies of scale in production, greater division of labour, extension of the market, etc.

### **The World Bank in its 1984 World Development Report argues:**

“...there is little doubt that the key to economic growth is people, and through people the advance of human knowledge. Per capita measures of income should not be used to imply that the denominator, people, contributes nothing to the numerator, total income. Nor is population growth in itself the main cause of natural resource problems—air pollution, soil degradation, even food availability.”

### **Costs of Population Growth:**

But Malthusians and neo-Malthusians think otherwise. First, they argue that population growth negatively affects economic development. Their argument is based on the law of diminishing returns in agriculture. Population growth acts as a barrier to economic development since the growth of population grows never in commensurate with the growth of food supply.

Actually speaking, as the rate of growth of population exceeds the rate of production, economic development is hampered. A growing population, within a limited geographical area, usually puts heavy pressure on the existing factor endowments, especially natural resources of the country. Moreover, if the society has a limited stock of capital, labour may have to be substituted for capital, in which case the production function will exhibit the law of diminishing returns. Diminishing returns may become a serious problem if population growth is rapid.

However, empirical evidence suggests that technological change—or the so-called green revolution in agriculture in different LDCs—has greatly offset the effects of diminishing returns in agriculture and the spectre of food problem and its aftermath (hunger, famine, etc.,) in most of these countries has virtually vanished. So, one must not view that population growth badly affects economic development.

Secondly, based on the Indian experience, Ansle Coale and E. M. Hoover drew attention to the likely adverse effects of population growth on savings and capital formation through the following effects: the age-dependency effect, the capital-swallowing effect, and the investment diversion effect.

It is said that a rapid population growth causes an increase in dependency ratio—a high ratio of non-working population to working wage people or active population. When the number of dependents or the ratio of consumers (non-producers) to producers increase, there occurs a diversion of income from savings to consumption and a fall in per capita income. But anti-Mathusians talk in a different vein.

They argue that many young children contribute directly to parents' income by working in farms and off-farm sectors. Further, additional mouths in the low income families tend to encourage people to work more. In this way, children themselves contribute to household and saving. Anyway, the impact on household saving can be negative, negligible or positive—the issue needs to be settled by empirical investigation.

The capital-shallowing effect states that a rapid population growth lowers the ratio of capital to labour or workforce thus works with less capital and consequently the poor rate of savings. This then reduces productivity of labour.

As children remain engaged in productive works, the family may experience an increase in saving. Under the circumstance, the capital-shallowing effect may remain inoperative. High economic growth is accompanied with overall high savings ratio in many developing countries.

The investment-diversion effect states that, because of rapid population growth a country's scarce resources get diverted away to the so-called unproductive sectors of health, education and social services from the more productive growth-oriented sectors. This logic assumes that the expenditures on human capital are unproductive. Educated and healthy people are viewed as one of the essential ingredients of economic development. Indeed, there are high returns to investment in human capital.

Anyway, empirical research does not confirm the Coale-Hoover thesis.

Thirdly, Mathusians are convinced that population growth badly affects food supplies. To them, the chronic food problem experienced by many poor developing economies is often attributed to rapid population. It is because of 'natural limits' in agriculture population growth would overtake food supply output, thereby leading to famine, hunger, malnutrition, etc.

But the evidence tells a different story. Because of the introduction of green revolution technology in agriculture, yields have increased to such an extent that many countries, including India, have now been exporting food-grains. Unfortunately, the present global world is highly unequal. We see an abnormally high level of malnourished children; starvation and famines occasionally visit in many countries.

However, this must not be attributed to a mismatch between a high population growth and food supply. This can be referred to as the unequal distribution of purchasing power among different groups of population. Hunger and famine, according to A. Sen, is due to 'entitlement failure' and not the food availabilities as such.

Fourthly, the question of unemployment and underemployment has assumed serious proportion, particularly in LDCs, because of rapid population growth. But whether population growth is responsible for unemployment problem cannot be said definitively since no such statistical strict correlation is observed. In fact, it is the technology that determines the absorption of unemployed labour

force. The experiences of Korea and Taiwan tell that economic development in these countries proceeded successfully despite high population growth.

In recent years, as agriculture is becoming more and more unprofitable, the issue of engaging surplus labour has become a concern to the Government of India. Agriculture's contribution towards GDP growth is not only falling but the absorptive capacity of agriculture is also falling. This development, consequent upon Mathusian pressure, has been forcing many farm people to migrate to towns and urban areas in search of employment.

However, this argument is a faulty one. Economic development is associated with declining importance of agriculture. Thus, the migration of the productive farm workers in other sectors needs to be attributed to the policy failure and not to the population pressure.

Finally, neo-Malthusians argue that excessive population growth and massive poverty in LDCs have greatly damaged the ecological balance by deforestation and land degradation. Consequently, these countries suffer badly from a variety of environmental hazards. Such canard is made by developed countries who are to be condemned outright for destroying ecological balance.

But today the debate has shifted from population pressure to climate change and environment—perceived as a great threat to humanity. The current ecological crisis is caused by human economic activity or anthropogenic. The way an economy is organised is rather 'inherently suicidal'.

The whole world is burning fossil fuels to drive the growth economy. Carbon dioxide emission is at its highest level. All these may be linked to a developed rich economy addicted to growth. The US economist Kenneth Boulding made the following statement: **"Anyone who believes that exponential growth can go on forever in a finite world is either a madman or an economist."**

### Conclusion:

Considering the above-mentioned plus and minus points, economists conclude that hindrances to economic development in LDCs are not to be attributed to population growth. The greatest and real obstacle to development is underdevelopment. Potentialities for development are adequate. By designing

their development programmes, LDCs can raise their levels of income and living standards.

Further, they argue that there is no population bomb in these countries. The myth of over-population causing underdevelopment should be given up in any analysis of economic development. It is not to be accepted that a slowing down of population increase might contribute substantially to our development prospects. So what is sauce for a goose may not be the sauce for a gander!

The moot point is that population growth may be either favourable or unfavourable to economic development, depending on where, when, and how it takes place.

Today, an international consensus has been reached. A country may strike a higher growth and development if population increases slowly. No one should exaggerate either the beneficial or the unfavourable effects of population growth on economic development. However, it is to be kept in mind three important issues.

First, all problems of levels of living, inequality and poverty are not to be necessarily linked with high population growth. Secondly, population growth must involve the quality of life, and not the quantity perse. Thirdly, but truly, rapid population growth makes prospect for development rather remote. All these then demand an appropriate economic and social policy so as to improve the well-being of the future world populations in a sustainable way.

## **How does Demographic Dividend impact on the India's economic growth?**

Generally in contemporary world, 'Demographic Dividend' has become a hot topic for the policy makers, economist and experts from the various sectors around the world. Many countries are on the crossover of this potential—with a proportionately large young and working-age population. But much more must be done to enable the dividend: increase the empowerment of girls and women, ensure universal and high quality education that is tailored to new economic opportunities, and expand secure employment.

## **What is Demographic Dividend?**

According to the United Nations Population Fund (UNFPA), the **Demographic Dividend** refers to “**the economic growth potential that can result from shifts in a population’s age structure, mainly when the share of the working-age population (15 to 64) is larger than the non-working-age share of the population (14 and younger, and 65 and older).**” It can only come into existence, when countries invest in the empowerment, education and employment including good governance.

## **Composition of Indian population**

### **What is relationship between Demographic Dividend and Economic Growth?**

There is a great influence of demographic dividend on the economic growth because the demographic dividend is the economic benefit that can arise when a population has a relatively large proportion of working age people, and effectively invests in their empowerment, education and employment.

According to the **Malthus**, increase in food production would not be able to keep up with an increase in population because while population grew geometrically, food production only increased arithmetically. He stressed that societies which have high fertility rates would have lower income levels and those with lower fertility rates will have higher incomes. The reasoning behind this inverse relationship is that high population levels would drive down the price of labour and increase the price of food. Hence, he believed that nature had its own checks to balance the world’s population. Therefore, on the basis of the above argument of Malthus, the **economic growth** can be defined as ‘a long term rise in capacity to supply diverse economic goods to its population, this growing capacity based on advancing technology and the institutional and ideological adjustments that it demands’.

## **Regional Distribution of Tribes in India**

According to the **International Labour Organisation (ILO)**, the 21<sup>st</sup> century can belong to India as it has three assets that no country has: ‘**democracy**’, ‘**demand**’ and ‘**demographic dividend**’. But did we wonder why the ILO states that, this is

because the greater the share of the population in the working-age group; the more will be the savings and investments in the economy.

The economy can be driven by a fast growth track with other macroeconomic variables like employment, per capita income, saving and investment putting a positive impact on the economic growth of the country only when demographic dividend is taken care of.

Hence, the **human resources** can only transform into asset through proper recruitment, selection, training, appraising performance, compensating, maintaining relationships, and welfare, health and safety measures of employees in compliance with labour laws of the land.

Therefore, it is of utmost importance that the youth needs to be absorbed meaningfully into the workforce to make it productive enough so that this demographic dividend does not turn into a demographic nightmare.

### **Urbanization in India**

**In this essay we will discuss about Urbanization in India. After reading this essay you will learn about: 1. Meaning of Urbanisation 2. Trends of Urbanisation in India 3. Degree 4. Causes 5. Consequences 6. Role in Economic Development of India.**

#### **Contents:**

1. Essay on the Meaning of Urbanisation
2. Essay on the Trends of Urbanisation in India
3. Essay on the Degree of Urbanisation in India
4. Essay on the Causes of Rapid Urbanisation in India
5. Essay on the Consequences of Rapid Urbanisation
6. Essay on the Role of Urbanisation in Economic Development of India

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### **1. Meaning of Urbanisation:**

Urbanisation is one of the common characteristics of economic development. With the gradual growth of the economy, the process of urbanisation depends on

the shift of surplus population from rural to urban areas along-with the growth of some industrialised urban centres.

Due to social and economic pressures, people from backward villages started to move towards urbanised centres in search of job, where newly established industries and ancillary activities continuously offer job opportunities to those people migrating to cities.

The pace of urbanisation is fast if the industrial growth is fast. The pace of urbanisation gradually declines only when the proportion of urban population to total population of the country becomes too high.

## **Essay # 2. Trends of Urbanisation of India:**

In India, an increasing trend towards urbanisation has been recorded from the very beginning of this present century. The census data on the rural-urban composition reveal a continuous rise in the rate of urbanisation in India and more particularly during the second half of the present 21st century.

The proportion of urban population to total population which was only 11 per cent in 1911 slowly increased to 11.3 per cent in 1921 and then gradually rose to 14 per cent in 1941.

With a liberal definition of urban area adopted in 1951, the proportion of urban population suddenly rose to 17.6 per cent. But with a slightly strict definition, the proportion of urban population recorded a small increase to 18.3 per cent in 1961. In the 1971 census, a new definition of an urban unit was adopted and that definition was continued in 1981 census.

### **This definition was as follows:**

(a) All places with a municipality, corporation, cantonment board or notified town area committee etc.

### **(b) All other places which satisfy the following criteri**

(i) Minimum population of 5,000;

(ii) At least 75 per cent of male working population engaged in non-agricultural pursuits; and

(iii) A density of population of at least 400 persons per sq km (1,000 persons per sq mile).

The definition of an urban unit in 1961 census was also similar to the above mentioned definition. Thus the data on rural-urban distribution during the last three censuses are comparable. The proportion of urban population to total population of India as per this new definition was estimated at 20.2 per cent in 1971 census and then marginally rose to 23.7 per cent in 1981.

Again in 2001, the total size of urban population in India increased to 285 million as compared to that of 217 million in 1991. This shows that the proportion of urban population to total population of India has increased from 25.8 per cent in 1991 to 27.8 per cent in 2001.

The provisional figure of total urban population of India in 2011 is estimated at 377 million which is estimated at 31.16 per cent of the total population of the country. Moreover, the total number of towns in India which was only 1627, gradually rose to 3060 in 1951, 3126 in 1971, 4029 in 1981 and then to 5166 in 2001. Table 6.7 reveals the detailed picture of this trend in urbanisation.

**TABLE 6.7. Trends of Urbanisation in India**

Year	Urban Population (in million)	Urban as % of total population	No. of towns
1901	26	11	1,627
1951	62	17.6	3,060
1961	79	18.3	2,700
1971	109	20.2	3,126
1981	160	23.7	4,029
1991	217	25.8	4,689
2001	285	27.8	5,166
2011	377	31.16	N.A.

Moreover, urbanisation has an increasing impact on the concentration of population towards relatively higher income categories. Therefore, urban areas have higher percentage of lower middle income, middle income, upper middle income and higher income group of people than that of rural areas. Table 6.8 clarifies this point.

Thus it is found from Table 6.8 that the percentage of households in the lower middle income category was 34.75 per cent in urban areas as compared to that of 23.88 per cent in the rural areas.

Similarly, the percentage of households in the middle income and the upper middle income categories were 17.89 per cent and 6.46 per cent in the urban areas as compared to that of only 7.06 per cent and 1.16 per cent in the rural areas. Again, the percentage of households in the higher income category was 3.75 per cent in the urban areas in comparison to that of only 0.56 per cent in the rural areas.

The size of total urban population increased from about 26 million in 1901 to 62 million in 1951, showing an increase of 36 million in just 50 years.

But during the next three decades (1951-81), the absolute increase was to the extent of 94 million and this shows that the population absorption capacity in urban areas has increased substantially due to industrialisation in the country. The census data shows that the annual growth rate of urban population which was 3.26 per cent during 1961-71, gradually increased to 3.86 per cent during 1971-81.

### **Essay # 3. Degree of Urbanisation in India:**

Measurement of the degree of urbanisation in a country like India is considered very important. Various measures are being used for the purpose. As per the first simple method we observed that the total urban population in India in 1981 was a little less than one fourth of the total population in comparison to that of one-ninth in 1921 and one-sixth in 1951.

The second method, i.e., the urban-rural growth differential (URGD) method also revealed that the growth rates of both rural and urban population are very close to each other at present.

Third method showing the growth of urban population reveals that as the total population of the country rose by about three times since 1921 but the total urban population of the country increased by about six-times. Thus all the methods observed more or less same results.

If we compare degree of urbanisation in India with that of developed countries then we can find that India is lagging far behind the high-income countries. In 1985, the proportion of urban population to total population was 92 per cent in U.K., 86 per cent in Australia, 76 per cent in Japan, and 74 per cent in U.S.A. as against only 25 per cent in India.

In India, towns are classified into six different classes. From the census data, it has been observed that in Class I town (having a population more than 1 lakh) the proportion of urban population concentration has increased from 25.7 per cent in 1901 to 60.4 per cent in 1981. Thus there is an increasing trend towards huge concentration of population in the bigger towns.

In Class II and Class III towns together, the proportion of urban population remained almost constant at the level of 26 to 28 per cent during the period 1901-81. But in the remaining Class IV, Class V and Class VI towns together, the relative proportion of urban population concentration declined sharply from 47.2 per cent in 1901 to only 13.6 per cent in 1981.

Besides continuation of urbanisation process, a number of Class II towns have been transformed into a Class I town and the number of Class I towns has thus increased from 74 in 1951 to 216 in 1981.

Accordingly, the total population of Class I towns also increased from 273 lakhs in 1951 to 943 lakh in 1981 showing an increase of nearly 245 per cent. During the same period, the number of Class II towns has increased from 95 to 270 and that of Class III towns increased from 330 to 739 in 1981

Total population of Class II and Class III towns increased from 330 to 739 in 1981. Total population of Class II and Class III towns increased by 130 per cent, i.e., from 97 lakh in

1951 to 224 lakh in 1981. While the number of class IV towns has increased from 85 lakh to 149 lakh, the number of Class V and class VI towns and their total population declined sharply during the same period.

Again the number of big cities with million plus population has increased from 12 in 1981 to 27 in 2001 and their total population also increased from 42.1 million in 1981 to 73.0 million in 2001. As per 2001 census the size of population of four-cities of India are 11.9 million for Mumbai, 4.58 million for Kolkata, 9.8 million for Delhi and 4.2 million in Chennai.

#### **Essay # 4. Causes of Rapid Urbanisation in India:**

Rapid urbanisation is taking place in different parts of the country in and around some big cities and towns of the country. The growing trend of urbanisation as reflected in growing concentration of major proportion of urban population in some big cities.

**The factors which are largely responsible for such rapid urbanisations are mentioned below:**

*(i) Natural Increase in Population:*

Rapid urbanisation is taking place as a result of high rate of natural increase in population. Natural increase is taking place when the birth rate in urban areas exceeds the death rate. The natural growth rate of urban population is higher than that of rural due to higher net survival rate arising out of better health and medical facilities.

Improvement in health and medical facilities, drinking water supply and sanitation facilities have reduced the incidence of water-borne diseases, communicable diseases etc.

Accordingly, the birth rate in urban areas in 1971 was estimated at 30.1 per thousand as compared to the death rate of 9.7 per thousand which subsequently reduced to 24.3 and 7.1 per thousand in 1991. Thus the natural growth rate is stated too high because of large difference between birth and death rates.

The death rate in urban areas declined considerably due to better availability of medical and health service, safe drinking water supply and improved sanitation facilities.

This natural increase in population is largely responsible for phenomenal growth of population in urban areas i.e. 46 per cent in 1971-81 and 36 per cent in 1980-91 decade as compared to that of 19 per cent and 20 per cent growth rate attained in rural areas of India during these two decades.

*(ii) Migrations:*

Rural-urban migration is considered another important factor responsible for rapid urbanisation in India. The rural to urban migrations have been resulted due to many factors during the post independence period. Creation of many activities of manufacturing and trading as a result of industrial development has resulted migration of rural people to urban areas for seeking jobs and higher incomes as well.

After the partition of the country in 1947 rural uprooted people started to settle down in urban areas. Poor living conditions and negligible arrangement in respect of education and health have also attracted large number of rural people to migrate and settle in urban areas in search of good education, health facilities, better living conditions and securities of life.

As a result of heavy public investments in industry and mining, huge industrial development and sustained agricultural development urbanisation takes place. Thus due to these “pull factors”, large number of rural people migrate to urban areas.

However there are certain “**push factors**” where due to worse economic conditions a number of rural people are pushed out of villages due to economic compulsions. Thus in the current phase of urbanisation both the “**pull factor**” and “push factor” are very much operational.

*(iii) Expansion of Industry and Trade:*

In recent years, urbanisation takes place with the growing expansion of industry and trade in a particular state or region. Growth of an industry with its ancillaries along with localisation of industry would always create a favourable situation for the growth of an urban set up.

Similarly, growth of business and trade along with establishment of an active market always provides adequate support toward growing urbanisation in those places related to the development of industry and trade.

*(iv) Boundary Changes of Towns:*

With the extension of the boundaries of cities and towns, more and more rural areas are gradually being included in rural areas. Although life in these newly extended areas remains rural initially but the inclusion of these areas into these towns and cities necessarily increases the number of urban population.

## **5. Consequences of Rapid Urbanisation:**

The rapid urbanisation is subjected to both healthy and unhealthy consequences and aspects.

*(i) Healthy Aspects:*

Rapid industrialisation results the development and setting up of many industrial cities. Along with manufacturing units, ancillaries and service sector started to grow in those urban areas. Secondly, new and additional employment opportunities are created in the urban areas in its newly expanding manufacturing and service sector units.

This would result rural-urban migration and “**industrialisation- urbanisation process**” to set in. Thirdly, growth of cities can give rise to external economies so as to reap the benefit of economies of scale for various services and activities.

Finally, urbanisation results changes in attitudes and mind set of the urban people resulting modernisation in behaviour and proper motivation which indirectly helps the country to attain faster economic development.

*(ii) Unhealthy Aspects:*

Although development of the economy are very much associated with urbanisation but it has resulted some serious problems. Firstly, growing urbanisation is largely responsible for increasing congestion in the urban areas. Too much congestion has resulted problems like traffic jams, too much concentration of population, the management of which is gradually becoming very difficult and costly.

Secondly, too much of population is another unhealthy aspect of urbanisation which creates urban chaos related to housing, education, medical facilities, growth of slums, unemployment, violence, overcrowding etc. All these would result in deterioration in the quality of human life.

Finally, as a result of urbanisation, large scale migration takes place from rural to urban areas. Such large scale migration of active population from rural areas would result loss of productivity in rural areas, leading to poor conditions in village economy. Thus urbanisation, beyond a certain point, would result in unhealthy consequences.

*(iii) Urban Policy Measures:*

Considering unhealthy consequences of rapid urbanisation, it is quite important to formulate an urban policy which can provide urban development with minimum undesirable effects.

**The measures which can be largely followed include:**

- (i) Integrating urbanisation process with the development plans of the country for developing non-agricultural activities like manufacturing services and infrastructure leading to attainment of external economies,
- (ii) Making arrangement for selective urban development so as to minimise the disadvantages of these large sized towns,
- (iii) To develop rural districts, by developing towns in highly rural districts,
- (iv) To develop satellite townships in and around large cities; and
- (v) Relieving pressure on large urban centres by developing urban amenities in adequate quantities so as to make urban living peaceful.

### **Role of Urbanisation in Economic Development of India:**

Urbanisation and economic development are closely associated. Economic development of a country indicates increase in the level of per capita income and standard of living along-with the enlargement of employment opportunities for its growing population. With the attainment of economic development and growing industrialisation, the process of urbanisation starts at a rapid scale.

Some areas emerge as a large urbanised centre with large scale industrial and trading activities. These areas started to offer increasing number of employment opportunities leading to a shift of population from rural areas to these urbanized centres. Thus economic development of a country assists in its process of urbanization.

Growing industrialisation raises the rate of economic development along-with the pace of urbanization in the country. Increase in the rate of economic development raises the level of per capita income and standard of living of the people which in turn enlarges the demand for various goods and services.

This increase in aggregate demand expands the production system leading to a large scale production of various goods and services.

All these lead to increase in the pace of urbanization in the country. Thus there is a good correlation between the level of per capita income and the pace of urbanization. In India, the coefficient of correlation between the proportion of urban population to total population and the level of per capita income is estimated at 0.5, which is significant.

Moreover, economic development paves way for growth of cities and towns. Thus with the increase in the number of cities and towns the proportion of urban population to total population is also increasing.

But higher degree of urbanisation cannot reduce the degree of unemployment in India significantly through the absorption of increasing number of surplus labour force from rural areas as the scope for raising urban employment is also limited. In India there is an insignificant positive correlation (0.18) between the proportion of urban population and the rate of daily status of unemployment.

Moreover, there is a mild negative correlation, i.e., 0.22, between the proportion of urban population and the percentage of population below the poverty line in India.

**Factors which are responsible for this typical situation are:**

- (a) neglect of urban slums in our planning coverage;
- (b) growing exploitation of unorganised sectors by capitalists, contractors, landlords etc. and
- (c) increasing application of capital intensive techniques in urban areas.

Thus in comparison to the degree of urbanisation achieved in India, the absorptive capacity of the urban centres is very low. This shows the reason why urbanised centres in India could not make much headway in reducing the degree of unemployment in the country.

Thus, in conclusions, it can be observed that the attainment of high rate of economic development paves the way for growing urbanization along-with the increase in the level of per capita income and the development of various urbanized infra-structural facilities like transportation and communication, housing, education, health, trade, banking etc.

But this growing urbanisation has also led to huge concentration of population in urban areas, resulting in various evils side by side such as growth of slums, increasing congestion and pollution, problems of transportation, housing, water supply, health services, unemployment and poverty.

**Understanding Poverty and Inequality in Urban India since Reforms**

Bringing Quantitative and Qualitative Approaches Together

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Vamsi Vakulabharanam, Sripad Motiram

Having grown considerably in the past two decades, Indian cities have become highly unequal spaces – economically, spatially, socially and culturally. Both quantitative approaches and qualitative methods have been used to study and measure the rising levels of inequality and the extent of poverty of the cities. While both have their problems, this paper claims that notwithstanding their respective limitations, these two approaches have captured different dimensions of the complex Indian urban process, even if they have rarely made an effort to speak to each other. The authors offer their own perspective on how these approaches can learn from each other and move forward.

For their comments on a previous version, we thank an anonymous referee, Anant Maringanti and Ashima Sood.

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### Introduction

The urban process<sup>1</sup> in India is fundamentally constitutive of the high growth that India has been witnessing since the 1980s. This process has received major impetus from the influx of agrarian capital into the cities from the 1980s onwards, the consolidation and growth of old and new urban capital, as well as the entry of foreign capital since the 1990s (Damodaran 2008; RBI 2012 and various issues). State investments of a facilitating kind (for example, urban infrastructure, as opposed to state-owned enterprises) have increased, too. Cities have witnessed significant in-migrations of working populations from agricultural hinterlands since colonial times (Chandavarkar 2006), and this process has intensified further in recent decades (Shrivastava 2011). City spaces have also undergone rapid reconfigurations over the last two or three decades with the emergence of wealthy enclaves and

new towns (Bhattacharya and Sanyal 2011), which have tended to be located away from older parts of the cities, viewed as congested, mixed (for example, in terms of income) and largely unplanned (or not amenable to modern planning). Across Indian cities, there has also been a significant growth in slums and pockets of poor neighbourhoods that house the poorer recent migrants and the older urban poor.

All the above processes have coalesced in such a way that Indian cities have become highly unequal over the last two decades – economically, spatially, socially and culturally (Motiram and Vakulabharanam 2012; Vakulabharanam 2012; Zacharias and Vakulabharanam 2011). Quantitative approaches,<sup>2</sup> using large macro surveys and measures, which have been relatively more popular with economists, do reflect these rising urban inequality levels. By all anecdotal accounts, Indian cities are also characterised by high levels of poverty, and what has been achieved (if at all) on the front of poverty reduction is modest. However, there is no consensus on the question of poverty.

It is important to understand at the outset that there are several problems with the quantitative approaches. On the question of poverty (urban or rural) in India, there is considerable controversy and disagreement on basic questions such as: How many poor are out there? What is the trend/rate of changes in poverty? On the question of inequality, too, there are strong reasons to believe that there is serious underestimation of both the levels and increases in inequality (Jayadev et al 2007). In December 1, 2012 vol xlvi nos 47 & 48 general, scholars using quantitative approaches have tended to focus on macro databases that come with a claim of an

“objective” representation of reality, when it is not at all clear if such a strong claim can be justified. There could be problems concerning how representative these data samples are of the whole population; whether the questions in the surveys are equally comprehensible to all respondents; whether these questions adequately reflect the agency of the respondents; and whether the mechanisms involved in social dynamics can be unearthed through these questions. Also, similar looking macro/statistical outcomes of poverty or inequality may hide the varied mechanisms that produce these outcomes. Therefore, quantitative approaches alone are not adequate to make sense of these deeper phenomena, which require an appreciation of the structural and historical context in which the present-day urban centre is located.

In our reading, the qualitative literature (for example, from geography, anthropology, sociology or political science),<sup>3</sup> which has mostly relied on research methods such as ethnography, participant observation and spatial mapping, has been very insightful in contextualising the changes that we are witnessing in urban India, and in engaging with the actual processes and mechanisms, and with the diversity and heterogeneity that characterises the urban. However, these approaches are rooted in particular traditions, with their own blind spots. Although there are notable exceptions, these studies have tended to focus on micro contexts (for example, particular slums) without investing adequate effort into theorising the relations between these micro contexts and the larger macro context. We also perceive a contradictory set of tendencies among these studies. On the one hand, there is a strong belief that it is epistemologically unfeasible to go beyond the subjective,

and the micro contexts. On the other, there is also a tendency to theorise the entire social totality from a micro-study, which may produce a whole range of conflicting claims that are somewhat impossible to resolve rigorously or satisfactorily. As a result, this literature is characterised by a deep fragmentation, from which a coherent picture of the larger social reality is somewhat hard to construct.

In this paper, which is intended for a broad audience of social scientists and policymakers, one of our claims is that notwithstanding their respective limitations, these two (that is, quantitative and qualitative) approaches have captured different dimensions of the complex Indian urban process, even if they have rarely made an effort to speak to each other. We present below (Sections 2 and 3) both the insights provided by an analysis of the larger macro databases, as well as the insights from various qualitative and conceptual approaches to produce a richer account of the questions of equity and justice in the Indian urban context. We also offer our own perspective (in Section 4) on how these approaches can learn from each other and move forward.

### [Quantitative Approaches](#)

Our focus in this section is on studies that have used large, nationally representative databases (National Sample Surveys (NSS), Census, and National Family Health Surveys (NFHS)) to understand urban poverty and inequality in India. There is an abundance of such studies, so given the restrictions of space, we survey this literature selectively. We focus on more recent studies (that have appeared since the late 1990s) and present the latest available evidence on the extent, trends and determinants of poverty, and the mechanisms through which it persists.

### **Do We Know Anything Definitive about Urban Poverty?**

We first look at the studies that have tried to estimate the number of urban poor, the rate/extent of urban poverty and their trends. In the monetometric or unidimensional approach, which is by far the dominant one and on which controversies have centred,<sup>4</sup> a poverty line in monetary terms is postulated and various measures (for example, the percentage of people below the poverty line, viz, the head count ratio (HCR)) are computed, based upon this. At the outset, we should acknowledge that any discussion of this approach has to be conducted in the shadow of the recent controversy on official poverty lines (that is, the recommendations of the Tendulkar Committee). There has been a series of critiques (for example, Subramanian 2011; Suryanarayana 2011; Swaminathan 2010), and there is near consensus now that the methodology adopted by this committee is shown to be flawed – essentially, there is no consistent norm that one can discern, beyond an attempt to find a poverty line that would result in a poverty rate perceived as reasonable, that is, neither too high nor too low. In a way, the government itself has recognised these problems, since it has recently appointed a new committee (chaired by Rangarajan) to set a new poverty line.

In a lucid and comprehensive account, Subramanian (2011) has shown how this is but the latest chapter in a long saga of problems and inconsistencies that have plagued the setting of Indian official poverty lines since Independence. There are several details (which interested readers can refer to in Subramanian 2011), but in the interests of space, we skip

these and illustrate one important controversy. The method suggested by the 1993 expert group involved rural and urban poverty lines for a “base year” (1973-74), and the updating of these lines regularly based upon the prevailing prices. The poverty lines for the base year were set (based upon results from the NSS consumption expenditure survey for 1973-74) so that they corresponded to a minimum calorie requirement (2,100 and 2,400 kcal for urban and rural areas, respectively), although the correspondence of these lines with these requirements was rough (at best). The problem with this approach is that if one agrees with it, one is equally justified in taking any year (and not just 1973-74) as the base year and using this procedure of updating. Put simply, for the year that one is interested in, one could just examine the proportion of people who fail to meet the calorie requirement to obtain the HCR. This is problematic since, depending upon the base year chosen, the trends and extent of poverty differ.

Choosing an official base year (1973-74) provides the comforting trend of a secular decline in urban poverty using NSS consumption expenditure surveys. This is what many scholars (including us; for example, Sen and Himanshu 2004a, 2004b; Himanshu 2006) have found using official poverty lines and NSS surveys on monthly consumption expenditure. The all-India urban HCR has declined from about 42-44% (various estimates) in 1983 to about 26% in 2004-05. However, Patnaik (2007: Table 2) uses the same data and takes a direct approach by looking at the proportion of people in urban areas who fall short of the nutrition norm of 2,100 kcal. She finds that this proportion has declined from 58.5% in 1983 to 57% in 1993-94, but then increased to 64.5% in 2004-05. From the above discussion, it is clear that one could claim that the official methodology is consistent with both these trends (and several others).

Other estimates are available for this period (based upon the NSS Employment and Unemployment Surveys) from the National Commission for Enterprises in the Unorganised Sector (NCEUS). The NCEUS was constituted in 2004 by the then United Progressive Alliance (UPA) government to investigate and report on the conditions of the informal sector. It estimates that in 2004-05, the unorganised sector<sup>5</sup> contributed about half of the GDP (NCEUS 2008: Table 2), and that unorganised workers<sup>6</sup> comprised 92% of the total workforce (NCEUS 2007: 1). It uses a consumption threshold of Rs 20 per person per day and estimates that in 2004-05, as high as about

77% of India (rural and urban, NCEUS 2007: Table 1.2 and p 1) fell below this threshold. The number of these “poor and vulnerable” has actually steadily increased: 732 million in 1993-94, 811 million in 1999-2000, and 836 million in 2004-05, although their proportion in the population has steadily declined. It is worth pointing out here that the number of poor (and not just the percentage of poor) is relevant if we want to budget for and target the poor; therefore, an increase in the number of poor has important implications.

The Planning Commission (2012: Tables 2, 3), using the Tendulkar Committee’s poverty lines, documents that the urban HCR declined from 25.4% (814.1 million people) in 2004-05 to 20.9% (764.7 million people) in 2009-10, but no one takes these estimates seriously.

Essentially, we will have to wait for the recommendations of the latest committee for a consensus to emerge on the extent of urban poverty and the number of urban poor.

However, the above controversies do not distract from some basic trends, correlates and mechanisms; we discuss these below. One can use the distribution of consumption expenditure for various socio-economic groups and experiment with various poverty lines to examine which of these groups has a higher prevalence of poverty. Motiram and Naraparaju (2012) do so<sup>7</sup> using data from the 61st (2004-05) and 66th (2009-10) rounds of the NSS consumption expenditure survey, and find a clear pattern for caste and occupational groups. Among caste groups in urban areas, poverty is highest among the scheduled castes (SCs), followed by the Other Backward Classes (OBCs), scheduled tribes (STs), and others. Among occupational groups, urban poverty is highest among those involved in casual labour, followed by the self-employed. Apart from caste and occupation, other interesting dimensions have also been explored, for example, the size of the city and migrant status. Dubey et al (2001) use NSS data to show that for all occupational groups, the incidence of poverty declines with city size, that is, the larger the city or town, the lower is the incidence of poverty (a finding also supported by Hashim 2009 and Kundu and Sarangi 2007). They argue that this could be due to better economic and social infrastructure in larger cities – while the former contributes through better opportunities, the latter does so through transfers. Migration status has also been found to be negatively associated with urban poverty. Using NSS data, Kundu and Sarangi (2007) show that migrants have a lower likelihood of being poor as compared to the non-poor, although there are differences among migrants, with rural-urban migrants displaying a higher likelihood compared to urban-urban migrants.

No discussion of urban poverty and urbanisation is complete without a reference to slums. Data from slums are present in the census, NSS and NFHS. Gupta et al (2009) use NFHS data for 2005-06 to examine eight large cities.<sup>8</sup> They define the poor in relative terms, as those falling in the lowest quartile of a wealth index. Defined this way, poverty varies from 7% in Mumbai to 20% in Nagpur. They find that the percentage of slum-dwellers varies across cities and depends upon the definition of a slum – whether it is designated a slum in the 2001

Census, or by the NFHS enumerator. Using the census definition, the variation is from 56.9% in Mumbai to 17.4% in Hyderabad, whereas using the NFHS, it varies from 57.4% in Mumbai to 2.8% in Indore. As expected, the prevalence of poor is much higher in slums as compared to non-slums (except in Indore) by both the above definitions; for example, according to the census, 41.7% of slum-dwellers in Delhi are poor, whereas the corresponding figure for non-slum-dwellers is 5%. However, there is a substantial percentage of poor in non-slum areas, too, for example, 14.7% in Nagpur.

#### [Urban Inequality after Economic Reforms](#)

A discussion of poverty is not complete without referring to inequality or relative deprivation, broadly speaking. In the literature on inequality, a distinction has been made between two different kinds of inequality – interpersonal (or vertical) inequality and

horizontal inequality (among subgroups of the population). Motiram and Vakulabharanam (2012) present an overview of the relevant literature and changes in both vertical and horizontal inequality in nominal consumption expenditure since the 1990s, based upon the 50th (1993-94), 61st (2004-05) and 66th (2009-10) rounds of the NSS consumption expenditure survey. They show that interpersonal inequality has displayed a steadily rising trend in urban areas – the urban Gini index has increased from 34.4% in 1993-94 to 37.6% in 2004-05, and then to 39.3% in 2009-10. This is also true for most of the states – they have witnessed an increase in urban inequality (as measured by the Gini index) during the period 1993-94 to 2009-10.

When it comes to horizontal inequality, there are several subgroups that can be considered, for example, caste, class, state/region and sector – rural/urban. One way to understand changes in horizontal inequality is to decompose the overall inequality into “between” and “within” components using an inequality measure that belongs to the single-parameter entropy family of inequality measures (for example, Theil). An increase in the share contributed by the between component can be interpreted as an increase in inequality among subgroups. Motiram and Vakulabharanam (2012) show that at the all-India level, rural-urban inequality and inequality among states have increased since 1993-94. Vakulabharanam (2012) decomposes the Gini index using the Yitzhaki (1994) methodology (which yields an overlapping component in addition to the between and within components) to show that class-based inequality (that is, inequality among classes) has increased since the 1980s. While the Indian growth experience in the 1980s was not inequality inducing, it has become sharply inequality inducing since the 1990s.

The story of the divergence of urban elites (owners, managers and professionals) from urban workers as well as the rural population comes across clearly from the 1980s itself. In fact, the urban elite, constituting about 10-15% of the total population in the country, has monopolised almost the entire relative gains after the economic reforms. Using the NSS All-India Debt and Investment Survey, Jayadev et al (2011) show that during 1991-2002, the median *wealth* of the urban elite was much higher and grew faster compared to that of the middle classes and manual workers. All this brings out the story of an emerging urban enclave in class terms, which indicates an extremely skewed and unequal growth. On caste, using the same survey, Z acharias and Vakulabharanam (2011) show that urban SCs are at the bottom of the urban wealth ladder, with urban STs having a marginally higher median wealth, followed by the OBCs and non-Hindus. The so-called “forward caste” Hindus are almost like an urban wealth enclave too, and overlap little with the other caste groups. Starting from a low wealth base, the urban SCs have registered a higher growth rate in median wealth compared to the other groups (especially the urban STs).

While studies using the statistical approaches discussed above have been insightful in providing broad and nationally representative trends, these insights come with certain limitations. They have scarcely provided clues as to why urban poverty persists and why/how people in urban areas move in and out of poverty (more on this below). Moreover, they have been somewhat silent on the larger structural and historical forces

that help us understand and locate urban poverty, inequality and exclusionary processes. Studies that have used qualitative approaches have been more illuminating in this regard, and we turn to them next.

### [Qualitative and Conceptual Approaches](#)

It is hard to provide a synthesis of the qualitative and conceptual approaches because of the presence of considerable heterogeneity. Examining the myriad studies that define this literature, we can discern disciplinary differences, differences in epistemology, and in scope. Given this, what we aim to do below is select representative studies that provide insights into the living and working conditions of the urban poor, and the processes of exclusion operating in Indian cities.

#### **How Do the Urban Poor Live and Work?**

From the above discussion, it is clear that the urban poor are disproportionately concentrated in casual labour and among the self-employed. Most of these are in the “informal sector”, a term coined by anthropologist Keith Hart in his 1973 study of Ghana to describe a variety of occupations taken up by people in cities in developing countries. Since its first use, this term has been deployed widely and this sector studied extensively. In a series of works based upon an intensive study of the state of Gujarat over a long period of time, Jan Breman (1996, 1999, 2010, particularly Chapter 1) provides several insights into the functioning of the informal sector in urban India. We draw upon these works below.

He argues that there is a considerable number and proportion of labourers who “circulate” between rural and urban areas, working when they are employed in the informal sector and returning to their villages otherwise. The extent of this phenomenon, which can be described as “footloose” or “nomadic” labour, is seriously underestimated in national surveys (for example, the NSS), which have provided a fixity of residence for the respondents.<sup>9</sup> These labourers are drawn from backward communities and lack land, education, or social networks. Poverty persists among them because they cannot find sustainable livelihoods in the agrarian economy, and their temporary status does not allow them to find a foothold in the urban economy. Interestingly, the process of circulation is not completely a function of demand and supply, and is sometimes a deliberate strategy on the part of employers to gain access to a pliable workforce, which also serves the purpose of disciplining the local labour. Since the conditions of this group (for example, the costs that they incur) are not adequately captured, one consequence of the above is that poverty may be underestimated using the NSS surveys.

Supplementing Breman’s work, Gidwani and Sivaramakrishnan (2003) argue that the standard marginalist (used in neoclassical economics) and Marxian narratives of migration are reductionist and economicistic. The authors bring in larger concerns of space, culture, politics and labour mobility to argue that the logic of circulation or circular migration is governed also (and sometimes mainly) by non-economic considerations, which can arise out of counter-hegemonic politics as well. They emphasise the role of agency and the subjectivity of the migrants, who may use consumption or labour deployment as ways of countering certain oppressive cultural or political processes in their places of origin.

The informalisation and circulation of labour have to be understood in the context of a larger intellectual discourse (for example, on the part of the World Bank) supporting these processes, and viewing labour mobility in a positive light. The difficult living conditions of informal workers are a result of certain major failures on the part of the Indian state, which, unlike states in the west, did not provide adequate (cooperative) housing for the workers (Breman 2010: Chapter 1). Since the early waves of migration induced by industrialisation (particularly in cities like Mumbai) began in the colonial period, this has to also be located in the context of the particular regime of colonialism that India witnessed, and the relationship between the colonial state and its “subjects”.<sup>10</sup>

Other features of the informal sector, which are not wellknown, have also been highlighted in the works of Breman and in some other studies. The informal sector is not homogeneous, but differentiated by the presence of a hierarchy of jobs. Moreover, contrary to received wisdom, the purpose of the informal sector is not a temporary one, providing respite to migrants who could use it to move to better jobs in the formal sector. It also does not have an infinite absorptive capacity and is actually characterised by unemployment and underemployment, phenomena that are not well understood. The informal and formal sectors are actually locked together and interact with each other in complex ways (also see Guha-Khasnabis et al 2006); therefore, the dualistic framework which has hitherto been the dominant paradigm informing both policymakers and scholars is simplistic.

The complexity and internal differentiation of the informal sector is confirmed by several field-based studies, which have focused on particular occupations and sectors. These have also provided valuable insights into the conditions under which informal workers live and work. We focus on two of these occupations – scrap/waste picking and street vending. There is extensive literature on the former, for example Furedy (1984), Chikarmane and Narayan (2000) and Chikarmane (2010). Chikarmane and Narayan (2000) document the different layers that characterise this industry – waste pickers, itinerant buyers and scrap dealers, with the waste pickers at the bottom of the hierarchy. While the waste pickers are mostly female, the itinerant buyers are mostly male. There are particular caste groups that enter this trade, and given this, a patronal but exploitative arrangement is formed between the traders and itinerant buyers/waste pickers. This industry also illustrates the fact that for the people involved in low-skilled occupations, there may be hardly any mobility and escape from poverty. Most people involved in waste picking spend their whole lives in this activity – starting as children and continuing till they become physically incapacitated.

Unlike waste picking, street vending has not received much scholarly attention (Sood 2011), despite being the ubiquitous and prominent face of the informal sector and providing livelihood to more than a crore individuals (EPW 2007). However, there are some recent scholarly studies that one can draw upon, for example Anjaria (2006); Kalhan (2007); and Bhowmik (2010). A study of street vending provides a good illustration of the relationship of the informal sector vis-à-vis the state and the urban elite/middle classes. The state tries to regulate street vending and views it as a source of revenue, while on the ground, it is predatory and rent-seeking (extracting bribes). The affluent urban elite view street vendors as a nuisance and an eyesore, obstacles in the path of Indian cities moving on to “world class” status. The less affluent middle classes take an ambivalent view, seeing vendors as a

source of cheap bargains while at the same time sharing the above attitudes. The withdrawal of the state and the wave of decentralisation in recent times have created a space for elite non-governmental organisations (NGOs) and residential welfare associations, which have been able to promote the above ideas and attitudes with some success – Bhan (2009) is another example in this regard. He shows how “slum clearance” and “slum evictions” have increased dramatically in Delhi since the turn of the (21st) century. One of the important differences between these evictions and those of the past is that the former have been carried out at the behest of courts, which have themselves ruled in favour of non-poor resident welfare and trade associations.

It is well known that many people in the urban informal sector, particularly the migrants, live in slums. In his path-breaking work, Davis (2006) provides further insights into the process of slum formation, the growth of the informal sector, and the growth of cities in general. A few findings from his study are worth pointing out. In India, in contrast to China, it is the medium-sized – and not the larger – cities that have seen enormous growth. Moreover, in larger cities (for example Mumbai) growth has proceeded concomitantly with deindustrialisation. Across the developing world (including India), an important contributor to this growth is migration from the countryside; however, the countryside is itself becoming urbanised while sending migrants to the cities. Several field-based studies have also provided further insights into slum conditions and the question of how poor households, particularly in slums, could get trapped in poverty. Banerjee (2000), based on a study from Delhi and Mumbai, argues that many slum children are not in school due to the inadequacies of the schooling system, rather than the economic backgrounds of their families. Kumar and Agarwal (2003), based on evidence from Delhi, documents the surprising finding of considerable inequality within slums, for example between men and women, and among migrants from various states.

#### [Urban Growth, Rising Inequality and Processes of Exclusion](#)

Sanyal (2007) makes a few general arguments about postcolonial capitalism that are applicable to the urban development in India as well. His main argument is that postcolonial capitalism operates on a twin trajectory of creating a space of capital that functions on the one hand with the dynamics of capitalism (as thinkers like Marx have described it), and on the other, creates a “need economy” for all those not incorporated into the domain of capital. The relation between these two is not one of annihilation, but one of exclusion, primitive accumulation, and at the same time a reversal of primitive accumulation through what Sanyal refers to as “developmental governmentality”. Applied to the urban, the fast-growing urban formal sector can coexist with a large informal sector that caters to the need economy of the majority of the workforce (“the dispossessed and the outcasts”). In this process, the formal/ capitalist sector could dispossess the informal continuously at the same time as it transfers some of its surpluses to renew the informal/need economy. This complex interaction precludes a larger narrative of historical transition in favour of an understanding that shows how capital itself constantly reinforces a non-capitalist space to ensure its own continued survival. While Sanyal’s description of the urban process as one that simultaneously includes a select minority and excludes the large majority is insightful, it

simplifies the relations between the two into one that is only mediated through developmentalist welfarism and dispossession. In reality, the so-called excluded are on the fringes of the formal economy – subsidising it and feeding various cheap inputs to it, while being periodically dispossessed by it. Sanyal's insights, along with the logic of circular migration (described above), which shows how the informal workers participate and leave the circuits of capital using their agency (or due to structural factors), may provide a better framework to explain how the urban process is unfolding in India. Also, if we take the insights offered by the work on "waste" and its circulation in Indian cities, the solid boundary that Sanyal draws between the world of capital and the world of need/subsistence becomes far more porous. Despite this, Sanyal's arguments throw considerable light on the inequality inducing growth processes that have characterised urban development in India over the last two decades.

Other studies, too, have provided insights into the complex processes of exclusion and inclusion occurring in India today. For example, Gooptu (2011) focuses on the process of reimagining cities as entrepreneurial and dynamic, and as keys to the future growth of India. This results in a contradictory set of tendencies. On the one hand, it leads to elite and middle class revolt against the poor and to their distrust of politics (particularly electoral politics), which they see as disruptive of the developmental process and one that allows the poor to be "vote banks". On the other hand, there is also a realisation that the poor have to be "included" in the growth process, which is done in two ways – as entrepreneurs and as stakeholders. The former is accomplished through NGO, international donor and state-sponsored schemes like self-help groups, microfinance, and so forth. The latter has gone along with decentralisation (the 74th amendment, which empowers local bodies), and the poor have been incorporated through local institutions and projects, for example, Ward Committees, Slum Works Maintenance Committees. The net effect of these contradictory tendencies has been that while inequality has grown and the poor are still vulnerable, their dissent is muted, lacking overt political mobilisation.

Harriss (2006) examines a different source of exclusion in modern India by focusing on "civil society" activism, which has grown in recent times. He draws upon survey-based and ethnographic evidence from Delhi, Mumbai and Chennai to throw light on the tensions and conflicts between the middle classes and the informal working classes. The middle classes dominate civil society activism, and those belonging to the informal sector are largely excluded from it. To the extent that participation in civil society organisations contributes to political participation, this is a mechanism through which political inequality is accentuated. The one exception to this trend is struggles over women's rights, livelihoods and housing. In these movements, women belonging to informal, working-class households are also active. However, housing and livelihood are issues over which the middle classes and working classes come into conflict. Middle-class apathy has also been used to explain why the sanitary conditions under which many of the urban poor in Indian cities live are appalling. Chaplin (1999) argues that the Indian middle classes (having monopolised the basic services provided by the state) have little incentive to support moves to improve sanitary conditions in general, since compared to the poor, they are largely protected from ill health resulting

from poor sanitation. Moreover, there is inadequate pressure “from below”, in contrast to mid-19th century Britain, where there was considerable organised trade union pressure.<sup>11</sup> While we have discussed exclusionary processes occurring on the basis of class and caste, some studies have focused on religion, particularly on the status of Muslims. In a recent study combining statistical data with ethnography (Jaffrelot and Gaynor 2012),<sup>12</sup> several scholars studied the conditions of Muslims in 10 Indian cities.<sup>13</sup> Muslims (along with Parsis and Jews) are the most urbanised community in India, although more than half of them live in seven states. Their urban poverty levels are much higher than their rural poverty levels, and are also higher than the urban poverty levels of the Hindus. As pointed out by the Sachar Committee, compared to the national average, urban Muslims are substantially under-represented in the formal sector. The marginalisation of Muslims can be located in a historical context – with the advent of British colonialism, partition, and the loss of the princely states. In recent times, an important contributing factor has been the rise of Hindu nationalism and the concomitant rise in communal violence. Repeated bouts of communal violence have resulted in ghettoisation in some cities (for example, Ahmedabad), and spatial segregation. Ghettoisation has taken a particular form, wherein despite other differences (for example class and caste), Muslims have begun to stay in the same locality, insulated from the rest of the city, a locality where the state services (schools, roads, etc) are very poor. Paradoxically, given that Muslims belonging to different socio-economic strata are resident in the same locality, the poor in these ghettos are better off compared to poor Muslims living in cities (Mumbai, for instance) where the Muslim elite and middle classes do not interact with them. Muslims are better off in the south and the east, compared to their compatriots in the west and the north.

### Discussion and Conclusions

What is the composite picture of distributional changes in urban India that we get from the quantitative and qualitative approaches? First, on the question of urban poverty (along any single dimension like consumption or income), the evidence from quantitative approaches is not adequate to come to any consensus in answering even simple questions, like: How many people are poor in urban settlements in India? What has been the trend/rate of poverty? What is the pace of poverty reduction over time? To a large extent, the blame can be laid on the Planning Commission and successive committees, which have been unable and/or unwilling to adopt a set of coherent and defensible norms in fixing the poverty line. The Indian situation is not unique in this regard; the World Bank has created considerable controversy and confusion through its international poverty lines (\$1 per day, \$2 per day, etc; see the contributions in UNDP 2004).

This is not the place to go into details, but one good way out of this mess is to adopt a capability-based approach (although it is difficult to implement) by fixing the threshold (that is, poverty line) at a level such that people above this threshold can afford some basic capabilities (for example, housing, shelter, food) – a proposal conceptually similar to the one made by Reddy (2004; also see Pogge and Reddy 2003) in the debate on international poverty lines. We suspect that if such an approach is adopted, the poverty levels in India will be much higher than what the official figures have hitherto told us (since the official

poverty lines have been kept artificially low). We also expect this approach to result in rates of poverty reduction that are lower than the corresponding official rates. Also, although there are some conceptual and operational issues that need resolution, it may be worth moving beyond analyses of urban poverty along a single dimension (for instance, consumption) and strengthening the tradition of multidimensional analyses in the Indian context.<sup>14</sup>

Due to a paucity of nationally representative panel data, it has not been possible to rigorously understand how/why people move in and out of poverty, and the mechanisms through which urban poverty persists and is reproduced.<sup>15</sup> However, we have some evidence showing that access to credit, education and family characteristics<sup>16</sup> play an important role.

Second, the evidence on inequality is much clearer from quantitative approaches (although there is an understatement of the levels of inequality). Since the advent of economic reforms, the fast-paced growth in India has become intertwined with rising inequality, primarily driven by the increasing urban inequality and rising gap between urban and rural areas. Within urban spaces, there has been a rapid increase in the gap between urban elites and urban workers (formal and informal), and this rise in class inequality is the basis for the increasing urban inequality. In the past two decades, as Indian growth has become centrally constituted by the Indian urban process, the rural populations (particularly agricultural populations, who have been unevenly affected by a nationwide agrarian crisis since the late 1990s) have been left behind, giving rise to the growing urban-rural gap.

The qualitative approaches on urban poverty and inequality add valuable insights to this picture, by showing how the specifically urban dynamics that Indian growth has unleashed have affected the livelihoods of the urban poor and their inclusion in the growth process. By focusing both on the nature of working groups and their dynamics, these approaches point to the need for a correction in our understanding, sourced from the estimates of large-scale surveys. It is clear that urban poverty levels probably run much deeper and are chronic by nature, given the kind of occupational continuities and the low valuation of the labour that the working poor in cities (especially in the informal sector) are forced to perform. It is also probably true that the poor perceive their condition in myriad ways, some of which are different from those of “experts” and policymakers.<sup>17</sup> The qualitative and conceptual work on inequality has delineated the deeper processes at stake, such as postcolonial capitalist dynamics, or the nature of the entrepreneurial and neo-liberal city, or the nature of middle class civil society activism, or exclusion and segregation based on caste or religion, which have shaped urbanisation and its iniquitous tendencies in the recent Indian experience. Studies that have combined quantitative and qualitative approaches in analysing poverty have provided richer and counter-intuitive insights. For example, Baud et al (2008) combine census data with geographic information systems techniques to map multidimensional urban poverty at the ward level for the city of Delhi. They explore the spatial concentration of poverty and the association between voting patterns and poverty levels. An interesting finding from their study is that areas of serious concerns (“hotspots”) are not concentrated in slums – this is in contrast to the findings from NFHS that we described above.

## Way Forward

In this paper, we have attempted to collate the various insights into urban poverty and inequality in India from separate quantitative and qualitative studies, and a few composite works. We strongly believe that combining these approaches in a more organic manner will produce better insights. There have been earlier attempts to bring these approaches together. An early attempt to do so produced inconclusive conversations between economists and anthropologists (Bardhan 1989).<sup>18</sup> Another consistent effort has been by the “Q-Squared” group (see, for example, the special issue of *World Development* (2007; 35, 2; and Addison et al 2009). This expression refers to the combining of quantitative and qualitative methods (hence the “squared”) in the understanding of poverty, carried out by a group of scholars from various social sciences (economics, sociology, anthropology, etc). They have achieved modest success while working through the serious tensions that conversations between these approaches generate. Some scholars associated with this group (Kanbur and Shaffer 2007) have argued that these tensions could arise at a very fundamental level, such as on the epistemological plane or at the level of normative theory in analysing poverty. Beall et al (2012) argue for a multidisciplinary approach in understanding urbanisation, on the basis that economists have tended to focus more on density (agglomeration effects) and dynamics (migration), while the other social scientists have focused more on diversity and heterogeneity in discussing politics, culture, social relations, change, and so forth.

While some progress has been made through these initiatives, the common problem facing all these efforts is that the disciplinary divide is really powerful and disabling where conversations are concerned. Future efforts will have to move from multidisciplinary efforts to interdisciplinary initiatives, a distinction emphasised by Harriss (2002), which we find insightful.<sup>19</sup> It is important to proceed with composite concepts, categories and approaches at the point of analysing the field, rather than trying to set up conversations at a later stage.

Given the strong influence of positivism in quantitative approaches, and the multiple and fragmented epistemological approaches that populate critical qualitative studies, the best that a post facto conversation can achieve is the small concessions that the two sides of this divide will make for each other.<sup>20</sup> Instead, it should be admitted at the outset that both quantitative and qualitative methodologies ought to be integrated (indeed, it is apparent that both are needed in any meaningful research) in studies on urban (or rural) poverty and inequality. Apart from the descriptions and characterisations that define this field currently, there should be an attempt to examine causal structures that blend various levels of being – the spatio-temporal nature of global capitalist dynamics, national political and economic regimes, and the local aspects of political economy and culture.

We believe that this will invariably produce a multiplicity of such conceptualisations (which also combine quantitative and qualitative methodologies) and there can then be a debate between these composite approaches, rather than going ahead with the current unproductive divide between quantitative and qualitative approaches. Quantitative scholars will have to move out of their comfort zone of observing/analysing the world through large

databases, to analysing the field through an expanded conceptual apparatus that grapples with the logic of power structures on the ground, and their role in producing different regimes and dynamics of poverty and inequality. Qualitative scholars should better attempt to integrate analyses of microcontexts with the larger structures in which they are located. Quantitative forays by these scholars towards understanding micro or macro structures (without attaching any necessary “objectivity” to numbers considered absent in other kinds of material by traditional quantitative scholars) may help reduce the intense fragmentation characterising their discussions. Movements of the above kind, coupled with a willingness to start from a set of composite research practices on the part of both may produce better conversations in the future. This might also go a long way in making sense of the mechanisms through which constructions of just and equitable urban spaces are being thwarted in India, and elsewhere

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## Urbanization and Economic Development in India

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### Introduction

In developing countries of the world the focus of attention remains in the rural sector but the haphazard growth of cities has brought in its train several problems like deterioration in housing and public health facilities, not to speak of the growing crime rate. Urbanization is a process of population increase in urban area following some non-agricultural activities. The percentage of urban population to the total population of a country reveals the level of urban population growth. Higher is this percentage; greater is the level of urbanization and *vice versa*. Similarly, the per capita income is a clear indicator of the level of economic development achieved by a nation. A country which is highly developed therefore enjoys a very high per capita income and this brings a high standard of living for its people. The economic development of a region always leads to greater urbanization. A high standard of living always leads to greater demand for goods and services. The need for greater production results in mechanization, division of labour, specialization of jobs and large scaled production. In short, economic development induces further urbanization through industrial development. It can even be stated that the extent of industrialization acts as a common indicator in understanding the level of economic development and urban growth achieved by the economy. In this way, urbanization becomes a part and parcel of economic development.

This should be understood from the fact that in recent times, with the development of our economy, there has also been an increase in the number of people living in urban areas from 2.58 crores in 1901 to 10.90 crores in 1971, 22 crores in 1991, 28.36 crores in 2001 and 37.70 crores in 2011 for India as a whole. Only 30 percent of India's population lives in urban areas. Level of urbanization increased from 27.81% in 2001 census to 31.16% in 2011 census.

#### [Data Base and Research Methodology](#)

The present research is based on secondary collected through various secondary data sources. The necessary secondary data has been collected from the sources relative reference books, journals and other information regarding to the study was collected from economic survey of India and socio economic survey of India. **Objective of the Study**

This paper endeavours to illuminate on the process of urbanization in India with emphasis on level, tempo of urbanization and urban morphology using Indian Census data. In this paper researcher has tried to trace pattern of urbanization, urban problems and related policy issues.

#### [Urbanization and Economic Development](#)

The effect of economic development on urbanization is always positive in the sense that it always results in greater urbanization, the reverse is not always true in the case of India. This Chapter tries to analyze the positive and negative impact of urbanization on the economic development of our country. The growth of small and medium sized urban centres always leads to expansion of existing facilities. This is reflected in the improvement in transport, communication, housing, education, employment facilities, trade and commerce, civic amenities, etc. These improvements induce the 'pull factors' in attracting immigrants towards these regions. The population shows an upward trend. Correspondingly the demand for goods and services increases. The need for a greater supply of commodities and services to meet the increasing demand encourages investment activity in the economy. The multiplier effect becomes significant. This result in more opportunities for greater investment and the pull factors become dominant and the region continues to attract more and more immigrants. In such a situation, urbanization acts as a stimulant in furthering economic growth.

However, such a situation cannot continue for ever. After a particular stage, which one may call the optimum, the negative effect of urbanization on economic development starts operating. The optimum level can be stated to be that level where the burden on civic finance as a result of huge inflow of immigrants just equalizes the beneficial results of urbanization. The optimum, in a way, shows that the civic finance can do only that much and no more with regard to the provision of all the necessary amenities to the public up to the

level of optimum. Though the burden on the civic finances for providing the basic amenities to the public increases. Undoubtedly, this happens due to immigration. The greater burden under such circumstances is confidently met by the administrative machinery because of high level of industrialization and greater taxable capacity of the people. At this stage, urbanization does not contribute to further economic development.

### Effect of Urbanization

This situation only serves as a warning signal for the negative effect of urbanization. Sooner or later, the downward trend starts exhibiting all the evils of over-urbanization. With the gaining momentum of full factors, the administrative machinery finds it burdensome to maintain the quality and quantity of public utilities and other amenities to the people. As the inflow of people towards these regions increases, the administrative machinery becomes less capable of meeting the additional requirements of the people and to maintain the desirable standard in the case of all civic amenities. This is the situation one comes across in big metropolitan cities like Calcutta in India. Over-urbanization in such a metropolitan cities reflects all the evils like housing problem, water scarcity, lack of medical aid, employment problem, spread of slums, increase in the number of beggars, lot of pavement dwellers, higher crime rate, atmospheric pollution and so on. This affects the economic development in two ways. Firstly, the rural migrant who comes to the metropolitan city with the hope of getting a decent job is disillusioned once he realizes the situation there. Having left his village in search of a job, he does not like to go back with a feeling of defeat. He struggles hard to find a job. Sometimes, he fails in his attempt and becomes one among the jobless and houseless poor. Even when he gets a job, it may not be to his satisfaction and may not be equivalent to his qualification. Poverty, lack of job satisfaction, under-employment, lack of proper accommodation and other minimum comforts of life become the root cause of frustration. With this anticipation about the outcome of over urbanization, the administrative machinery is compelled to change the pattern of expenditure. The primary concern of the administration becomes the provision of basic civic amenities and other requirements to the people and the multiplier starts working in the reverse direction. Urbanization, beyond optimum level, acts as an impediment for further economic development. The optimum level of urbanization depends upon the capacity of the region in providing all the amenities to the public in a fair manner. Greater capacity always raises the level of optimum and a lower of optimum is an indication of lesser monetary fiscal, administrative and other capacities of the administrative machinery. The following factors are responsible for this trend. The first factor relates to the attitude of the migrant. The migrant in most cases desires to move towards a big metropolitan city, ignoring all small and medium-sized towns and cities, because of the desire to

live in a well known metropolitan city. The natural outcome is the over crowding in these big cities. This is evident from the data available. It can even be pointed out that urban growth in India has been mostly due to the urbanization of very few big cities. For example, Calcutta, has a population of 108 lakhs as on 1991 and has reached 132.17 lakh in 2001. The corresponding figure for the year 1991 was 108 lakhs. This is followed by Greater Mumbai, Delhi, Chennai, Bangalore, Hyderabad, Ahmedabad, Kanpur, Pune, Nagpur, Lucknow and Jaipur. In 2001 Mumbai has reached a population of 196 lakhs which is the primate city of India.

#### [\*\*The growth of small and medium sized towns and cities\*\*](#)

The growth of small and medium sized towns and cities is not quite significant. In fact, there has been a degeneration of smaller towns. The period from 1901 to 1991, there has been a decrease in the number of Class V and VI towns. Partly, this may be due to the tendency of the smaller towns to go up to the higher classes. Still, the fact remains that the smaller and medium sized towns and cities are not given their due importance in our development programmes. The other factors responsible for such a situation relates to the lack of proper planning of the towns and cities in India. It is even said that many cities and towns in India are nothing but overgrown villages. Further, the investment decisions are biased by other considerations rather than favourable economic factors. The third factor which is of no less importance relates to the tremendous increase in population. The 1947 census shows that the population of India has 350 million and in 2001 population has increased to 1.02 billion and further 2011 population show that 1.21. billion. Though the percentage of growth has been more or less steady, there has been an absolute increase in the total population. This is mainly due to improved medical aid, lower death rate, increased life expectancy, etc. The birth rate has actually declined from 29 per thousand in 1991 to 24.28 in 2001 and 20.97 in 2011. The death rate however decreased from 13 per thousand in 1991 ,8.74 in 2001 and 7.48 in 2011. The life expectancy has increased from 62 years in 1991, 61.97 in 2001 and 64.8 in 2009. The density of population as a result of absolute increase in population has risen to 274 in 1991 people per square kilometer, 324 people in 2001 and 382 people in 2011. All these have led to over crowding everywhere.

On the other hand, the supply of land cannot be enhanced; the additional labour force in rural areas as a result of the population increase cannot be absorbed in agriculture. The surplus labour force will have to engage in occupations other than agriculture and in the absence of sufficient non-agricultural occupations in the villages the villager has to turn towards the city for a job. If urbanization has to induce further economic development, then the present trend should be reversed and measures which will improve the situation have to be undertaken. They include: (i) Rural development programmes which reduce the rural-urban dichotomy and minimize the push

and pull factors leading to over-urbanization of a few cities. This will also lead to balanced regional development which is necessary for achieving a high level of economic development for any nation; (ii) Proper planning of towns and cities, particularly relating to the land utilization pattern, industrial development, educational development, cultural and civic amenities development; (iii) Development of smaller and medium sized towns and cities for diverting the attention of the migrant towards these places; and (iv) Further efforts should be taken to reduce the birth rate in a significant manner through various methods of family planning have been enforced.

### Conclusion

The economic development of India requires economic growth. Cities are engines of growth because there is a bi-directional link between urbanization and growth. Great progress has been made in developing the framework for reform linked investment in urban infrastructure. As per population projection in 2026, level of urbanization will be different in various states. India's future urban strategy should recognize these differences and plan accordingly. To improve urban governance and delivery of services there should be constitutional amendments as well administrative actions. Most importantly, inter-government transfers should have built-in incentives to improve performance and capacity building should be an important component of the future urban program.

### Policy Implication:

Redirection of investment is recommended to develop strong economic base for small and

Medium city neglected so far. Redirection of migration flows is required. Since the mega cities have reached saturation level for employment generation and to avoid over-crowding into the over congested slums of mega cities i.e Bombay, Calcutta, Delhi, Madras etc it is required to build strong economic sector (Kundu and Basu,1998) in the urban economy, growth efforts and investments should be directed towards small cities which have been neglected so far so that functional base of urban economy is strengthened. Then redirection of migration to these desirable destinations will be possible.

Policy should also relate to proper urban planning where city planning will consist of operational , developmental and restorative planning .Operational planning should take care of improvement of urban infrastructure, e.g roads, traffic, transport etc. Developmental planning should emphasize on development of newly annexed urban areas. Various urban renewal processes can be used. Restorative planning should aim to restore original status of old building monuments which have historic value.

In general urban planning must aim at :

- a) Balanced regional and urban planning (Mukherji, 2001)
- b) Development of strong economic base for urban economy
- c) Integration of rural and urban (Kundu, Sarangi and Dash, 2003) economy-- emphasis on Agro-based industry.
- d) Raw material should be processed in rural economy and then transferred to urban economy.
- e) Urban planning and housing for slum people with human face.

## UNIT -3<sup>rd</sup>

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### **Occupational Structure in India: An Overview**

- 1. Economic Development of Occupational Structure**
- 2. Occupational Distribution of Population**
- 3. Factors Responsible for Failure.**

### **Economic Development of Occupational Structure:**

Economic development creates various types of occupations in an economy. All these various occupations can be broadly classified into three categories, viz., primary, secondary and tertiary. The primary occupations include all those essential activities such as agriculture and allied activities like animal husbandry, forestry, fishery, poultry farming etc.

Secondary activities include manufacturing industries composed of both large and small scale and mining. Tertiary activities include all other activities like transport, communication, banking, insurance, trade etc. The occupational structure indicated the distribution as well as absorption of population into these various types of occupations.

In underdeveloped countries, majority of the population are still engaged in agriculture and other primary activities. Even in some developed countries like Japan, England, Norway fishing continues to be an important occupation, providing employment to a substantial number of populations.

Development experience shows that with the gradual development of a backward economy, the importance of primary occupations gradually declines with the growth of industries and tertiary activities. In the secondary sector, large scale industries, being more capital-intensive cannot provide much employment opportunities.

But it is the development of small scale and cottage industries, mining activities etc., being largely labour-intensive, can provide huge number of employment opportunities.

Again the tertiary occupations are also considered very important as these have a huge employment potential. In developed countries, the absorption capacity of this sector is very high. According to World Development Report, 1983, whereas about 45 to 66 per cent of the work force of developed countries was employed in the tertiary sector but India could absorb only 18 per cent of total force in this sector.

Changes in occupational structure are very much associated with economic development. The rate of economic development and the level of per capita income increase as more and more work force shifts from primary sector to secondary and tertiary sector.

As A.G.B. Fisher writes, “**We may say that in every progressive economy there has been a steady shift of employment and investment from the essential ‘Primary activities’..... to secondary activities of all kinds and to a still greater extent into tertiary production.**”

While putting importance on the change in occupational structure, Colin Clark observes, “**A high average level of real income per head is always associated with a high proportion of working population engaged in tertiary industries low real income per head is always associated with a low proportion of the working population engaged in**

## **tertiary production and a high percentage in primary production.”**

Thus to attain a high rate of economic development inter-sectoral transfer of work force is very much necessary. This would be possible only when productivity of agriculture increases due to introduction of improved technology in it.

The increase in productivity in agriculture transfers surplus work force from agriculture to other sectors. The extent and pace of inter-sectoral transfer of work force depend very much on the rate of increase in productivity in the primary sector in relation to other sectors.

## **Occupational Distribution of Population in India:**

Occupational distribution of population reflects on the degree of development and the diversification achieved in an economy. Let us now turn our discussion on the occupational structure of India. The occupational structure of India clearly reflects a high degree of backwardness prevailing in Indian economy.

Since the turn of the present century the occupational structure in India was tilted towards the primary sector. Over the last 80 years (1901-1981), the proportion of working force engaged in primary occupations remained very steady, i.e., around 70 per cent and that in secondary and tertiary sector was ranging between 28 to 30 per cent only.

Let us now make a detailed study on the occupation structure of India during this long 100-years period.

### **Occupational Structure during 1901-1951:**

During the first half of the present century, occupational distribution of population in India did not report any appreciable change. Agriculture occupied the dominant position and its absorption capacity had increased marginally from 66.9 per cent in 1901 to 69.7 per cent in 1951.

The commercial policy of the British had paved the way for the introduction of British machine-made goods in Indian market leading to destruction of traditional Indian handicrafts. This forced the labourers of this household

industry to engage themselves in agricultural operations for earning their livelihood.

All these led to a marked increase in the proportion of landless agricultural labourers to total labour force from 17 per cent in 1901 to nearly 20 per cent in 1951. The percentage of population engaged in other allied activities like forestry, livestock, fishery etc. declined from 4.3 per cent in 1901 to only 2.3 per cent of the total work force in 1951.

During this period, industrial activity was very much restricted to plantation and textile industry and was also supported by imported machinery resulting limited backward linkage effects and lack of diffusion of spread effect of industrialisation. Thus this process of industrialisation had created a very little impact on the generation of employment opportunities.

On this industrialisation issue, Priyatosh Maitra rightly observed, “**In Indian experience employment multiplier seems to be small and, therefore, occupational structure remained almost static..... Limited employment horizons, resulting from a process of industrialisation devoid of ‘built-in technological process’ effects, strengthen the hold of production techniques with built-in under employment.**

Moreover,’ the depressed and overcrowded agriculture could not offer a significant portion of marketable surplus which could raise the demand for industrial goods and the tertiary sector could not increase its absorption capacity significantly.

However, T. Krishnamurty wrote, “Between 1901 and 1951 factory employment expanded partly at the expense of non-factory sectors, the modern branches grew at the cost of a number of traditional ones; and manufacturing output per head increased. While the share of transport, storage and communications rose, for the other branches of services trends are unclear.

Many services associated with modernisation under colonial rule expanded, in particular, public, educational, medical and legal services.”

## ***Occupational Structure during 1951-2000:***

After independence and especially after the introduction of planning in India, attempt was made by the planning to accelerate the process of industrialisation and also to change the occupational structure by transferring a section of working force from agriculture to secondary and tertiary sector

Accordingly, the Second Plan observed, “By 1975-76, the proportion of agricultural labour force to the total should come down to 60 per cent or so. But for this to happen something like a fourfold increase in the numbers engaged in mining and factory establishment has to be brought about, and the investment pattern in the plans has to be adjusted to these requirements.”

Just to fulfill these requirements it was necessary to increase the agricultural productivity through adoption of modern technology for meeting food and raw material requirements of the developing economy. It was also necessary to reduce the dependence on agriculture by generating alternative employment opportunities in the rural areas.

All these technological changes in agriculture along-with land reforms measures were introduced in India in order to increase agricultural production and productivity and to transfer surplus labour force from agricultural sector to secondary and tertiary sector.

On the other hand, to change the occupational structure in India, importance of designing a suitable employment policy was felt. With the introduction of planning, a considerable increase in employment opportunities was expected.

The planned economic development anticipated a rapid progress in the expansion of irrigation, power, basic industries, other manufacturing and household industries and the expansion of tertiary activities in the service sector like expansion of trade, banking, insurance, transportation and communication etc. But after two decades of planning occupational structure in India could not show any remarkable change.

Although both secondary and tertiary sector expanded and their absorption capacity also increased substantially but the rate of increase in employment opportunities fell far short of rate of increase in the labour force.

Moreover, another important condition for realising the change in occupational structure, viz., a significant increase in agricultural productivity

could not be fulfilled. Again the allied activities of the primary sector and development of village industries could not make much headway in engaging the surplus population from the agricultural sector. All these led to growing pressure of population on agricultural sector and resulted in widespread disguised unemployment in rural areas.

Considering this situation, the Planning Commission in its Fifth Plan document mentioned, “**At the present pace of industrialisation any mass-scale transfer of the labour force from agriculture to non-agriculture sectors is ruled out. The growing labour force in agriculture has to be provided with fuller employment within agriculture.”**

Thus, Table 6.11 shows that during the period 1951-71, the proportion of work force engaged in the primary sector remained constant at 72.1 per cent. In spite of heavy investment made on manufacturing and service sector during these two decades of planning the absorption capacity of secondary and tertiary sectors jointly remained the same at 28 per cent of the total work force.

**TABLE 6.11. Occupational Distribution of Working Population in India**  
(*Per cent*)

	1901	1951	1961	1971	1981*	1991	2000
<b>A. Primary Sector (1 + 2 + 3)</b>	<b>71.8</b>	<b>72.1</b>	<b>71.8</b>	<b>72.1</b>	<b>68.8</b>	<b>66.8</b>	<b>56.7</b>
1. Cultivator	50.6	50.0	52.8	43.4	41.6	38.4	
2. Agricultural Labourers	16.9	19.7	16.7	26.3	24.9	26.4	
3. Livestock, forestry, fishing etc.	4.3	2.4	2.3	2.4	2.3	1.9	
<b>B. Secondary Sector (4 + 5 + 6)</b>	<b>12.6</b>	<b>10.6</b>	<b>12.2</b>	<b>11.2</b>	<b>13.5</b>	<b>12.7</b>	<b>17.5</b>
4. Mining and quarrying	0.1	0.6	0.5	0.5	0.6	0.6	0.7
5. Manufacturing	11.7	9.0	10.6	9.5	11.3	10.2	12.4
6. Construction	0.8	1.0	1.1	1.2	1.6	1.9	
<b>C. Tertiary Sector (7 + 8 + 9)</b>	<b>15.6</b>	<b>17.3</b>	<b>16.0</b>	<b>16.7</b>	<b>17.7</b>	<b>20.5</b>	<b>25.8</b>
7. Trade and Commerce	6.0	5.3	4.0	5.6	6.2	7.5	11.1
8. Transport, Storage and Communications	1.1	1.5	1.6	2.4	2.7	2.8	4.1
9. Other services	8.5	10.5	10.4	8.7	8.8	10.2	10.6
<b>Total</b>	<b>100.0</b>						

Again during the next 1971-2000 period, the proportion of work force engaged in the primary sector declined marginally to 56.7 per cent. Another noticeable change that was recorded was that the proportion of cultivators declined from 50 per cent in 1951 to 38.4 per cent in 1991 and that of agricultural labourers increased from 20 per cent to 26 per cent during the same period.

This shows the growing concentration of land in the hands of rich and well-to-do farmers and the transformation of small and marginal farmers into landless agricultural labourers. Moreover, the proportion of work force engaged in the secondary sector increased marginally from 11.2 per cent to 17.5 per cent during the 1971-2000 period and that of engaged in tertiary sector increased slightly from 16.7 per cent to 25.8 per cent during the same period.

The absorption capacity of both the secondary and tertiary sector jointly increased from 28 per cent to 43.3 per cent during this 1971-2000 period.

Again the World Development Report, 1995 shows that in 1993, the percentages of work force, both wages and non-wages engaged in agriculture, industry and services were to the extent of 63.2 per cent, 14.2 per cent and 22.6 per cent respectively.

Considering the earlier mentioned position we can conclude that there was virtually no clear shift of working population from primary sector to secondary and tertiary sectors. Thus the planning process in India has totally failed to bring any change in its occupational structure.

## **Factors Responsible for Failure of Occupational Structure:**

1. Indian planners failed to make any serious attempt for the development of rural economy for utilizing the vast idle labour force and also to raise the productivity of labourers. Due to poor organisation, the programmes of reducing unemployment and under-employment problem in the rural areas failed miserably.

Moreover, planners did not make any serious attempt to enlarge the scope of non-agricultural rural employment.

2. Land reforms in India failed miserably to realise its goal and to create small owner holding. These reforms could not diffuse the ownership of land among a large number of marginal cultivators.

3. Various other facilities provided by the Government such as cheaper credit, marketing, subsidy on fertilizer price etc. only benefitted rich farmers and poor and marginal farmers could not reap any benefit from these facilities leading to a failure in raising their agricultural productivity.

4. Efforts of the planners to develop industries helped the large scale capital goods sector and the plans could not create much response to the development of small scale and cottage industries. This development of large scale highly capital-intensive industries could not create much employment potential and thus created no impact on the occupational structure of the country.

5. The high rate of growth of labour force is also an important factor which has been creating serious drags on the path of changing the occupational structure in India. This fast growing labour force without getting any subsidiary occupation open to them in the rural areas stated to eke out their living from agricultural sector alone.

This led to a huge dependence as well as a high degree of disguised unemployment in the agricultural sectors.

Thus under this present situation occupational structure in India can be amended suitable only when the country will start to develop its labour-intensive sectors that include small scale and cottage industries, allied activities in the primary sector such as animal husbandry, fishing, poultry farming etc. and the service sectors as well as so to foster the growth of non-agricultural employment side by side with modern large scale industrial sector.

Development of this huge labour-intensive sector will raise the level of employment and income both in the rural and urban areas leading to an enlargement of aggregate demand for various goods and services produced by large scale industries.

Thus the development of this labour intensive sector will be able to bring changes in the occupational distribution of population from agricultural to non-agricultural occupations and will also be able to support the large scale manufacturing sector by enlarging the demand for their products and while doing so they can save these large scale industries from recession.

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## **Unemployment in India**

**In this essay we will discuss about Unemployment in India. After reading this essay you will learn about:** 1. Meaning of Unemployment in India 2. Nature of Unemployment Problem in India 3. Extent 4. Causes 5. Remedial Measures 6. Characteristics 7. Employment Policy and Schemes 8. Growth of Employment and Others.

### **Unemployment in India Content:**

1. Meaning of Unemployment in India
  2. Nature of Unemployment Problem in India
  3. Extent of Unemployment
  4. Causes of Unemployment Problem in India
  5. Remedial Measures to Solve Unemployment Problem in India
  6. Characteristics of Employment Problem Followed in India – Its Critical Evaluation
  7. Employment Policy and Schemes in India
  8. Growth of Employment in India in Recent Years
  9. Is the New Economic Policy promoting Jobless Growth ?
  10. Global Economic Recession and its Impact on Unemployment Problem in India
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### **Essay # 1. Meaning of Unemployment in India:**

Unemployment is a common economic malady faced by each and every country of the world, irrespective of their economic system and the level of development achieved. But the nature of unemployment prevailing in underdeveloped or developing countries sharply differs to that of developed countries of the world.

While the developed countries are facing unemployment, mostly of Keynesian involuntary and frictional types but the underdeveloped or developing

countries like India are facing structural unemployment arising from high rate of growth of population and slow economic growth.

Structural unemployment may be open or disguised type. But the most serious type of unemployment from which those undeveloped countries like India are suffering includes its huge underemployment or disguised unemployment in the rural sector.

Unemployment is a serious problem. It indicates a situation where the total number of job vacancies is much less than the total number of job seekers in the country. It is a kind of situation where the unemployed persons do not find any meaningful or gainful job in-spite of having willingness and capacity to work. Thus unemployment leads to a huge wastage of manpower resources.

India is one of those ill-fated underdeveloped countries which is suffering from a huge unemployment problem. But the unemployment problem in India is not the result of deficiency of effective demand in Keynesian term but a product of shortage of capital equipment's and other complementary resources accompanied by high rate of growth of population.

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## **Essay # 2. Nature of Unemployment Problem in India:**

Present unemployment problem in India is mostly structural in nature.

### **Unemployment problem of the country can now be broadly classified into:**

- (a) Rural unemployment and
- (b) Urban unemployment.

#### ***(a) Rural Unemployment:***

In India the incidence of unemployment is more pronounced in the rural areas.

#### **Rural unemployment is again of two types:**

- (i) Seasonal unemployment and

(ii) Disguised or perennial unemployment.

### **(i) Seasonal Unemployment:**

Agriculture, though a principal occupation in the rural areas of the country, is seasonal in nature. It cannot provide work to the rural population of the country throughout the year. In the absence of multiple cropping system and subsidiary occupation in the rural areas, a large number of rural population has to sit idle 5 to 7-months in a year.

Seasonal Unemployment is also prevalent in some agro- based industries viz., Tea Industry, Jute Mills, Sugar Mills, Oil Pressing Mills, Paddy Husking Mills etc.

### **(ii) Disguised or Perennial Unemployment:**

Indian agriculture is also suffering from disguised or perennial unemployment due to excessive pressure of population. In disguised unemployment apparently it seems that everyone is employed but in reality sufficient full time work is not available for all.

In India, about 72 per cent of the working population is engaged in agriculture and allied activities. In 1951 more than 100 million persons were engaged in the agricultural and allied activities whereas in 1991 about 160 million persons are found engaged in the same sector resulting in as many as 60 million surplus population who are left with virtually no work in agriculture and allied activities.

### ***(b) Urban Unemployment:***

#### **Urban unemployment has two aspects:**

(i) Industrial unemployment and

(ii) Educated or middle class unemployment.

### **(i) Industrial Unemployment:**

In the urban areas of the country, industrial unemployment is gradually becoming acute. With the increase in the size of urban population and with the exodus of population in large number from rural to the urban industrial areas to seek employment, industrialization because of slow growth could not provide sufficient employment opportunities to the growing number of urban population.

Thus the rate of growth of employment in the industrial sector could not keep pace with the growth of urban industrial workers leading to a huge industrial unemployment in the country.

### **(ii) Educated or middle-class Unemployment:**

Another distinct type of unemployment which is mostly common in almost all the urban areas of the country is known as educated unemployment. This problem is very much acute among the middle class people. With rapid expansion of general education in the country the number of out-turn of educated people is increasing day by day

But due to slow growth of technical and vocational educational facilities, a huge number of manpower is unnecessarily diverted towards general education leading to a peculiar educated unemployment problem in the country. The total number of educated unemployment increased from 5.9 lakh in 1962 to 230.50 lakh in 1994.

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### **Essay # 3. Extent of Unemployment:**

In view of the growing problem of unemployment and under-employment prevailing in the country it is very difficult to make an estimate of the total number of unemployment in a country like India. As per the statement of the then Labour and Employment Minister in the Parliament, there was about 35 million unemployed person's in-spite of 42.5 million new jobs created during 1951 and 1969.

Various agencies like Planning Commission, CSO, NSS etc. could not provide any dependable estimate about the magnitude of unemployment in India. As per the estimates of unemployment made in the Five Year Plan the backlog of unemployment which was 5.3 million at the end of First Plan gradually increased to 7.1 million, 9.6 million and then to 23 million at the end of Second, Third and Three Annual Plans respectively.

The number of unemployed as percentage of total labour force which was 2.9 per cent at the end of the First Plan gradually increased to 9.6 per cent at the end of Annual Plans

The Committee of Experts on Unemployment under the Chairmanship of Mr. B. Bhagawati observed in its report (1973) that total number of unemployed in 1971 was 18.7 million out of which 16.1 million unemployed were in rural areas and the rest 2.6 million existed in urban areas. Moreover, unemployment as percentage of total labour force was to the extent of 10.9 per cent in 1971 for the whole country.

As per the Employment data, the number of registered job seekers in India rose from 18.33 lakh in 1961 to 165.8 lakh in 1981 and then to 370.0 lakh at the end of March 1994. Total number of educated job seekers has also increased from 5.90 lakh in 1961 to 230.0 lakh in the end of March 1994, which constituted nearly 62 per cent of the total job seekers of the country.

At the end of January 1996, total number of registered job seekers in India was 368.9 lakh. As on 1st April, 1997, total number of unemployed persons in India was 7.5 million. The International Labour Organisation (ILO) report World Employment 1995 observed that 22 per cent of all male workers in India are underemployed or unemployed and the figure is rising.

The employment in the modern sector in India grew only by 1.6 per cent per annum in 1980s, Underemployment in the rural areas also remained high.

The National Sample Survey Organisation (NSSO) developed three concepts of unemployment since 1972-73.

**These were:**

- (i) Usual Status Unemployment,
- (ii) Weekly Status Unemployment and
- (iii) Daily Status Unemployment.

The magnitude to usual status unemployment (chronic unemployment) rose from 1.4 million in 1961 to 7.1 million in 1978.

The Planning Commission's estimates of usual unemployment revealed that the usual status unemployment at the age-group 5+ increased from 12.02 million in 1980 to 13.89 million in March, 1985. The total employment at the beginning of 1992-93 was estimated to be 301.7 million on a "weekly status" basis, and the labour force was estimated to be 319 million.

Again as per the NSS tentative estimates of unemployment for April 1990, the usual status and daily status unemployment were 3.77 per cent and 6.09 per cent respectively of the total work force in 1987-88. By adjusting these estimates, Arun Ghosh estimated the backlog of unemployment in April 1990 as—13 million of usual status and 20 million of daily status.

At the end of each Five Year Plan, the backlog of unemployment in India has been increasing as the volume of employment generated cannot match this additional number of labour included in work force. As per document of the Sixth Plan (1980-85), total number of unemployed was 20.7 million in 1980 which represents 7.74 per cent of the total labour force.

Ninth Plan (1997-2002) estimated the total backlog of unemployment as 36.8 million in 1996. Thus a huge portion of our national resources has been constantly used for the generation of employment opportunities so as to clear the backlog of unemployment arising from rapidly rising population.

By looking at a different angle, it is found that India's population presently stands at 104 crore and increasing by nearly 1.6 crore per year. It is generally estimated that nearly 50 per cent of the total population of the country requires employment although in many countries like China, Thailand etc. 55 per cent of total population is normally employed.

So, taking the employment ratio of 50 per cent, the employment requirement of India is 52 crore which is again increasing by nearly 80 lakh per annum as the population is growing by 1.6 crore annually. As per official estimate, total employment in the country was 41 crore in 1999-2000 and it grew by at the rate of 41 lakh annually, during the period 1994-2000.

This official employment figure is somewhat inflated as it included disguised unemployment existing in rural areas of the country. But the level of unemployment existing at present is around 10 crore and that unemployment figure is again increasing by nearly 40 lakh per year due to our increasing size of population.

In view of the centrality of the employment objective in the overall process of socio-economic development as also to ensure availability of work opportunities in sufficient numbers, a special group on targeting ten million employment per year over the Tenth Plan period was constituted by Planning

Commission under the Chairmanship of Dr. S.P. Gupta, Member, Planning Commission.

Considering the need for generating employment opportunities which are gainful, the Special Group has recommended the use of Current Daily Status (CDS) for measuring employment, as this measure of employment is net of the varying degrees of underemployment experienced by those who are otherwise classified employed on usual status basis.

The Special Group has made following estimate of employment and unemployment in India on current daily status (CDS) basis.

Table 12.4 reveals that the Export Group estimates has shown a decline in the rate of growth of population (from 2.0 to 1.95 per cent), labour force (from 2.43 to 1.31 per cent) and work force (from 2.70 to 1.07 per cent) during the period 1983-94 to 1994-2000.

But unemployment rate in the country during the period 1993-94 to 1999-2000 increased from 5.99 per cent to 7.32 per cent although the overall growth performance of the economy has been better in recent times than the previous decade (1983-94).

During the same period, the unemployment rate in rural areas of the country increased from 5.61 per cent to 7.21 per cent and the same unemployment rate in urban areas of the country also increased from 7.19 per cent to 7.65 per cent.

Total number of unemployed also increased from 20.13 million in 1993-94 to 26.58 million in 1999- 2000 out of which the rural and urban number of unemployed stood at 19.50 million and 7.11 million respectively in 1999-2000.

**TABLE 12.4. Past and Present Macro-Scenario on Employment and Unemployment (CDS Basis)**  
 (Person Years)

Heads	Numbers (Million)			Growth per annum (%)	
	1983	1993-94	1999-2000	1983 to 1993-94	1993-94 to 1999-2000
<b>All India</b>					
1. Population	718.20	894.01	1003.97	2.00	1.95
2. Labour Force	261.33	335.97	363.33	2.43	1.31
3. Work Force	239.57	315.84	336.75	2.70	1.07
4. Unemployment Rate (%)	(8.30)	(5.99)	(7.32)		
5. No. of Unemployed	21.76	20.13	26.58	- 0.08	4.74
<b>Rural</b>					
1. Population	546.61	658.13	727.50	1.79	1.67
2. Labour Force	204.18	255.38	270.39	2.15	0.96
3. Work Force	187.92	241.04	250.89	2.40	0.67
4. Unemployment Rate (%)	(7.96)	(5.61)	(7.21)		
5. No. of Unemployed	16.26	14.34	19.50	-1.19	5.26
<b>Urban</b>					
1. Population	171.59	234.98	276.47	3.04	2.74
2. Labour Force	57.15	80.60	92.95	3.33	2.40.
3. Work Force	51.64	74.80	85.84	3.59	2.32
4. Unemployment Rate (%)	(9.64)	(7.19)	(7.65)		
5. No. of Unemployed	5.51	5.80	7.11	0.49	3.45

*Source :* Planning Commission as reproduced in Economic Survey, 2002-03, p. 218.

Finally, as per the data available from 939 employment exchanges in the country, the number of job seekers registered with employment exchanges as on September, 2002 (all of whom are not necessarily unemployed) was of the order of 4.16 crore out of which approximately 70 per cent are educated (up to 10th standard and above).

The number of women job seekers registered was of the order of 1.08 crore (26 per cent of the total job seekers). The maximum number of job seekers awaiting employment were in West Bengal (63.6 lakh), while the minimum were in the UT of Dadra & Nagar Haveli (0.06 lakh) and in the state of Arunachal Pradesh (0.2 lakh).

The placement was maximum in Gujarat whereas the registration was maximum in U.P. The placement effected by the employment exchanges at all India level during 2001 was of the order of 1.69 lakh as against 3.04 lakh vacancies notified during this period.

The National Sample Survey Organisation (NSSO), as per one of its recent surveys made in 2003 observed that the proportionate unemployment rate in India at present stands at 2.0 per cent of the total population and around 3.0 per cent of the total work force of the country.

## *Findings of NSS Survey 61st Round (2004-05):*

The latest and seventh quinquennial NSSO, Survey, namely 61st round conducted during July 2004 to June 2005 constituted an important source of information on employment and unemployment. The 61st round of NSSO survey revealed a faster increase in employment during 1999-2000 to 2004-05 as compared to 1993-94 to 1999-2000. Table 12.5 has clarified the position in this regard.

It would now be better to look at the current estimates of employment and unemployment in the country made by Planning Commission. In the meantime, the Eleventh Five year Plan has largely used the Current Daily Status (CDS) basis of estimation of employment and unemployment in the country.

It has also been observed that the estimates based on daily status are the most inclusive rate of 'unemployment' giving the average level of unemployment on a day during the survey year.

It captures the unemployed days of the chronically unemployed, the unemployed days of usually employed who became intermittently unemployed during the reference week and unemployed days of those classified as employed according to the criterion of current weekly status. Table 12.5(a) shows the estimates of employment and unemployment on CDS basis.

**TABLE 12.5 (a). Employment and Unemployment in million person years (by CDS basis)**

	Number (Million) 1983	Number (Million) 1993-94	Number (Million) 1999-00	Number (Million) 2004-05	Growth p.a. (%)		
					1983 to 1993-94	1993-94 to 1999-00	1999-00 to 2004-05
Population	718.10	893.68	1005.05	1092.83	2.11	1.98	1.69
Labour Force	263.82	334.20	364.88	419.65	2.28	1.47	2.84
Workforce	239.49	313.93	338.19	384.91	2.61	1.25	2.62
Unemployment Rate (per cent)	9.22	6.06	7.31	8.28			
No. of unemployed	24.34	20.27	26.68	34.74			

*Source :* Various rounds of NSSO survey on employment and unemployment/Planning Commission.

Table 12.5(a) reveals the trend in respect of population as well as labour force and workforce since 1983 to 2004-05 and the resultant difference between these two figures also shows the number of unemployed in different periods. With the increase in the population of the country, the number of labour force is increasing faster than the number of work force resulting growing number of unemployment in the country.

In 1983, total number of labour force in India was 263.82 million, total number of work force was 239.49 million and the resultant number of unemployed was 24.33 million. In 2004-05, total labour force of the country was 419.65 million and total work force was 384.91 million and as a result total number of unemployed increased to 34.74 million in 2004-05.

However, the growth of labour force in per cent per annum increased from 2.28 per cent during the period 1983 to 1993-94 to 2.84 per cent during the period 1999-00 to 2004-05. But the growth of work force in per cent per annum increased from 2.61 per cent during the period 1983 to 1993-94 to 2.62 per cent during the period 1999-00 to 2004-05.

Moreover, the unemployment rate as a proportion of labour force decreased from 9.22 per cent in 1983 to 6.06 per cent in 1993-94 and then gradually increased to 8.28 per cent in 2004-05.

Estimates on employment and unemployment on CDS basis [Table 12.5(a)] indicate that employment growth during 1999-2000 to 2004-05 has accelerated significantly as compared to the growth witnessed during 1993-94 to 1999-2000. During 1999-2000 to 2004-05, about 47 million work opportunities were created compared to only 24 million in the period between 1993-94 and 1999-00.

Employment growth accelerated from 1.25 per cent per annum to 2.62 per cent per annum. However, since the labour force grew at a faster rate of 2.84 per cent than the workforce, unemployment rate also rose.

The incidence of unemployment on CDS basis increased from 7.31 per cent in 1999-00 to 8.28 per cent in 2004-05. It would also be better to look at the sectoral employment shares by current daily status in the country. Table 12.5(b) will clarify the position in this respect.

Table 12.5(b) reveals the sectoral employment shares of different sector of the country in recent years. The decline in overall growth of employment during 1993-94 to 1999-00 was largely due to the lower absorption in agriculture. The share of agriculture in total employment dropped from 61 per cent to 57 per cent.

This trend continued and the share of agriculture in total employment further dropped to 52 per cent in 2004-05.

While the manufacturing sector's share increased marginally during this period, trade, hotel and restaurant sector contributed significantly higher to the overall employment than in earlier years. The other important sectors whose shares in employment have increased are transport, storage and communications apart from financial, insurance, real estate, business and community, social and personal services [Table 12.5.(b)].

**TABLE 12.5(b). Sectoral Employment Shares by Current Daily Status (CDS Basis)**

Industry	1983	1993-94	1999-00	2004-05
Agriculture	65.42	61.03	56.64	52.06
Mining & Quarrying	0.66	0.78	0.67	0.63
Manufacturing	11.27	11.10	12.13	12.90
Electricity, water etc.	0.34	0.41	0.34	0.35
Construction	2.56	3.63	4.44	5.57
Trade, Hotel & Restaurant	6.98	8.26	11.20	12.62
Transport, Storage and Communication	2.88	3.22	4.06	4.61
Financial, Insurance, Real Estate, & Business Services	0.78	1.08	1.36	2.00
Comty., social & personal Services	9.10	10.50	9.16	9.24
Total	100.0	100.0	100.0	100.0

*Source :* Various rounds of NSSO survey on employment and unemployment/Planning Commission.

### *Extent of Farm Unemployment:*

A high degree of unemployment and underemployment prevails among the agricultural workers of the country. This farm or agricultural unemployment is prevailing in the form of seasonal unemployment, disguised unemployment and chronic and usual status unemployment.

To measure the extent of unemployment and underemployment is really a difficult task. As per the N.S.S. study the daily status rural unemployment rate in India was 5.25 per cent in 1987-88.

The Agricultural Labour Enquiry Committee Report (First and Second) revealed that in India agricultural labourers had 275 and 237 days of employment in 1950-61 and 1956-57 respectively. Considering the fall in the employment elasticity with reference to GDP for the agricultural sector during the 1970s and 1980s it can be guessed that the seasonal unemployment might have increased in recent years.

In respect of disguised unemployment various estimates have been made to determine the extent of surplus labour in India by Shakuntala Mehera, J.P. Bhattacharjee, Ashok Rudra, J.S. Uppal and others. Among these works, Shakuntala Mehera's work was quite well known.

She estimated that the extent of surplus work force in agriculture was 17.1 per cent during 1960s. Again on the basis of 32nd Round of the NSS, the Usual status of rural unemployment in March 1985 was estimated at 7.8 million and such unemployment was highest in the age-group of 15-29.

Recently, a study to estimate the extent of farm unemployment was conducted by Lucknow based Centre of Advanced Development Research (CADR). The report submitted by this centre in September 1992 revealed that a very high degree of unemployment or under-employment prevails among the 160 million Indians engaged in agriculture, either as cultivators or labourers.

It is found that these rural people do not get even the minimum work opportunity of 270 days a year, the average being only 180 days. This indicates that only 100 million people are sufficient to carry out the entire agricultural operations, including those of animal husbandry. Thus as many as 60 million people are at present left with virtually no work in agriculture and allied activities.

The study also highlighted the inter-state variation in agricultural labour absorption capacity. Among all the states, only in four states—Punjab, Haryana, Himachal Pradesh and Kerala—agriculture provides full work opportunities of 270 days of eight-hour duration to every worker.

But in states like Andhra Pradesh, Bihar and Tamil Nadu, employment in agriculture is available to less than 50 per cent of the workforce while Karnataka, Maharashtra and Uttar Pradesh too have inadequate labour absorption capacity in the rural areas.

The CADR estimated that the agricultural sector will be able to absorb only 120 million of the available 180 million people by the end of the present century provided the rate of labour replacement by mechanization is not accelerated.

The report revealed that most of the unemployed or underemployed people are concentrated in the states of Uttar Pradesh (104 lakh), Bihar (100 lakh), Andhra Pradesh (80 lakh) and Tamil Nadu (66 lakh).

### ***Extent of Urban Unemployment:***

In India urban unemployment has been recording a serious proportion from the very beginning. The estimates of urban unemployment were made by the

Planning Commission, the Central Statistical Organisation (CSO), Ministry of Labour and Employment and some individual economists like W. Malenbaum, R.C. Bhardwaj at different times.

Although these estimates are not comparable due to differences in concepts adopted, but these estimates provide some idea about the quantum of urban unemployment.

These reports revealed that during the first decade of planning the quantum of urban unemployment increased from 2.5 million in 1951 to 4.5 million in 1961, i.e., about 11.4 to 15.5 per cent of the working population remained unemployed. Again the extent of urban unemployment increased to 6.5 million in 1985 (as per NSS 32nd Round) and the rate of urban unemployment was 9.7 per cent.

### **This urban unemployment is mostly of two types:**

- (a) Industrial unemployment and
- (b) Educated unemployment.

In India due to growing industrial sickness in huge number of small scale industrial units and in some large scale units, the quantum of industrial unemployment has been increasing at an alarming rate. Moreover, the recent structural adjustments in industrial sector will also add a good number of unemployment to this category. However, the exact number of industrial unemployment in India is not available in the absence of proper data.

### ***Educated Unemployment:***

Educated unemployment in India which is contributing a significant portion of urban unemployment has been increasing at a very rapid scale. Total number of educated unemployment in India increased from 2.4 lakh in 1951 to 5.9 lakh in 1961 and then to 22.96 lakh in 1971.

Again the number of educated job seekers increased from 90.18 lakh in 1981 to 167.35 lakh in 1987 and then to 291.2 lakh in 2002 which constituted about 74 per cent of the total job seekers of the country.

### ***Unemployment Rates by Level of Education:***

NSSO data indicates that compared to 1993-94, unemployment rates for persons of higher education level has declined in rural areas both for males

and females in 1999-2000 and it has further declined in 2004-05 compared to 1999-2000.

Unemployment rate of graduate and above female population is much higher in rural areas than in urban areas which is indicative of lack of opportunities in rural India combined with lack of mobility of this population segment.

### ***Sluggish Employment Growth in Recent Times:***

In recent times, there is a slump in the rate of growth of employment. An important cause of concern is the declaration in the annual compound growth rate (CAGR) of employment during 2004-05 to 2011-12 to 0.5 per cent from 2.8 per cent during 1999-2000 to 2004-05 as against CAGRs of 2.9 per cent and 0.4 per cent respectively in the labour force for the same periods. Table 12.5(c) will clarify this situation.

Table 12.5(c) reveals that as per the National Sample Survey Office (NSSO) data during 1999-2000 to 2004-05, employment on usual states (US) basis increased by 59.9 million persons from 398.0 million to 457.9 million as against the increase in labour force by 62.0 million persons from 407.0 million to 469.0 million.

After a period of slow progress during 2004-05 to 2009-10, employment generation picked up during 2009-10 to 2011-12, adding 13.9 million persons to the workforce, but not keeping pace with the increase in labour force (14.9 million persons) as shown in the table.

Again, based on current daily status (CDS), CAGR in employment was 1.2 per cent and 2.6 per cent against 2.8 per cent and 0.8 per cent in the labour force respectively for the same periods.

**TABLE 12.5(c). Employment and Unemployment Scenario in India in recent years**

<i>Method</i>	<i>1999-2000</i>	<i>2004-05</i>	<i>2009-10</i>	<i>2011-12</i>
<b>Persons in the labour force (in millions)</b>				
US	407.0	469.0	468.8	483.7
CDS	363.3	417.2	428.9	440.4
<b>Persons and Person days employed (in millions)</b>				
US	398.0	457.9	459.0	472.9
CDS	336.9	382.8	400.8	415.7
<b>Unemployment Rate (in per cent)</b>				
US	2.2	2.3	2.0	2.2
CDS	7.3	8.2	6.6	5.6

*Source :* Various Survey rounds of the NSSO on employment and unemployment in India.

*Note :* US (principal + subsidiary) measures employment in person, CDS measures employment in person days.

However, the country has been experiencing structural changes in its employment pattern in recent times. Thus for the first time, the share of primary sector in total employment of the country dipped below the half way mark as its share declined from 58.5 per cent in 2004-05 to 48.9 per cent in 2011-12.

But the employment in the secondary and tertiary sectors increased to 24.3 per cent and 26.8 per cent respectively in 2011-12 as compared to 18.1 per cent and 23.4 per cent respectively attained in 2004-05. Moreover, self-employment continues to dominate by attaining 52.2 per cent share in total employment in the year 2011-12. But what is critical is the significant share of workers are engaged in low income generating activities.

Moreover, there are other issues of concern such as poor employment growth in rural areas, especially among females. Though employment of rural males is slightly better than that of females, long term trends indicate a low and stagnant growth. Such trends call for diversification of livelihood in rural areas from agricultural to non-agricultural activities.

Besides, a major impediment to the pace of quality employment generation in India is the small share of manufacturing in total employment. However, the data available, from 68th round of NSSO (2011-12) indicates a revival in employment growth in manufacturing from 11 per cent in 2009-10 to 12.6 per cent in 2011-12.

Moreover, the usual status (US) unemployment rate is generally regarded as the measure of chronic open unemployment during the reference year while

the current daily status (CDS) is considered as a comprehensive measure of unemployment, including both chronic and invisible unemployment. Thus, while chronic open unemployment rate in India hovers around a low 2 per cent, it is significant in absolute terms.

The number of unemployed people (under US) declined from 11.3 million during 2004-05 to 9.8 million in 2009-10 but again increased to 10.8 million in 2011-12. However, on the basis of CDS, the number of unemployed person days declined from 34.3 million in 2004-05 to 28.0 million in 2009-10 and further to 24.7 million in 2011-12.

It is also observed [from Table 12.5(c)] that there has been a significant reduction in chronic and invisible unemployment from 8.2 per cent in 2004-05 to 5.6 per cent in 2011-12. Expert feels that despite only a marginal growth in employment between 2009-10 and 2011-12, the main reason for the decline in unemployment levels could be that an increasing proportion of the young population opts for education rather than participating in the labour market. This is reflected from the fact that there is a rise in enrolment growth in higher education from 4.9 million in 1990-91 to 29.6 million in 2012-13.

### *Salient Features of the Trend of Unemployment Rates in India in Recent Years:*

#### **Following are some of the salient features of the trend of unemployment rates in India:**

- i. The unemployment rate went up between 1993-94 to 2004. On the basis of the current daily status (Unemployed on an average in the reference week) during the reference period unemployment rate for males increased from 5.6 per cent to 9.0 per cent in rural areas and from 6.7 per cent to 8.1 per cent in urban areas.
- ii. The unemployment rate for female increased from 5.6 per cent in 1993-94 to 9.4 per cent in 2004 in rural areas and from 10.5 per cent to 11.7 per cent in urban areas.
- iii. Furthermore, it is found that unemployment rates on the basis of current daily status were much higher than those on the basis of usual status (unemployed on an average in the reference year) implying a high degree of intermittent unemployment. This could be mainly because of the absence of regular employment for many workers.

- iv. Urban unemployment rates (current daily status) were higher than rural unemployment rates for both males and females in 1993-94. However, in 2004, rural unemployment rates for males were higher than that of urban males.
  - v. Unemployment rates varied sharply across states. States, where wages are higher than in higher growing ones because of strong bargain or social security provisions; such as high minimum wage, had high incidence of unemployment in general.
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## **Essay # 4. Causes of Unemployment Problem in India:**

Unemployment problem in India is the cumulative result of so many factors.

**The broad causes of unemployment problem are as follows:**

**(i) Population Explosion:**

The most fundamental cause of large scale unemployment in India is the high rate of population growth since the early 1950s and the consequent increase in its labour force. It was estimated that with the 2.5 per cent annual rate of population growth, nearly 4 million persons are added to the labour force every year. To provide gainful employment to such a big number is really a difficult task.

**(ii) Underdevelopment:**

Indian economy continues to be underdeveloped even as a vast quantity of unutilized and under utilised natural resources are prevailing in the country. The scale and volume of economic activities are still small. The non-agricultural sector especially modern industrial sector which could generate huge number of employment, is growing very slowly.

During the pre-independence period also, Indian economy experienced a slow growth. British destroyed the indigenous small scale and cottage industries instead of expanding and modernising them. During the post- independence period also, the performance of the industrial sector has also been found far below the plan targets and needs.

Moreover, the slow rate of capital formation is also responsible for the hindrances in the path of realisation of growth potential in agriculture, industry and infrastructure sector. Thus this underdevelopment is largely responsible for slow expansion of employment opportunities.

***(iii) Inadequate Employment Planning:***

In the first phase economic planning in India, employment opportunities could not be increased adequately and little has been done to utilise the Nurksian variety of labour surplus existing in the rural areas. Moreover, weak manpower planning is also another serious gap in Indian planning.

Less effort has been made for balancing the manpower needs and supplies in various production sectors, indifferent regions of the country and also indifferent skills.

This has resulted to large imbalances in the sphere of educated and trained personnel like engineers, technicians, cost accountants, plain graduates and post graduates, administrators etc. Thus huge amount of resources used for developing manpower could not come into much help due to faulty manpower planning.

***(iv) Slow Rate of Growth:***

In India the rate of growth of the economy is very poor and even the actual growth rate lies far below the targeted rate. Thus the increased employment opportunities created under the successive plans could not keep pace with the additions to the labour force taking place in the country every year leading to a huge and larger backlog of unemployment at the end of each plan.

***(v) Backwardness of the Agriculture:***

Heavy pressure of population on land and the primitive methods of agricultural operations are responsible for colossal rural unemployment and underemployment in the country.

***(vi) Insufficient Industrial Development:***

Industrial development in the country is not at all sufficient. Rather the prospects of industrial development has never been completely realised. Due to dearth of capital, lack of proper technology, scarcity of industrial raw materials, shortage of electricity and lack of labour intensive investment

industrial sector could not gain its momentum and also could not generate sufficient employment opportunities in the country.

#### *(vii) Prevailing Education System:*

The prevailing education system in India is full of defects as it fails to make any provision for imparting technical and vocational education. Huge number of matriculates, undergraduates and graduates are coming out every year leading to a increasing gap between job opportunities and job seekers among the educated middle class.

In the absence of vocational education and professional guidance, these huge number of educated youths cannot avail the scope of self-employment leading to growing frustration and discontent among the educated youths.

#### *(viii) Slow Growth of Employment during Economic Reforms:*

Finally, the current phase of economic reforms introduced in India has resulted jobless growth to some extent. Economic Reforms has resulted large scale retrenchment of surplus workers in different industries and administrative departments due to down-sizing of workers.

The annual growth rate of employment which was 2.40 per cent during the period 1983- 94, but the same rate declined to a mere 0.98 per cent during the period 1994-2000. As a result, the unemployment growth rates increased from 5.99 per cent in 1993-94 to 7.32 per cent in 1999-2000.

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### **Essay # 5. Remedial Measures to Solve Unemployment Problem In India:**

Unemployment problem is a serious problem faced by a large populous country like India. Thus it is quite appropriate to suggest some measures to solve this problem. In order to suggest appropriate measures to solve this problem, it is better to identify some measures separately for the problem of rural unemployment and urban unemployment.

#### **A. Remedies to Rural Unemployment Problem:**

As the nature of rural unemployment is quite different, it is better to suggest some special measures to solve this problem.

**Following are some of these measures:**

**(i) Expanding Volume of Rural Works:**

One of the most important remedial measures to solve the problem of unemployment is to expand the opportunities for work especially in rural areas. In order to clear the backlog of unemployment and also to provide jobs to additional labor force joining the mainstream workers, this expansion in the volume of works needs to be done rapidly and that too in the areas of both wage employment and self-employment.

As large scale industries cannot provide adequate employment opportunities thus more importance be given to the development of agriculture and the allied sector along with development of small scale and cottage industries and also the unorganised informal sector and the services sector.

**(ii) Modernisation of Agriculture:**

In order to eradicate the problem of rural unemployment, the agricultural sector of the country is to be modernized in almost all the states. This would derive considerable agricultural surplus which would ultimately boost the rural economy and also expand employment opportunities in the rural areas. Attempts should also be made for wasteland development and diversification of agricultural activities.

**(iii) Development of Allied Sector:**

The problem of rural unemployment can be tackled adequately by developing allied sector which includes activities like dairy farming, poultry farming, bee keeping, fishery, horticulture, sericulture, agro processing etc. which are having a huge potential for the generation of employment and self-employment opportunities in the rural areas of the country.

**(iv) Development of Rural Non-Farm Activities:**

In order to generate employment opportunities in the rural areas, development of rural non-farm activities, viz., rural industries, the decentralised and cottage small scale sector of industry, agro-based industry, rural informal sector and the services sector, expansion of rural infrastructure, housing, health and educational services in the rural areas etc. should be undertaken throughout the country with active government support. Since Eighth Plan, the Government is following this strategy for the generation of rural employment.

**(v) Appropriate mix of Production Techniques:**

Although Mahalanobis strategy of development argued in favour of capital intensive techniques but in order to tackle the problem of rural unemployment the government should adopt an appropriate mix of production techniques where both the labour intensive and capital intensive methods of production should be adopted selectively in the new fields of production so as to attain both growth in employment along with its efficiency.

**(vi) Rural Development Schemes:**

In order to eradicate the problem of rural unemployment, the Central as well as the State Governments should work seriously for introducing and implementing rural development schemes so that the benefit of such development could reach the target groups of people in time.

**(vii) Decentralisation:**

In order to reduce the extent of the problem of rural unemployment it would be quite important to spread the location of industries around the small towns on the basis of local endowment position so that migration of people from rural to urban areas can be checked.

**(viii) Extension of Social Services:**

It is also important to extend the social services in the rural areas in the sphere of education, medical science and in other areas which will go a long way for the empowerment of the rural people in general. Such a situation will indirectly motivate the people towards self-employment.

**(ix) Population Control:**

Adequate stress should be laid on the control of growth of population through family welfare programmes especially in the rural and backward areas of the country. This would be conducive for solving the growing problem of rural unemployment of the country as a whole.

**(x) SHGs and Micro Finance:**

Adequate steps be taken for promoting self help groups (SHGs) for generating self employment opportunities. In this respect, micro finance flow through NGOs towards SHGs can play a responsible role in solving the problem of rural unemployment.

## ***B. Remedies to Urban Unemployment Problem:***

In order to solve the problem of urban unemployment the country should follow certain important measures.

### **Following are some of these measures:**

#### **(i) Rapid Development of Industries:**

In order to solve the problem of urban unemployment, immediate steps must be taken for enhancing the industrial efficiency. In this regard, immediate attempts must be made for expansion and modernisation of existing industries in cost-effective manner and also for setting up of new industries.

Some basic and heavy industries which were already established in the field of iron and steel, chemicals, defence goods, heavy machineries, power generation, atomic energy etc. should be modernized and more such new industries should also set up in the new and existing fields for generating huge number of employment opportunities for the present and coming generations.

More new resource based and demand based industries should be set up for generating employment opportunities.

#### **(ii) Revamping Education System:**

Indian education system still largely remains very much backward and fails to meet the demand for present industries and administrative set up. Instead of giving too much stress on general education, stress should be laid on vocationalisation of education which would help the younger generation to involve themselves in small scale and cottage industries and also in the services sector.

#### **(iii) Motivation for Self-Employment:**

In order to change the mindset of younger generation, especially from urban areas, attempts must be made by both government and non-government agencies for motivating the young people to accept the path of self-employment in the contest of squeezing scope of employment through carrier counseling at the institutional level.

#### **(iv) Development of SSIs:**

Considering the huge number of unemployed, it is quite important to develop a good number of small scale and cottage industries by adopting labour-intensive approach. Developing such S.S.Is for the production of need-based

products would help a lot for generating huge employment opportunities in urban and semi-urban areas.

**(v) Development of Urban Informal Sector:**

As a good number urban people are engaged in urban informal sector, thus adequate steps must be taken for the improvement and modernisation of this informal sector so as to expand the sector further and also to generate more such employment opportunities for the growing number of urban unemployed person.

**(vi) Revamping the Role of Employment Exchange:**

In order to utilise the huge governmental set up of Employment Exchange throughout the country it is quite important to change the role of such exchanges for motivating and guiding the younger generations for self-employment in addition to its existing role for registration and placement.

**(vii) Banking Support:**

In order to solve the problem of urban unemployment, the scheduled commercial banks should come forward with rational proposals for the development of SSIs, various units in the services sector and also for the development of urban informal sector with a sympathetic attitude.

**(viii) Works of National Interest:**

In order to solve the problem of urban unemployment it is quite necessary to start the work of national interest which would generate adequate employment opportunities in the urban areas.

**(ix) Changing Pattern of Investment:**

Attempt should also be made to change the pattern of investment into a viable and productive one both from economic and social point of view so as to generate employment opportunities.

**(x) Government Support:**

In order to tackle the problem of urban unemployment, the government should come forward with viable urban employment generation schemes in the line of PMRY, NRY etc. to assist the urban unemployed for self-employment projects.

**(xi) Growing Participation of FDI:**

In order to tackle the problem of urban unemployment, the government should follow a suitable policy in the line of China for promoting the smooth flow of foreign direct investment (FDI) into our country for its growing participation in various important industrial and infrastructural projects.

### ***C. General Remedies to Unemployment Problems:***

#### **(i) Special Employment Programmes:**

In order to meet the gap between the requirement and the actual generation of employment opportunities, special employment programmes must be undertaken as an interim measure till the economy could reach the maturity level of securing jobs for everyone.

These kind of supplementary programmes are very important for the poor people residing in both rural and urban areas and also residing in small 8 medium towns.

Seasonally unemployed can also be offered seasonal employment through such special employment programmes. Moreover backward people like landless agricultural labourers, marginal formers, rural artisans, tribal people settled in remote and hilly areas can also be benefited from such programmes.

The programmes may be chalked out by providing direct wage employment as on rural capital works or in the form of providing assets or providing inputs to those people for self-employment. Currently, the steps taken by the government for the implementation of NREGA is a right step in this direction.

#### **(ii) Raising the Rate of Capital Formation:**

In order to reduce the problem of unemployment, in general, it is quite necessary to raise the rate of capital formation in the country. Raising the rate of Capital formation is necessary to expand the volume of work.

Capital formation can directly generate employment in the capital goods sector. Raising the capital formation helps the country to raise its capital-stock and thereby can raise the productivity of workers by raising the volume of capital available per workers.

#### **(iii) Manpower Planning:**

Management of human resources in a right and scientific manner is quite important for solving the problem of unemployment. This is important for ensuring promotion of employment scope as well as for realization of

development of the economy. All these call for proper manpower planning which requires the following measures.

Firstly, going beyond the narrow domain of manpower planning simply related to matching demand and supply of skilled personnel, it is quite important to adopt effective remedies to cut down the growth rate of population which in turn reduce the growth rate of labour supply after a gap of period and thereby reducing the problem of unemployment.

Secondly, in order to attain effective use of skills it is essential to tailor the supply of skilled labour as per the its requirement so that excess or shortages in skills in different sectors are not faced.

Thirdly, while continuing with present strategy to promote high level skill formation through education and Training confined to a small proportion of labour force, it is also essential to improve the capabilities of large number of general people for their development.

This calls for several inter-related measures like making provision for adequate food and nutrition, elementary education, proper health facilities, training for jobs etc.

Fourthly, while introducing special programmes for employment, it is quite essential to ensure that the programmes rightly matches the characteristics and abilities of targeted group and also match with the overall development plans of various sectors. This will definitely make schemes quite useful and meaningful.

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## **Essay # 6. Characteristics of Employment Policy Followed in India—Its Critical Evaluation:**

Since the inception of planning, the Government of India has been pursuing its employment policy for eliminating the problems of unemployment.

### **The following are of its broad characteristics:**

#### **(i) Multi-Faceted:**

As the unemployment problem in India is multi-dimensional thus the policy followed by the government to tackle this problem is multi-faceted our which constitutes many-sided approach. Thus the employment policy followed in

India constitutes many sub-policies to tackle various forms of unemployment including under employment.

### **(ii) Emphasis on Self-Employment:**

The employment policy of India has given due emphasis on self-employment as a small proportion of our labour force is engaged through wage employment and the majority (56 per cent) of the workforce is self-employed.

Thus the employment policy makes provision for training of skills, supply of inputs, marketing of products, extending loan etc. so as to make them self-employed in various activities, like agriculture and allied activities, village and small industries, non-farm activities and also in informal sector.

### **(iii) Emphasis on Productive Employment and Asset Creation:**

Employment policy of our country lays stress on creation of productive employment and also on creation of assets for the poor workers.

### **(iv) Employment Generation:**

With the growth of various sectors, the employment policy gave due stress on employment generation at a targeted growth rate fixed under different plans through different employment generation programmes like NREP, RLEGP, JRY etc.

### **(v) Special Employment Programmes:**

Employment policy of India has incorporated different special employment programmes both for rural and urban areas. These includes IRDP, TRYSEM, DWCRA, JGSY, JRY, EAS, AGSY, etc. for rural areas and PMRY, SJSRU, NRY etc. for urban areas.

### **(vi) Employment for the Educated:**

Employment policy has made provision for tackling the educated unemployment prevailing both in rural and urban areas through employment schemes related to processing, banking, trading, marketing etc.

### **(vii) Manpower Planning:**

The employment policy has taken certain measures for ensuring proper development of human resources and also through right deployment. Stress is given on attaining balancing of demand and supply of skilled manpower.

### *Critical Evaluation:*

It is important to make critical evaluation of the employment policy followed in India both in terms of achievements and failures. Undoubtedly some increase in employment has taken place in all the sectors of the country since 1951, more specially in recent times.

The average growth rate of employment per annum from 2.7 per cent during 1983-94 to 1.0 per cent during 1994-2000. During 1998-99 and 1999-2000, the overall growth rate of employment in the organised public and private sector remained negative.

Moreover a significant portion of the employment generated has been able to benefit the poor and weaker sections of the population and helped a number of them to reach above the poverty line.

However, improvement that has taken place on the employment front can be considered inadequate for the growing number of unemployed. The large number of people still lying below the poverty line is a pointer to such inadequacy. Even then it is quite important to point out some of the positive and negative aspects of the policy of employment followed by the government.

### *Positive Aspects of the Policy:*

Since the inception of planning, the broad perception of employment generation followed in our country has been found largely correct. The following four components of the employment policy usually favoured employment generation on a major scale. Firstly, since the second plan, our policy has been approaching to the long term perspective of full employment at higher incomes.

Development of modern industries along with capital goods industries including infrastructure would strengthen the economy and help reach high income employment at a later stage.

Secondly, provision has been made for the promotion of labour intensive small scale and cottage industries, Thirdly, considering the inadequate employment growth achieved through industrial activities, the policy devised special employment programmes for generating jobs work to rural and vulnerable sections of population. Fourthly, employment policy pursued in the country helped to attain self-employment of a faster rate than wage employment.

### ***Weaknesses of the Policy:***

However, the employment policy followed India is not free from faults. The faults are mostly related to its unsatisfactory implementation and inadequate employment orientation as discussed in the following manner.

Firstly, unsatisfactory implementation of the policy has been mostly related to long term slow growth of the economy, widespread industrial sickness and retrogression in growth in industrial sector since mid-sixties.

Moreover, it was also related to slow and poor execution of special employment programmes. Secondly, the faults in the employment policy are mostly related to inadequate attention to full employment except in the Ninth and Tenth Plan, where measures like too much emphasis on capital intensive investment and lesser emphasis on labour intensive investment, inadequate steps to absorb labour surpluses and inadequate arrangement for manpower planning educated and skilled personnel were taken.

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### **Essay # 7. Employment Policy and Schemes in India:**

Since the Third Five Year Plan, the Government of India launched certain special programmes for removing unemployment problem in the country. With that purpose, the Government of India, set up Bhagawati Committee to suggest measures for solving growing unemployment problem in the country.

The Bhagawati Committee submitted its report in 1973 and suggested various schemes like rural electrification, road building, rural housing and minor irrigation works. Accordingly, the Government undertook various programmes to generate employment opportunities and to alleviate under-employment prevailing in the country.

#### **These programmes were as follows:**

##### **(a) Rural Works Programmes:**

This programme was undertaken to generate employment opportunities for 2.5 million persons and also for the construction of civil works of a permanent nature. But this programme generated employment only to the extent of 4 lakh persons only.

**(b) Marginal Farmers and Agricultural Labourers Development Agencies (MFALDA):**

During the Fourth Plan this scheme was introduced for marginal farmers and agricultural labourers for assisting them with subsidized credit support for agricultural and subsidiary occupations like horticulture, dairy, poultry, fishery etc.

**(c) Small Farmers' Development Agencies (SFDA):**

This scheme was also introduced during the Fourth Plan with the object to provide small farmers credit so that they, could avail latest technology for intensive agriculture and also could diversify their activities.

**(d) Half-a million Job Programme:**

To tackle the problem of educated unemployment, a special programme—**"Half a million job programme"** was introduced. In 1973-74, provision of Rs 100 crore was made and different states and Union Territories were asked to formulate and implement this scheme for securing an employment opportunities for definite number of persons.

**(e) Job education for unemployed:**

In 1972-73, another programme for educated unemployed and for highly qualified engineers, technologists and scientists were prepared. Under this scheme, a sum of Rs 9.81 crore was allotted to the states which created 45,000 job opportunities for the educated persons.

**(f) Drought Area Programme:**

This programme was introduced for the economic development of certain vulnerable areas by organising productive and labour-intensive programmes like medium and minor irrigation, soil conservation, afforestation and road construction. During 1970-72, the government spent Rs 30.80 crore, generating employment about 4.70 million man-days and in 1972-73 by spending Rs 38.51 crore about 40 million man-days of employment was generated.

**(g) Crash programme for rural employment:**

This scheme was introduced in 1971-72 for generating additional employment through the introduction of various productive and labour-intensive rural projects.

The main objectives of these programmes were to provide employment to 100 persons on an average to each block over the working seasons of 10 months in every year and secondly to produce durable assets. But the various schemes introduced during the Fourth Plan could not succeed in solving the problem of rural unemployment and underemployment.

### ***Employment Policy in the Fifth Plan:***

The Fifth Plan document laid emphasis on the generation of employment in rural areas and aimed at absorbing the increments in the labour force during the plan period by stepping up rates of public investment.

### **(h) Food-For-Work-Scheme:**

This scheme was introduced in April 1977 for benefitting the rural poor and more particularly the landless agricultural labourers. Under this scheme, a part of wages those workers engaged in rural works was paid in terms of food grains. The Central Government supplied these food grains to the State Government free of charge. In this way off-season employments were made available to rural unemployed.

### ***Employment Policy in the Sixth Plan:***

The Sixth Plan in its Employment Policy admits, “In the field of employment the picture has been far from satisfactory. The number of unemployed and under-employed has risen significantly over the last decade. In the above context therefore our employment policy should cover two major goals: Reducing underemployment by increasing the rate of growth of the gainfully employed and reducing unemployment on the basis of usual status commonly known as open unemployment”.

### **(i) National Rural Employment Programme:**

In October, 1980, the NREP replaced the Food-for-work programme. In this programme State Governments received central assistance both in the form of food grains and cash for undertaking productive works in the rural areas.

During the Sixth Plan, total expenditure incurred by both the Central and State Government were of the order of Rs 1,837 crore and total food grains utilisation was 20.57 lakh tonnes. Total employment generation under this programme during the Sixth Plan was 1,775 million man-days.

During the Sixth Plan overall employment increased by 35.60 million standard person year (SPY) as against the target of 34.28 million SPY. During the Sixth

Plan the growth rate of employment was 4.32 per cent per annum. During the Sixth Plan other programmes like IRDP and RLEGP were introduced.

### ***Employment Policy in the Seventh Plan:***

During the Seventh Plan, the magnitude of employment requirement was worked out at 47.58 million. Accordingly, the Seventh Plan document mentioned: "It is expected that additional employment of the order of 40.36 million standard person years would be generated during the Seventh Plan with an implied growth rate of 3.99 per cent per annum.

The special employment programmes of NREP and RLEGP would generate 2.26 million standard persons years of employment in 1989-90. The employment generation of IRDP has been estimated as 3 million SPY mainly concentrated in agriculture and other sectors". Thus the Seventh Plan decided to supplement the efforts of employment generation by direct employment programmes like IRDP, NREP, RLEGP and TRYSEM.

### **(j) Integrated Rural Development Programme (IRDP):**

The Sixth Plan proposed to integrate multiplicity of agencies for providing rural employment like Employment Guarantee Scheme, SFDA, MFALDA, Drought Prone Area Programme, Command Area Development Programme etc. Accordingly, on 2nd October 1980, the Integrated Rural Development Programme was introduced.

This programme was a multi-pronged attack on the problem of rural development and was designed as an anti-poverty programme. During the Sixth Plan this programme was initiated in all the 5,011 blocks of the country. To implement this scheme one District Rural Development Agency was established in every district.

During the Sixth Plan, a sum of Rs 1,661 crore was spent on this programme as against the provision of Rs 1,500 crore and the total number of beneficiaries covered during the plan period was 16.56 million as against the target of 15 million.

The Seventh Plan set a target to assist 20 million households under IRDP and the total allocation under this programme was Rs 3,474 crore. During this plan about 18.2 million families were assisted and about Rs 3,316 crore was utilised.

## **(k) Rural Landless Employment Guarantee Programme (RLEGP):**

The Rural Landless Employment Guarantee Programme was introduced on 15th August, 1983 with the sole object of generating gainful employment opportunities, to create productive assets in rural areas and for improving the overall quality of rural life.

In this programme preference in employment is given to landless labourers, women scheduled caste and scheduled tribes. This programme is funded fully by the Central Government.

During the Seventh Plan, Rs 1,744 crore was provided by the central sector to generate 1,013 million man-days of employment during the plan period. But during the first three years of the plan Rs 1,743 crore was utilised and generated employment to the extent of 858 million man-days only. Thus 85 per cent of the target was only realised.

### ***NREP:***

The Seventh Plan had earmarked a total outlay of Rs 2,487 crore for the National Rural Employment Programme out of which centre sanctioned Rs 1,251 crore. The Seventh Plan sets a target to generate employment to the extent of 1,445 million man-days. But during the first four years of the Seventh Plan nearly Rs 2,940 crore were spent under NREP generating 1,447.7 million man-days of employment which has fulfilled plan target.

### ***Jawahar Rozgar Yojana (JRY):***

Jawahar Rozgar Yojana was launched on 28th April, 1989 by the Prime Minister Rajiv Gandhi. Under the programme, all the existing rural wage employment programmes like National Rural Employment Programme and Rural Employment Committee Programme were merged.

The programme (JRY) aims at reaching each and every panchayats of the country. In this programme 80 per cent of resources would be funded by the centre and the rest 20 per cent by the States. In the year 1989-90, the centre made a provision of Rs 2,100 crore.

In this programme allocation of funds to the State is being made in proportion to the size of their population below the poverty line. In this programme, on an average a village panchayat with its population of 3,000 to 4,000 people will

receive between Rs 80,000 to Rs 1 lakh every year. It was also decided to provide employment to at least one member in each poor family for at least 50 to 100 days in a year.

Besides this, the National Scheme of Training of Rural Youth for Self Employment (TRYSEM) was also introduced in the country. This programme was meant for generating self-employment opportunities by imparting training to the rural youths in various trades and skills.

Thus considering all these programmes introduced in the employment policy of the country under different plans, it can be concluded that these programmes could not make much headway in solving both the rural and urban unemployment in the country.

### ***Employment Policy in the Eighth Plan:***

Although various employment generation schemes were implemented till the completion of the Seventh Plan, the problem of unemployment faced by the country still remains grave. Total unemployment in the country totaled 23 million in the year 1992. In 1981-91, the country registered a 2.1 per cent growth rate in population while the growth rate of the labour force was 2.5 per cent per annum.

In 1991, the total population of the country was estimated at 837 million of which the labour force constituted about 315 million. Thus the growth of the labour force has been higher than the population growth but the growth rate of employment, which remained only 2.2 per cent per annum during the period 1971-91, has remained lower than of labour force.

It has been estimated that the country will have 94 million unemployment by the year 2002. Thus in Order to wipe out the projected unemployment in the country completely by 2002, the country should achieve the required annual employment growth rate between 2.6 to 2.8 per cent. As unemployment is a major socio-economic problem it must be tackled on a priority basis.

At the outset of the Eighth Five Year Plan (1992-97), employment was estimated to be about 301.7 million. The open unemployment was estimated at 17 million, of which the educated unemployment accounted for 7 million. Severe under-employment was estimated as 6 million. Thus the backlog of

unemployment for planning purposes was thus reckoned at 23 million in April 1992.

As the net additions to labour force during the Eighth Plan and during the period 1997-2002 were estimated at 35 million and 36 million respectively, in order to reduce unemployment to negligible levels by 2002, the employment should grow at the average annual rate of about 2.6 to 2.8 per cent over the ten year period 1992-2002.

Considering the present unemployment scenario, the Eighth Five Year Plan sought to achieve 2.6 per cent rate of growth of employment, corresponding to an average annual growth rate of GDP of 5.6 per cent envisaged in the plan.

Thus the Eighth Plan emphasised the need for a high rate of economic growth, combined with a faster growth of sectors, sub-sectors and areas which have relatively high employment potential for enhancing the pace of employment generation.

The plan sought to achieve the target by laying emphasis on a crop-wise and geographic diversification of agricultural growth, wasteland development, promotion of agro-based activities, rural non-farm activities including rural industries, the decentralised and small scale sector of industry, the urban informal sector and the services sector, expansion of rural infrastructure, housing and health and educational services especially in rural areas, revamping of the training system and streamlining of the special employment programmes to integrate them with area development plans.

Thus all these above are considered as basic elements of the employment oriented growth strategy envisaged in the plan. Additional employment opportunities to the extent of 8 to 9 million per year, on an average, during the Eighth Plan period and of the order of 9 to 10 million per year, on an average, during 1997-2002 period are expected to be generated.

Thus the employment strategy as envisaged in the Eighth Plan generated around 42.5 million additional employment during the period 1992-97. The continuation of the strategy during the Ninth Plan period generated around 47.5 million additional employment during the period 1997-2002.

Thus the employment strategy wiped out the entire backlog of open unemployment and a sizable part of the severe under-employment in the country.

**The Eighth Plan document has also identified various problems as factor responsible for the lower growth of employment in the country. These include:**

- i. Mismatch between skill requirement and employment opportunities;
- ii. Low technology, low productivity and low wage;
- iii. Occupational shifts from artisanal of unskilled employment in agriculture;
- iv. Declining employment in agriculture; and
- v. Under-employment due to seasonal factors and more labour supply than demand.

*Endorsement of New Employment Schemes by NDC and its Subsequent Launching:*

The 46th meeting of the National Development Council, held on 18th September, 1993, unanimously endorsed three employment generating schemes, covering the rural poor, educated unemployment and women.

Accordingly in 1993-94, two new programmes were launched in order to give a fillip to employment generation. These two programme included: (i) Employment Assurance Scheme (EAS), and (ii) Prime Minister's Rozgar Yojana (PMRY) for the Educated and Unemployed youth.

**(i) Employment Assurance Scheme (EAS):**

The Employment Assurance scheme was introduced on 2nd October, 1993 to make provision for “assured employment” for the rural poor.

**The highlights of the scheme are as follows:**

**(a) Aim:**

The scheme (EAS) was implemented in the 3,175 backward blocks with an aim to provide 100 days of unskilled manual work to all those who were eligible in the age group of 18-60 years.

**(b) Feature:**

The scheme will provide unskilled manual work to rural poor with statutorily fixed minimum wages linked to the quantum of work done. Its funding pattern is 80: 20 by the Centre and the States respectively. The scheme is targeted at the poor especially during the lean agricultural season in rural areas.

The works undertaken are run departmentally and no contractors are hired. Part of the wages may be paid in terms of food grains. The collector of the district is assigned to oversee the performance. Under this scheme, applicants will be given a “family card” listing the number of days of employment under different programmes.

The objective of the scheme (EAS) is to create economic infrastructure and community assets for sustained employment and development. Specific guidelines had been sent by the centre to various states so as to ensure that the provision of employment under the scheme resulted in the creation of durable assets in each block where the scheme had been launched. The implementing agencies were made responsible for the payment of minimum wages according to the standard of performance under the scheme.

A part of the wages were paid in the form of food grains not exceeding 50 per cent of the wages in cost. However, the payment of wages in terms of food grains has been made optional, depending upon the price of food grains in the open market.

### **Achievement:**

During the first year since introduction, i.e., during 1993-94 more than 49.5 million man- days of employment has been generated and nearly 1.7 million have been registered under the newly launched Employment Assurance Scheme (EAS).

The states where maximum number of man day of employment generated include Andhra Pradesh followed by Madhya Pradesh, Orissa and West Bengal. During the first eight months of 1994-95 about 115 million man-days of employment was generated under the EAS scheme.

Among these states, about 2.9 million man-days of employment had been generated in Andhra Pradesh while the figure touched about 2.3 million in Madhya Pradesh. In Orissa, nearly 1.5 million man-days of employment was generated and the figure was almost the same in the case of West Bengal.

In 2003-04, total man-days of employment generated under EAS was around at 37.28 crore. At the end of 2003-2004, EAS had generated total employment to the extent of 302.25 crore man-days, since its inception in October 1993.

### **(ii) Mahila Samridhi Yojana (MSY):**

The Mahila Samridhi Yojana was also launched on 2nd October, 1993 in order to benefit all rural adult women. This scheme entitles every adult women who opens an MSY account with Rs 300 to get an incentive of Rs 75 for a year.

The MSY is aimed at empowering rural women with greater control over household resources and savings. It is now implemented through post offices. At the end of October 1995, a total of 1,25,423 accounts had been opened under the scheme.

### **(iii) Prime Minister's Rozgar Yojana (PMRY):**

On 2nd October, 1993, the Government introduced another new employment oriented scheme—Prime Minister's Rozgar Yojana (PMRY) under the on-going Eighth Plan. The scheme is specially designed for educated unemployed youth which will provide employment to more than one million persons by setting up seven lakh micro enterprises during the Eighth Five Year Plan in industry, service and business.

The scheme initially covered urban areas only during the 1993-94, subsequently covered both the urban and rural areas. The scheme but involved an expenditure of ? 540 crore to meet the capital subsidy, training and administrative cost during the remaining period of the Eighth Five Year Plan.

The scheme provided a loan, up to a ceiling of Rs 1 lakh in case of individuals. If two or more eligible persons enter into a partnership, projects with higher cost can be assisted provided the share of each person in the project cost did not exceed Rs 1 lakh.

An entrepreneur is required to contribute 5 per cent of the project cost as margin money in cash. Subsidy at the rate of 15 per cent of the project cost subject to a ceiling of Rs 7,500 per entrepreneur was provided by Central Government. All those who undertook Government sponsored technical course for a minimum duration of six months besides matriculate and ITI diploma holders were be eligible for the scheme.

Under the PMRY, unemployed educated youth between the 18-25 years age group and of families with annual income up to Rs 24,000 along with certain educational and other criteria were eligible for such assistance.

In 2003-04, total micro enterprises developed under PMRY was 1.2 lakh and total employment generated was 1.8 lakh. At the end of 2003-2004 PMRY has developed micro enterprises to the extent of 17.2 lakh and generated employment to the extent of 24.82 lakh since its inception in October 1993. Under PMRY, the Government assisted 20 lakh youth for self-employment during the Tenth Plan.

**(iv) JRY:**

Moreover, the achievement of JRY in respect of employment generation was 782 million man- days in 1992-93 and 1,026 million man-days in 1993-94. The 1994-95 budget provide for Rs 70.1 billion and set a target of employment generation at 980 million man-days, against which the achievement of JRY in 1994-95 was 952 million man-days.

In 1998-99, the target of employment generation under JRY is fixed at 396.6 million man-days but during 1998-99, the achievement was 375.2 million man-days. Under JRY, about 50 per cent employment generation during 1998-99 came from SC/ST group.

**(v) Nehru Rozgar Yojana (NRY):**

Nehru Rozgar Yojana (NRY) contemplated by the Ministry of Urban Affairs was designed to create employment opportunities for urban poor. This programme was launched in October 1989 with the objective of providing employment opportunities to the unemployed and under employed urban poor.

The Yojana is applicable to household living below the poverty line in urban slums and within this broad category, SC/ST and women constitute a special target group.

**Nehru Rozgar Yojana consists of three sub schemes:**

- (a) Scheme of Urban Micro enterprises. (SUME),
- (b) Scheme of Urban Wage employment (SUWE) and
- (c) Scheme of Housing and Shelter Upgradation (SHASU).

So far, 6.55 lakh beneficiaries have been assisted in setting up of micro enterprises under SUME. About 541.52 lakh man-days of work have been generated through the construction of economically and socially useful public assets under SUWE and SHASU till 1994-95. Under NRY, total number of families assisted was 2.37 lakh in 1992-93, 1.52 lakh in 1993-94, 1.25 lakh in 1994-95 and 0.6 lakh during 1997-98 as against the target of 1.2 lakh.

Total man-days of employment generated under NRY was 140.5 lakh in 1992-93, 123.7 lakh in 1993-94, 92.9 lakh in 1995-96 and 44.6 lakh during 1997-98 as against target of 135.8 lakh. In December, 1997, this programme was amalgamated with SJSRY.

#### **(vi) Prime Minister's Integrated Urban Poverty Eradication Programme (PMIUPEP):**

The Prime Minister's Integrated Urban Poverty Eradication Programme (PMIUPEP) was launched in 1995-96 with a specific objective of effective achievement of social sector goals, community empowerment, employment generation and skill upgradation, shelter upgradation and environmental improvement with a multi-pronged and long-term strategy.

The Programme covered 5 million urban poor living in 345 class II Urban Agglomerations (towns) with a population of 50,000 to 1,00,000 each. There was a provision for Rs 800 crore as central share for the entire programme period of 5 years. In 1995-96, Rs 100 crore were allocated for the programme.

The programme benefitted about 150 lakh urban poor in 1996-97. As on October 1996, over 14,000 and 1,00,000 beneficiaries had been identified for self-employment and shelter upgradation respectively. In December 1997, this programme was amalgamated with SJSRY.

#### **(vii) The Swarna Jayanti Shahari Rozgar Yojana (SJSRY)/National Urban Livelihoods Mission (NULM):**

The Swarna Jayanti Shahari Rozgar Yojana (SJSRY) which subsumed the earlier three urban poverty programme viz., Nehru Rozgar Yojana (NRY), Urban Basic Services for the poor (UBSP) and Prime Minister's Integrated Urban Poverty Alleviation Programme (PMIUPEP) came into operation from December 1997.

This programme sought to provide employment to the urban unemployed or underemployed poor living below poverty line and educated up to XI standard through encouraging the setting up of self-employment ventures or provision of wage employment.

The scheme gives special impetus to empower as well as uplift the poor women and launches a special programme, namely, Development of women and children in Urban Areas (DWCUA) under which groups of urban poor women setting up self-employment ventures are eligible for subsidy up to 50 per cent of the project cost.

An allocation of Rs a 181.0 crore was provided in 1999-2000 (BE). In 1998-99, the DWCUA scheme had assisted 0.01 lakh women related to their self-employment schemes. During 2001-02, Rs 168 crore was allocated against which' Rs 45.50 crore was spent. In 2002-03, all allocation of Rs 105 crore was provided against which Rs 74.0 crore was spent.

Two special schemes of SJSRY include—the Urban Self-Employment Programme (USEP) and the Urban Wage Employment Programme (UWEP). SJSRY is funded on a 75: 25 basis between Centre and States. During 1997-98, 1998-99 and 1999-2000, a sum of Rs 102.51 crore, Rs 162.28 crore and Rs 123.07 crore respectively were spent in the States and Union Territories under different components of SJSRY.

About the performance of SJSRY, total number of beneficiaries under USEP was 0.04 million in 1998-99 and 0.10 million in 2003-2004 and total number of persons trained under USEP was 0.05 million in 1998- 99 and 0.12 million in 2003-2004. Again, total man-days of employment generated under UWEP was 6.60 million in 1998-99 and 10.14 million in 1999-2000 and 4.56 million in 2003-04.

The number of urban poor assisted for setting up micro/group enterprises in 2005-06 was 0.9 lakh against a target of 0.80 lakh. The number of urban poor imparted skill training in 2005-06 was 1.42 lakh against a target of 1.0 lakh.

Budget allocation for the SJSRY scheme for 2011-12 is Rs 813.0 crore of which Rs 676.80 crore had been utilized till February 16, 2012. During 2009-10, as reported by States/UTs, a total of 28,613 urban poor have been assisted in setting up individual enterprises, 13,453 urban poor women have been

assisted in setting up group enterprises and 27,463 urban poor women have been assisted through a revolving fund for thrift and credit activities and also 85,185 urban poor have been imparted skill training. A total of 3,63,794 beneficiaries have been assisted in the year 2011-12.

### **NULM:**

SJSRY was replaced by the NULM in September 2013. It aims to provide gainful employment to urban employed and under employed. The NULM will focus on organizing urban poor in SHGs, creating opportunities for skill development leading to market based employment, and helping them to set up self-employment ventures by ensuring easy access to credit.

The NULM aims at providing shelter with basic amenities to urban homeless. It also plans to address livelihood concerns of urban street vendors. During 2013-14, Rs 720.43 crore was released and the number of persons skill trained and assisted for self-employment was 6,83,452 and 1,06,250 respectively.

### **(viii) The Swarnajayanti Gram Swarozgar Yojana (SGSY) and NRLM:**

SGSY was launched in April, 1999 and is the only self employment programme currently being implemented. It aims at promoting micro enterprises and to bring the assisted poor families (Swarozgaris) above the poverty line by organizing them into Self Help Groups (SHGs) through the process of social mobilization, training and capacity building and provision of income generating assets through a mix of Bank credit and Government subsidy.

The scheme is being implemented on a cost-sharing ratio of 75: 25 between the Centre and the States. Since inception of the Scheme up to December, 2012 a total allocation of Rs 42,16,842 crore was made available by the Centre and the States which formed 42.05 lakh SHG's and assisted 168.46 lakh Swarojgaris. The SGRY restructured as National Rural Livelihood Mission (NRLM).

The SGSY is restructured as National Rural Livelihood Mission (NRLM) and it has been renamed as Ajeevika and now being implemented in mission mode across the country since 2011.

### **The main features of Ajeevika are:**

- (a) One women member from each identified rural poor household to be brought under the SHG network;
- (b) Ensuring 50 per cent of the beneficiaries from SC/STs, 15 per cent from minorities, and 3 per cent persons with disability while keeping in view the ultimate target of 100 per cent coverage of BPL families;
- (c) Training for capacity building and skill development;
- (d) Ensuring revolving fund and capital subsidy;
- (e) Financial inclusion;
- (f) Provision of interest subsidy;
- (g) Backward and forward linkages and
- (h) Promoting innovations.

The objective of NRLM is to ensure that each family, once it is in the SHG network for a period of 6- 8 years, it is able to achieve household food security and have 3-4 stabilized livelihoods through a strong convergence with panchayati raj institutions (PRIs).

The mission has covered 97,391 villages and mobilized around 20 lakh SHGs, of which 3.8 lakh are new. During 2013-14, Rs 22,211.18 crore of SHG bank credit has been disbursed. For 2014-15, Rs 3,560 crore has been allocated to NRLM.

#### **(ix) Sampoorna Grameen Rozgar Yojana (SGRY):**

The Sampoorna Grameen Rozgar Yojana (SGRY) was launched in September 2001. The schemes of Jawahar Gram Samridhi Yojana (JGSY) and Employment Assurance Scheme (EAS) have been fully integrated with SGRY.

The objective of the scheme is to provide additional wage employment along with food security creation of durable community, social and economic assets and infrastructure development in the rural areas. The scheme envisages generation of 100 crore man-days of employment in a year. The cost of the programme is to be shared between the Centre and the State on a cost sharing ratio of 87.5 : 12.5 (including food grains component).

In 2005-06, 82.18 crore person-days of employment were generated with the centre releasing Rs 5497.43 crore as cash component and about 37.30 lakh tonnes of food grains to the states and UTs. Besides, under special component of SGRY with the states/ UTs meeting the cash components, centre released 15.64 lakh tonnes of food grains to the 11 calamity affected states.

In 2007-08, up to December 31, 2007, the number of person days of employment generated under SGRY was 11.60 crore while the centre's contribution in terms of cash and food grain component up to December 31, 2007 were Rs 1,142.27 crore and 9.55 lakh tonnes.

#### **(x) Pradhan Mantri Gramodaya Yojana (PMGY):**

PMGY was launched in 2000-2001 in all the States and the UTs in order to achieve the objective of sustainable human development at the village level. The PGMY envisages allocation of Additional Central Assistance to the States and UTs for selected basic minimum services in order to focus on certain priority areas of the Government.

PMGY initially had five components viz., Primary Health, Primary Education, Rural Shelter, Rural Drinking Water and Nutrition. Rural Electrification has been added as an additional component from 2001-02. The allocation for PMGY in 2000-01 was Rs 2,500 crore. This was enhanced later on to Rs 2800 crore for 2001-02. For the year 2002-03, an amount of Rs 2,800 crore was provided.

During the last two annual plans, the six sectoral programmes of PMGY were managed by the concerned Central Administrative Departments. However, from the current year, the Planning Commission is to directly implement this programme. New guidelines on the implementation of the PMGY during Annual Plan 2002- 03 have been issued to all the State Governments and UTs.

#### **(xi) Pradhan Mantri Gramodaya Yojana (Gramin Awas):**

The scheme seeks to achieve the objective of sustainable habitat development at the village level. Central allocation for rural shelter component of PMGY. GA in 2001-02 was Rs 406.85 crore out of which an amount of Rs 291.51 crore was released by Ministry of Finance.

## **(xii) Pradhan Mantri Gramodaya Yojana—Rural Drinking Water Project:**

Under this programme, a minimum 25 per cent of the-total allocation is to be utilised by the respective States/UTs on projects/schemes for water conservation, water harvesting, water recharge and sustainability of the drinking water sources in respect of areas under Desert Development Programme/Drought Prone Areas Programme.

## **(xiii) Pradhan Mantri Gram Sadak Yojana (PMGSY):**

The PMGSY, which was launched on 25th December, 2000 is a programme to provide road connectivity through good all-weather roads to 1.60 lakh Unconnected Habitations with a population of 500 persons or more in the rural areas by the end of the Tenth Plan period (2007) at an estimated cost of Rs 60,000 crore.

The programme is being executed in all the States and Six Union Territories. While the focus of the programme is on providing road connectivity to Unconnected Habitations of stipulated population size, connectivity is being provided to all Panachayat Headquarters and places of tourist interest under the PMGSY irrespective of the population size.

Thus, the main objective of PMGSY is to provide all weather connectivity to all eligible unconnected habitations in rural areas of the country having population of 500 persons and above in plain areas and 250 persons and above (as per 2001 census) in special category states, selected tribal and desert areas.

It also permits upgradation of existing rural roads. In 2001-02, an amount of Rs 2,500 crore was allocated for this scheme. Since inception, projects for providing new connectivity to 1,44,717 habitations with a road, length of 5,44,462 km have been cleared at an estimated cost of Rs 1,82,560 crore including upgradation cost.

A total of 3,99,979 km road length have been completed and new connectivity have been provided to over 97,838 habitations up to March 2014. During 2013-14, about 25,316 km of all-weather road including new connectivity to 6,560 habitations has been completed at an expenditure of Rs 13,095 crore. Upgradation on selected existing roads has been taken up.

The present source of funding for PMGSY is the diesel cess, 50 per cent of which is earmarked for PMGSY. Efforts are underway to raise additional resources for the programme with financial assistance from the World Bank and the Asian Development Bank.

#### **(xiv) Maharma Gandhi National Rural Employment Guarantee Act Scheme (MGNREGA):**

The National Rural Employment Guarantee Act Scheme (NREGS) was formally launched on February 2, 2006 by Prime Minister Manmohan Singh at Bahdlapalle Gram Panchayat of Anantpur district of Andhra Pradesh marking an important milestone of the UPA Government's efforts to provide jobs to the rural poor.

The Act passed in August 2005 was launched in 200 districts and has been expanded to 330 districts in the second phase and by next four years, i.e., by 2008-09 all the districts was covered under the Act.

This is for first time a job guarantee scheme has been introduced in the country. Under this Act, one member of each of the country's 150 million rural households will have the legal guarantee to get at least 100 days of employment at minimum wages of Rs 65 for one person in each household irrespective of poverty levels they belong to.

Accordingly, rural household in selected districts will have the right to register themselves with the local Gram Panchayats as persons who seek employment under the Act. Thus this Act provides a social safety net for the vulnerable groups of people of our society and thereby makes an attempt to attain growth with equity.

#### **The main features of this Act are:**

- (a) NREGA is not just a scheme but an Act providing legal guarantee to work.
- (b) Any adult person in the notified are willing to do unskilled manual work, can apply for registration with Gram Panchayat. The Panchayat will then issue a job card to that person and the person will be entitled to apply for employment.
- (c) The registered persons will then have the legal right to demand employment.

- (d) The person will get the right to get employment within 15 days of their demand.
- (e) The person will get the right to receive unemployment allowance if the employment is not given within 15 days.
- (f) One third of the beneficiaries will be women.
- (g) Employment will be given within 5 km. of the applicant's residence, else additional wages will be paid.
- (h) Panchayati Raj Institutions ((PRIIs) will have the principal role in planning, monitoring and implementation.
- (i) The beneficiary will get the right for statutory wages.
- (j) The beneficiary will get the right to worksite facilities like drinking water, sheds for children and first aid.

The Centre is bearing 80 per cent of the total cost of the programme and the State Government will have to play a crucial role. The wage component of the implementation of this Act will be borne by the centre and cost of materials and other components of the work would be shared between the Centre and the State Governments.

Thus this flagship programme of the government aims at enhancing livelihood security of households in rural areas by providing at least one hundred days of guaranteed wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work with the stipulation of one-third participation of women.

The MGNREGA provides wage employment along with focusing on strengthening natural resource management through works that address causes of chronic poverty like drought, deforestation and soil erosion and thereby encourage sustainable development. The two-pronged objective of the Act are firstly to ensure food security through employment generation and secondly, creation of permanent assets.

**However, the successful implementation of NREGA depends on two important factors, i.e:**

- (i) The efficient and regular functioning of Panchayati Raj institutions and
- (ii) Proper use of the Right to Information Act.

However, the most striking feature of this Act, it is the first attempt of its kind at the national level to work out an employment guarantee programme with 80 per cent central funding and with its legal force which makes it quite different than that of other employment generation schemes introduced earlier in the country.

The MGNREGA, being a demand driven scheme, has its definite focus on works relating to water conservation, drought proofing, land development, flood protection/control and rural connectivity in terms of all-weather roads. Of the Rs11,300 crore allocated for NREGA in 2006-07 (BE) Rs 6,714.98 crore was released up to January 31, 2007.

Till January 31, 2007, about 3.47 crore job cards have been issued and of the 1.50 crore households, who have demanded employment, 1.47 crore households have been provided employment under the scheme. Under this scheme, up to December, 2006 of the 53.56 crore person-days of employment generated, 21.13 crore were for women, and of about 5.81 lakh work taken up, 2.34 lakh were completed.

As against the employment demanded by 2.61 crore rural households, 2.57 households have been provided wage employment during 2007-08. A budget allocation of Rs 12,000 crore (including NER Component) was made for 2007-08 and Rs 10,501.02 crore has been released till 30.01.2008. The Government is now considering a proposal of raising the number of days of guaranteed jobs from 100 days to 200 days.

In 2007-08, the IT-enabled network of India Post has been successfully utilised for disbursement of wages to the beneficiaries of NREGA in 19 districts of Andhra Pradesh and in all 22 districts of Jharkhand. The scheme is also operative in Karnataka, Madhya Pradesh, and West Bengal.

In 2008-09, the Government has stepped up the allocation for its flagship programme of rural employment scheme NREGA by over 65 per cent to Rs 26,500 crore. The additional amount of Rs 10,500 crore has been provided to meet the additional requirement of NREGA Scheme.

Under phase II, 130 additional districts were notified and brought under its ambit with effect from April 1, 2007. Under the programme, so far 293.46 lakh jobs have been provided to households. In 2008-09, the entire Sampoorna Grameen Rozgar Yojana (SGRY) was subsumed in NREGA Scheme.

The coverage was extended to all the rural districts of the country in 2008-09. At present, 619 districts are covered under NREGA. During the year 2008-09, more than 4.51 crore households were provided employment under the scheme. As against the budgeted outlay of Rs 33.000 crore for the year 2013-14, an amount of Rs 25,894.03 crore has been released to the states/UTs till January, 2014.

The number of households covered under the scheme increased considerably from 3.39 crore in 2007-08 to 4.47 crore in 2008-09 and then to 4.78 crore in 2013-14 with an average wage employment of 46 person days.

Out of the 219.72 crore person days of employment created under the scheme during 2013-14, 23 per cent and 17 per cent were created in favour of SC and ST population respectively and 53 per cent were in favour of women. Thus NREGA provides a social safety net for the vulnerable groups of people of our society and thereby makes an attempt to attain growth with equity.

The MGNEGA is thus playing an important role in improving the livelihood security as well as improving the resource base at the rural level. At national level with the average wage paid under the MGNEGA increasing from Rs 65 in 2006-07 to Rs 115 in 2011-12, the bargaining power of agricultural labourer has increased as even private sector wages have increased as shown in many studies.

Improved economic outcomes, especially in watershed activities, and reductions in distress migration are its other achievements. Wages under MGNREGA are indexed to the consumer price index for agricultural labour (CPI-AL). Recently the government has taken some initiatives under MGNREGA to make it much more effective and transparent.

### **These are:**

- i. The basket of permissible activities has been expanded to make it more meaningful.

- ii. Electronic fund management system (eFMS) in all states has been initiated in a phased manner to reduce delay in payment of wages.
- iii. Additional employment over and above 100 days per household is notified in drought-affected talukas or blocks is now permissible.
- iv. Provision has been made for seeding in Aadhaar into the MGNREGA workers records in order to prevent leakage.
- v. Convergence of the MGNREGA with the total Sanitation Campaign (TSC) has been undertaken.

While commending the success of MGNREGA, Prime Minister Dr. Manmohan Singh recently observed that **“MGNREGA has brought momentum in the financial inclusion of our rural population. Besides direct financial benefit, the scheme has given many indirect benefit to the people and brought down the migration graph”**.

Nothing that more than four crore accounts have been opened in banks besides those in post offices, the Prime Minister observed that, “these bank accounts will assist the government in reaching the incentives of the Direct Benefit Transfer Scheme to the rural population. Moreover, the use of information technology in MGNREGA at many levels has helped making governance better and increase accountability and transparency in government work. There are enough proofs that the scheme has helped to a great extent in getting the small and very small farmers a better produce by increasing land productivity and water conservation.”

Thus it can be observed that with better planning of project design, capacity building of panchayati raj institutions (PRTs), skill up-gradation for enhanced employability, and reduction of transaction costs, gaps in scheme implementation could be plugged to a greater extent and the assets so created could make a much larger contribution towards raising land productivity and improvement of living conditions of rural people in general.

### ***Employment Policy in the Ninth Plan:***

The Draft Approach Paper of the Ninth Plan gave due recognition to the problem of unemployment. With that purpose, the Approach Paper has incorporated one of its Objectives as “Giving priority to agriculture and rural

development with a view to generate adequate productive employment and eradication of poverty.”

The four dimensions of state policy as reflected in the strategy of the Ninth Plan has incorporated “**generation of productive employment**” as one of those dimensions. Accordingly the Ninth Plan has incorporated a primary objective to generate greater productive employment in the growth process of various sectors and by adopting labour intensive technologies in the unemployment prone areas.

In order to enhance employment opportunities for the poor, the Ninth Plan has Undertaken a National Employment Assistance Scheme, recognising the high incidence of under-employment and increasing casualization of labour.

The Approach Paper of Ninth Plan also mentioned that “Improvements in quality of employment can be achieved only in a situation of rapidly growing productivity to which the labour can lay a just claim. However, it is not merely enough to create the right kinds of employment opportunities, but also to provide the people with the human capital by which they can take advantage of these opportunities. Education and skill development are essential features of such empowerment. Free and compulsory education of children supported by an adequate midday meal programme in schools is the first step towards this end. In addition, special programmes will have to be implemented to develop skills, enhance technological levels and marketing channels for people engaged in traditional occupations.”

**“There is no simple or unique correlation in the short-run either in theory or in Indian experience between the rate of growth of output and the rate of growth of employment.”**

Under the present context, the growth process should be restructured in such a way so that employment opportunities grow at an accelerated pace and the country become successful to achieve the goal of full employment in the early part of new millennium.

**In this connection, the Planning Commission has suggested the following measures to be adopted during the Ninth Plan period:**

(a) Attainment of economic growth would be mostly from those sectors which have high employment potential.

- (b) High priority would be accorded to attain growth and lines of production with high employment intensity along with the maintenance of demand-supply balance.
- (c) Discouraging unnecessary and indiscriminate increase in capital intensity and encouraging the adoption of production techniques with higher employment potential per unit of capital.
- (d) Lastly, reorienting public sector investment towards those sectors having employment bias and influencing private investment decisions to adopt technologies with high employment potential.

Again the draft Ninth Five Year Plan (1997-2002) approved by the National Development Council (NDC) on 19th February, 1999 has given priority to reduce the extent of unemployment and it has set a target to generate 50 million jobs during the Ninth Plan period.

### ***Employment Policy in the Tenth Plan:***

The Approach Paper to the Mid-Term Appraisal of the Tenth Plan has reiterated that employment growth should exceed the growth of labour force to reduce the backlog of unemployment.

### **Employment strategies advocated in the Approach Paper include:**

- i. Special emphasis to promote public investment in rural areas for absorbing unemployed labour force for asset creation.
- ii. Identification of reforms in the financial sector to achieve investment targets in the Small and Medium Enterprises (SME) sector.
- iii. Large scale employment creation in the construction sector, especially for the unskilled and semiskilled.
- iv. Necessary support to services sector to fulfill their true growth and employment potentials and greater focus on agro-processing and rural services.

Thus the employment strategy in the Tenth Plan needs, therefore, to focus on adequate employment growth and on the qualitative aspects of employment. In order to enable the poor to access the opportunities and to ensure

consistency between the requirement and availability of skills, emphasis will need to be placed on required skill development.

Thus the Tenth Plan document observed that the current backlog of unemployment at around nine per cent, equivalent to 35 million persons, is too high and every effort needs to be made to not only arrest the rising trend, but to actually reduce it during the Tenth Plan period itself.

On the whole, the Tenth Plan aimed at the creation of approximately 50 million employment opportunities during a period of 5 years, of which 30 million will be created from normal process of growth and rest 20 million will be created from special initiatives. The result of the 61st NSSO round show that above 47 million persons were provided employment during 2000 to 2005.

### ***Employment Policy of the Eleventh Plan:***

Generation of employment opportunities for the growing number of unemployed and new entrants to labour force is a great challenge. Doubling the growth of agricultural GDP to 4 per cent per annum will improve employment conditions in agriculture by raising real wages and reducing the number of underemployed in agricultural sectors.

The Approach Paper to the Eleventh Plan targets generation of additional employment opportunities in services and manufacturing, in particular, labour intensive manufacturing sectors such as food processing, leather product, footwear and textiles and in service sector such as tourism and construction.

It also calls for elimination of distorting fiscal incentives which foster capital intensity, infrastructure investment, removal of distortions that hinder competition, prevent entry and discourage graduation from unorganised to organised status; and greater emphasis on vocational training and skill development to improve employability of youth.

As Village and Small Scale Enterprises (VSE) will have to provide most of the employment during the Eleventh Plan, the Approach Paper also calls for redressing the problems faced by VSE units and home based workers, especially women which include non availability of timely and adequate credit, unrealizable or absence of power supply, requirement of permission from a number of government agencies and burden of multiple inspections. However,

some direct employment will be available in the social sector, i.e., on health and education. Besides the wage employment programme like NREGS will also improve employment scenario considerably.

In this connection the Economic Survey, 2007-08 observed “the Eleventh Plan envisages rapid growth in employment opportunities while ensuring improvement in quality of employment. It recognises the need to increase the share of regular employees in total employment and a corresponding reduction in casual employment. The employment Generation strategy of the Eleventh Plan is also predicted on the reduction of under employment and movement of surplus labour in agricultural sector to higher wage and more gainful employment in the non-agricultural sector. Agriculture sector is projected to generate no increase in employment during the Eleventh Plan period. Employment in manufacturing is expected to grow at 4 per cent while construction and transport and communication are expected to grow at 8.2 per cent and 7.6 per cent respectively. The projected increase in total labour force during the Eleventh Plan is 45 million. As against this, 58 million employment opportunities would be created in the Eleventh Plan. This would be greater than the projected increase in the labour force leading to a reduction in the unemployment rate to below 5 per cent.”

But if we take into account the increasing participation of women, the total projected increase in labour force during the Eleventh Plan will be nearly 65 million. If we add the present backlog of unemployment of 35 million at the end of Tenth Plan then the total job requirements during the Eleventh Plan would be around 100 million.

But as 58 million employment opportunities will be created in the Eleventh Plan this would leave nearly 42 million workers to be absorbed in the non-agricultural unorganised sector, which is, no doubt, a difficult proposition.

If we consider the performance of the last decade with a negative employment growth in the organised sector, then the Eleventh Plan is too ambitious by expecting generation of 15 million jobs from the organised sector and in total generating 58 million employment opportunities during the Plan. Thus the estimates made by the planners is found highly unrealistic and over-optimistic considering the ground realities.

However, the projected increase in total labour force during the Eleventh Plan is estimated at 45 million. It is also projected that 58 million employment opportunities would be created during the Eleventh Plan.

This would be greater than the projected increase in labour force leading to a reduction in the unemployment rate below 5 per cent by the terminal year of the plan. It is expected that agriculture sector may not contribute towards any increase in employment during the Eleventh Plan.

Hence, the employment generation strategy of the Eleventh Plan is based on the reduction of underemployment and movement of surplus labor in agriculture sector to higher wage and more gainful employment in non-agricultural sector.

The Eleventh Plan has especially identified labour intensive manufacturing and services sectors with employment potential like food processing, leather products, footwear, textiles, wood and bamboo products, gems and jewellery, handicrafts, handlooms, tourism and construction for this purpose.

Thus the key strategy for achieving inclusive growth in the Eleventh Plan has been generation of productive and gainful employment, with decent working conditions, on a sufficient scale to absorb the growing labour force. The Eleventh Plan (2007-12) aims at generation of 58 million work opportunities in twenty one high growth sectors so that unemployment rate falls to 4.83 per cent by the end of the Plan.

The International Commission on Peace and Food, a non-government organisation headed by Dr. M.S. Swaminathan, made a study on the unemployment problem of the country. The Committee has come to the conclusion that a minimum of 100 million new jobs are needed by the year 2000 in the unorganised sector to achieve full employment and to eradicate poverty.

The findings of the team were in the form of a strategy statement which emphasises that there is potential to increase employment with emphasis on higher productivity, and income through extension of irrigation and green revolution to areas not hitherto covered and having potential, waste land development and diversification of agriculture to other productive activities like horticulture, aquaculture, sericulture and agro-processing.

The Centre of Advanced Development Research (CADR) has also criticised various employment generation programmes launched by the Government which has touched only a fringe of the problem and has suggested measures for labour-intensive, and land based programmes.

These include diversification of crop programme, which places high priority on the needs of the poor and on the transformation of the crop pattern from the present low-value to high-value and labour intensive programmes.

The Centre also suggests a jump in the production of milk and eggs, making the best use of water and land resources and improving 175 million hectares of degraded land which is about half of the total geographical area, mainly through afforestation.

Taking all these factors into considerations, it can be said that the future employment programmes of the country should be redressed in such a manner so that it can meet requirements of the people with maximum utilisation of scarce resources. Moreover, considering the depth of the problem it can be safely said that the government alone cannot tackle this problem alone.

Thus private sector should be fully involved in the employment programme of the country. Accordingly, the Planning Commission should chalk out programme for the private sector in order to involve the sector into the employment generation programme of the country.

Thus an appropriate joint strategy involving both the public sector and private sector is to be taken in order to tackle both the rural as well as urban unemployment of the country.

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## **Essay # 8. Growth of Employment in India in Recent Years:**

It would be better to look at the growth rate of employment both in organised and unorganised sectors in recent years. In an overpopulated country like India with a high rate of growth of population, the rate of growth of population should be consistently higher and steady.

But the rate of growth of employment prevailing in a country like India are not very much conducive and encouraging. Table 12.6 reveals the growth rate of employment during the period from 1972-73 to 1993-94.

**TABLE 12.6. Growth Rate of Employment in India (per cent)**

Period	<i>Growth rate overall employment</i>	<i>Growth rate of employment in the organised sector</i>			<i>Total</i>
		<i>Public</i>	<i>Private</i>		
1972-73 to 1977-78	2.75	—	—	—	2.45
1977-78 to 1983	2.36	2.99	1.41	—	2.48
1983 to 1987-88	1.77	2.17	0.43	—	1.38
1987-88 to 1993-94	2.37	1.00	1.18	—	1.05
1993-94 to 1999-2000	1.57	—	—	—	—
1999-2000 to 2004-05	2.48	—	—	—	—

*Source :* Planning Commission (as Reproduced in Economic Survey, 1998-99, p. 147) and 2006-07, p. 208.

Table 12.6 shows that the average annual growth rate of overall employment attained both in organised and unorganised sectors declined continuously from 2.75 per cent during 1972-78 to 1.77 per cent in 1983-88, but again increased to 2.37 per cent in 1987-94.

The same growth rate again declined to 1.57 per cent during 1993-2000 and then again increased to 2.48 per cent during 1999-2005. However, the annual average growth rate of employment in organised sector maintained its declining trend from 2.45 per cent during 1972-78 to 1.38 per cent during 1983-88 and then to 1.05 per cent during 1987-94.

The growth rate of employment in the organised public and private sector has declined from 2.99 per cent during 1977-83 to a mere 1.00 per cent during 1987-94. But the growth rate of organised employment in the private sector has initially declined from 1.41 per cent during 1977-83 to 0.43 per cent during 1983-88 but the same rate again increased to 1.18 per cent during 1987-94.

For the first time, the growth rate of employment in the organised private sector exceeded the employment growth rate in public sector. It would also be better to look into the growth rates of employment in India during the post-reform period. Table 12.7 will clarify the position.

Table 12.7 reveals the annual growth rates of employment in the organised public and private sector during 1991 to 1999. It is observed that the growth rate of employment in the public sector has declined from 1.52 per cent in 1991 to 0.60 per cent in 1993 and 0.11 per cent in 1995 and to even (-) 0.09 per cent in 1998 and finally to (-) 0.90 per cent in 2001.

Again the growth rates of employment in the organised private sector increased from 1.24 per cent in 1971 to 2.21 per cent in 1992 and after maintaining a lean period reached the peak level of 5.62 per cent in 1996 and then again maintained a moderate rate of 2.04 per cent in 1997 and then declined to 0.1 per cent in 2001.

Thus the growth rate of employment in the organised sector remained relatively stable i.e., from 1.44 per cent in 1991 to 0.55 per cent in 1995, 1.51 per cent in 1996 and then declined to only (-) 0.6 per cent in 2001. Thus it can be observed that the private sector contributed pre-dominantly to the increase in the organised sector employment in the reform period since 1991 except in 1993.

**TABLE 12.7. Growth Rates of Employment in Organised Sector (Per cent)**

Year	Public Sector	Private Sector	Total Organised
1991	1.52	1.24	1.44
1992	0.80	2.21	1.21
1993	0.60	0.06	0.44
1994	0.62	1.01	0.73
1995	0.11	1.63	0.55
1996	(-) 0.19	5.62	1.51
1997	0.67	2.04	1.09
1998	(-) 0.09	1.72	0.46
1999	(-) 0.02	(-) 0.57	(-) 0.19
2000	(-) 0.68	0.97	(-) 0.17
2001	(-) 0.9	0.1	(-) 0.6
1983-1994	1.53	0.44	1.20
1994-2008	(-) 0.65	1.75	0.05

*Source :* Planning Commission (As reproduced in Economic Survey, 2002-03, p. 149 and 2010-11, p. 299)

However, the employment growth in the organised sector, public and private sector confined, declined during the nineties. Annual employment growth in establishments covered by Employment Market Information System of Ministry of Labour decelerated from 1.20 per cent during 1983-1994 to 0.05 per cent per annum during 1994-2008.

This deceleration happened in spite of an acceleration in annual employment growth in the private sector from 0.44 per cent to 1.75 per cent during the reference periods as these acceleration was not enough to make up for the corresponding decline of employment in the public sector from 1.53 percent to (-) 0.65 per cent during the reference period.

Considering the situation, the Government has decided to set up the Second National Commission on Labour with a view to provide protection to millions

of workers. The main focus of the Commission would be to suggest rationalisation of the existing labour laws in the organised sector and also to suggest an umbrella legislation for ensuring a minimum level of protection to the workers in the unorganised sector.

In recent years, employment in India has declined marginally in both the urban and rural areas according to the results of the latest survey conducted by the national Sample Survey Organisation (NSSO). The results of the 55th round of NSSO survey revealed that in 1999-2000, employment in rural areas among males was down by two percentage points, while it was lower by three percentage points for females compared to 1993- 94 when the last NSSO survey was conducted.

In urban areas, employment for females decreased by more than one percentage point in 1999-2000, while it remained at the same level for males. The survey brings out that the workforce participation rate during 1999-2000 is higher in rural areas than in urban areas and the participation is higher for males than, females.

Moreover, employment levels among the states reveal that work participation among males in rural areas is highest in Andhra Pradesh which has 605 males employed per 1,000 males, followed by Karnataka and Tamil Nadu. The lowest rates are reported by Haryana with 475 males employed per 1,000 males followed by Uttar Pradesh and Bihar.

The 64th round (2004-08) of NSSO survey on employment-unemployment indicates creation of 4 million work opportunities between 2004-05 and 2007-08.

The employment situation of the country in recent years has been showing marginal improvement. As highlighted in Economic Surveys of previous years based on NSSO data, employment on a current daily status (CDS) basis during 1999-2000 to 2004-05 had accelerated significantly as compared to the growth witnessed during 1993-94 to 1999-2000.

During 1999-2000 to 2004-05, about 47 million work opportunities were created compared to only 24 million the period between 1993-94 and 1999-2000 and employment growth accelerated from 1.25 per cent per annum to 2.62 per cent per annum.

However, since the labour force grew at a faster rate of 2.84 per cent than the workforce, unemployment also rose the incidence of unemployment on CDS basis increased from 7.31 per cent in 1999-2000 to 8.28 per cent in 2004-05.

In recent period, the country is facing sluggish employment growth as there is a deceleration in the compound annual growth rate (CAGR) of employment during 2004-05 to 2011-12 to 0.5 per cent from 2.8 per cent during 1999-2000 to 2004-05 period as against CAGRs of 2.9 per cent and 0.4 per cent respectively in the labour force for the same periods.

After a period of slow progress during 2004-05 to 2009-10, employment generation picked up during 2009-10 to 2011-12 adding 13.9 million persons to the work force, but not keeping pace with the increase in labour force (14.9 persons). Based on current daily status (CDS), CAGR in employment was 1.2 per cent and 2.6 per cent against 2.8 per cent and 0.8 per cent in the labour force respectively for the same periods.'

Employment scenario in India is likely to improve in recent years. Recently, a study conducted by a industry group in December 2013 among more than 5,600 firms across 12 industry sectors. The survey report observed that the job seekers can look forward to a prosperous new year (2014) as more than 8.5 lakh new jobs are expected to be created across various sectors, including FMCG and healthcare.

Coming against the backdrop of uncertain economic conditions, the projected number of new jobs in 2014 is 8.5 lakh which is higher than the estimated 7.9 lakh employment opportunities created in the year 2013. All the opportunities have been projected in for the organised sector.

Besides FMCG, more jobs are expected in healthcare, IT, retail and hospitality sectors. Banking and financial services (61,400), manufacturing and engineering (51,500), education, training and consultancy (42,900), media and entertainment (42,800) and real estate (38,700) are also expected to create job opportunities.

According to the report of the Sixth Economic Census conducted by the National Statistical Commission, the number of employed persons in the country grew by 34.35 per cent to 12.77 crore in eight years period (2005-2013). The growth rate in employment at 34 per cent in eight years period is a

good rate as it had grown at an annual rate of over 4 per cent when the population is growing at around 2 per cent.

Employment in urban areas increased by 37.46 per cent to 6.14 crore in 2013 whereas in rural areas the growth was 31.59 per cent to 6.62 crore compared to 2005. The proportion of women in total workforce rose to 25.56 per cent in 2013 from about 20 per cent in 2005.

Taking all these into considerations it can be said that the future employment programmes of the country should be redressed in-such a manner so that it can meet requirements of the people with maximum utilisation of scarce resources. Moreover, considering the depth of the problem it can be safely said that the government cannot tackle this problem alone. Thus private sector should be fully involved in the employment programme of the country.

Accordingly, the Planning Commission should chalk out programme for the private sector in order to involve the sector into the employment generation programme of the country. Thus an appropriate joint strategy involving both the public sector and private sector is to be taken in order to tackle both the rural as well as urban unemployment of the country.

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## **Essay # 9. Is the New Economic Policy Promoting Jobless Growth?**

It is a very pertinent question—whether the New Economic Policy is promoting jobless growth in India. In the mean time, various studies have been made in this direction. Some of these studies are pointing affirmative answer to this question and again some other studies are pointing a different answer to this question.

It would be better to start with the following observation of Dr. L.C. Jain, former member, Planning Commission, “The gravest crisis Indian political, economic and social order faces today is in the mounting unemployment. Nothing exposes the barrenness of pure growth rate observed development strategies than the empirical results of the past decade in India. GDP has shot up from 3.5 to 5.3 in the period, but the employment growth rate has fallen from 2.82 during 1973-78 to 1.55 during 1983 to 1987-88. In agriculture, the

employment growth rate declined from 1.8 to an insignificant 0.07 in the 15 years period ending 1988.”

Another study made by Mr. Sudipto Mundle of the National Institute of Public Finance and Policy, New Delhi has simply shown the employment effects of New Economic Policy under two different assumptions of a high and a low growth situations.

The study revealed that by 1994, even with the achievement of high growth rate, this stabilisation and structural adjustment programme will increase “unemployment rate from less than 4 per cent in the current year (1991-92) to about 5 per cent in 1992-93. This implies extra unemployment of about 4 million persons in 1992-93 and the year after as a net consequence of stabilisation programme.”

In respect of high growth situation, Mr. Mundle has assumed growth rates of 3.9, 3.0 and 5.7 per cent for 1991- 92, 1992-93 and 1993-94 respectively. But the CSO estimates of GDP growth rates for these three years were—1.1 per cent for 1991-92, 4.0 per cent for 1992-93 and 3.8 per cent (advance estimates) for 1993-94.

Thus it is found that under structural adjustment programme, the actual growth rates of GDP are even lower than the growth rates assumed by Mr. Mundle. Accordingly, it can now be observed that the actual growth rates of unemployment are much higher than the growth rates predicted by Mr. Mundle.

With the introduction of New Economic Policy, the country has initiated the programme of technological upgradation leading to promotion of capital intensive technologies. This has resulted in fall in employment elasticities.

The study made by Mr. B.B. Bhattacharya and Arup Mitra on the employment elasticities of various sectors of the economy, on the basis of the data obtained from 1981 and 1991 censuses revealed that employment elasticity (as measured by the ratio of employment growth rate to income growth rate) of various sectors varied significantly.

Employment elasticity for the economy as a whole was estimated at 0.45 but the employment elasticity of the various sectors were as follows: primary sector—0.74, manufacturing sector— only 0.19, trade and commerce—0.37

and storage and communications—0.34. But this employment elasticity worked out by Mr. Bhattacharya and Mr. Mitra and the actual observed growth rates of GDP, the probable additions to employment were estimated.

Table 12.8 reveals that the total number of unemployed persons increases sharply from 11 million in 1990-91 to 17 million in 1991-92 and then to 19 million in 1992-93. Accordingly the rate of unemployment increased sharply from 3.1 per cent in 1990-91 to 5.1 per cent in 1992-93. This is no doubt an alarming situation.

Later on, as per NSSO survey it was revealed that the total number of unemployed persons in the country increased from 9.0 million in 1993-94 to 10.5 million in 1999-2000 and then to 13.1 million in 2004-05. Accordingly, the rate of unemployment also gradually increased from 2.62 per cent in 1993-94 to 2.78 per cent in 1999-2000 and then to 3.06 per cent in 2004-05.

Moreover, in India, the major portion of additional employment generation has come from unorganised sector and the organised sector has a little contribution in this regard. Unorganised sector provided employment at poor wage rates and was also relatively insecure as compared to organised sector.

Besides, the structural adjustment programme introduced in the organised sector has reduced its employment potential leading to retrenchment of workers in the organised sector. This increased the burden of unemployment through displacement of labour. Thus the structural adjustment programme may result in “undue hardships” for the people if implemented unimaginatively.

In India, faster economic growth would not be relevant unless it was job-oriented. India was not for “**jobless growth**” as it was not conducive to sustained economic development and might lead to social tensions.

The advocates of structural adjustment programme are of the opinion that due to liberalisation, privatisation and globalisation of the economy, there will be increase in the magnitude of unemployment in the short run but with the growing flow of foreign direct investment as well as domestic private investment, employment elasticity of different sectors will improve gradually in recent years.

But with the gradual disinvestment of the public sector and increasing capital intensity of the private corporate sector, chances of acceleration of growth of employment is almost nil. In India, the contribution of the corporate sector in employment generation is very poor.

In the mean time, although the GDP growth rate of the country are increasing gradually from 3.8 per cent in 1993-94 to about 5.5 per cent in 1994-95 but the rate of growth of employment achieved in the country is far from satisfactory.

As per one recent Government report, over 100 million job seekers will seek employment in the country. Therefore, substantial amount of additional employment opportunities per year will have to be generated in the remaining period of the Eighth Five Year Plan to eventually meet the goal of reducing unemployment to “negligible levels” by the year 2002.

But this is really a stupendous task and underscore the necessity of achieving a higher average annual growth rate of the economy than targeted in the Eighth Plan and vigorous pursuit of the employment strategies envisaged in different sectors of the plan.

At the outset of the Eighth Plan in 1992-93, open unemployment was estimated at 17 million, of which the educated accounted for seven million. Severe underemployment was estimated at 6 million. Thus, the backlog of unemployment for plan purposes was thus reckoned at 23 million in April, 1992.

The net additions to labour force during tile Eighth Plan (1992-97) and during 1997-2002 were estimated at 35 million and 36 million, respectively. Thus the

total number of people seeking employment will be 58 million during 1992- 97 and a little over 94 million over the 10 year period ending 2002.

At the end of March 1994, there were 37 million job seekers on the live register of employment exchanges in different parts of the country. In order to reduce this extent of unemployment to negligible levels by 2002 A.D., it implies that the employment should grow at the average annual growth rate of 2.6 to 2.8 per cent over this period.

Expansion of employment opportunities is an important objective of the Eighth Five Year Plan and the plan strategy lays emphasis on the faster growth of sectors, sub sectors and areas having employment potential to accelerate the employment growth.

Therefore, the Eighth Plan seeks to achieve 2.6 per cent rate of growth of employment corresponding to an average annual growth of Gross Domestic Product of 5.6 per cent as envisaged in the plan.

A relatively high rate of economic growth combined with a pattern of sectoral growth yielding a higher aggregate employment elasticity will be necessary for achieving the rate of employment growth envisaged. Raising employment in aggregate will require faster growth of sectors, the sub-sectors and the areas which have relatively high employment potential.

This is sought to be achieved by laying emphasis on crop-wise and geographic diversification of agricultural growth, wasteland development for crop cultivation and forestry, promotion of agro-based activities, rural non-farm activities, including rural industries.

It will also include decentralization of the small-scale sector, the urban informal sector and the services sector, expansion of rural infrastructure, housing and health and educational services, especially in rural areas, revamping of the training system and streamlining of the special employment programmes to integrate them with area development plans.

All these sectors and areas are identified as basic elements of an employment growth strategy.

Under the present circumstances, where the organised industry has created no new jobs in the last decade, and budgetary constraints mean that government

service has little extra job potential, agriculture alone cannot hold the key to additional job creation.

Rather, a growing body of evidence suggests that labour absorption in agriculture is gradually falling in many areas. In fact, there has been a veritable boom in non-farm employment of rural areas, i.e., in its construction, transport, trade and manufacturing.

Therefore, the major future thrust in additional job creation should probably be neither in agricultural sector nor in industry but in what Prof. R.P. Misra of the Delhi School of Economics termed it “urbanisation”—that indicates the urbanisation in rural areas. Historically, agriculture has resulted about 70 per cent of all jobs.

But in the latest period, 1986-92, for which NSS data are readily available only 11.7 per cent of males and 0.3 per cent of females entering the work force got farm jobs. Most of the remaining part of workforce went into construction, trade and manufacturing.

In 1983-88, about 70 per cent of females entering into workforce in rural areas found jobs in construction works. In the decade ending 1987-88, jobs in farming activities rose by only 0.74 per cent annually, which is barely one-third of the rate of growth of population of the country.

Prof. Shiela Bhalla of Jawaharlal Nehru University has come up with a startling finding that in five states—Uttar Pradesh, Rajasthan, Madhya Pradesh, Bihar and Tamil Nadu, farm employment has been actually falling with the rise in their yield rates.

This type of finding negates the conventional ideas that employment goes on rising with production. These five states account for nearly half of the population of the country. Naturally, it is time for considerable rethinking on agriculture as an avenue of employment.

Prof. Bhalla's research shows that new technology is not the problem. In more than 90 per cent of cases, farmers started to adopt economizing on labour whenever real wages rose and this so happened whether or not the farmers mechanised their farms.

The most important reason behind such rise in real wages in rural areas is that non-farm jobs are paying much more wages in rural areas, and this has simultaneously drawn labour away from farming and pushed up farm wages significantly.

It is seen from the above observation that the main factor responsible for slow growth of employment is the capital intensive method of production. It is also expected that private participation would give a fillip to the growth of employment in the medium term.

But it is known to everybody that the private investment from Indian Corporate sector or foreign direct investment from multinationals is very much capital-intensive.

Therefore, under such a capital-intensive strategy employment generation at a quicker pace is impossible. Besides, the idea of "**growth of employment in the medium term**" is also in vogue. Thus under such a situation it is quite necessary to finalize the strategy of growth of employment in the country concretely, otherwise the economy of the country will proceed towards a jobless growth leading to social tensions.

Addressing the fifth conference of the Labour Ministers of non-aligned and other developing countries on January 20, 1995, the then Finance Minister, Dr. Manmohan Singh asserted that the economic reforms unleashed in 1991 had the support of the "**broad mass**" of population, particularly the labour force, as the Government realised that mass support was the pre-requisite for their success.

Observing that three odd years was too short a period to judge the success of any economic reform programme in such a big and diverse country like India, Dr. Singh said that the positive impact could be gauged from the fact that India was not only able to pull out itself from serious imbalances on financial and external sectors but had embarked on balanced growth on all fronts.

Dr. Manmohan Singh further observed, in this connection, "**All our reforms aim at achieving a rapid and sustained growth of output and employment. Liberalization is being pursued keeping in view the comparative advantage the country had in labour-intensive methods of production.**"

Therefore, economic reforms which would bring with them modernization, upgradation and introduction of new technologies—might cause some job losses on one hand. On the other, however, job opportunities would expand because of the growth of the economy and fresh investments.

Moreover, higher outlays had been provided in the Eighth Plan in the agriculture, rural development, village and small industries and environment sectors with the aim of providing better job opportunities.

In the meantime, a sign of hope has been noticed. In 1991-92, total employment grew by only 3 million but in 1992-93 and 1993-94 employment increased twice as fast, i.e. 6 million new jobs added each year. The increase is expected to be higher in 1994-95.

As per one recent estimate, new enterprises in India provided 17 million fresh jobs in 2003, the second highest in the world after China where 84 million employment opportunities were created in the new enterprises.

This estimate is made by Global entrepreneurship Monitor report of the London School of Business. According to the report entrepreneurship in India rose marginally in 2003 over the previous year. Nearly 18 per cent of India's population in the age group of 18 to 64 is engaged in some sort of entrepreneurial activities.

However, downsizing of the government has also created a serious impact on the employment scenario of the country.

As on December, 2003, the central government had identified about 55,000 posts for abolition in various ministries and departments in line with the recommendations of the Expenditure Reforms Commission (ERC) and over 25,000 posts were abolished in different ministries and departments, including Information and Broadcasting and Petroleum.

The ministries and departments concerned identified 24,000 posts for immediate abolition.

Moreover, a wave of Voluntary Retirement Schemes (VRS) and closure of industrial units led to shrink in jobs in the organised sector by over 4.2 lakh in 2001-02. Apart from this, the reduction in jobs in the organised sector has been going on continuously for five years.

While presenting a grim picture of the job scenario in the organised sector, the recent study made by the government says, the total employment in the public sector as on March 31, 2001 was over 277.54 lakh which came down to 273.32 lakh on March 31, 2002.

As per the latest quick estimates of employment available with the Directorate General of Employment and Training of the Labour Ministry, though the decline is to the extent of only 1.5 per cent during the prior under review, what is of more concern is the fact that reduction in jobs in the organised sector has been going on continuously five years.

In case of women, the employment in the States and Union Territories during the said period under review fell by 35,000 from 50.71 lakh on March 31, 2001 to 50.36 lakh on March 31, 2002.

The report further observes that with a whopping 97 per cent of the country's total work force eking out a living in the unorganised sector, the organised sector accounts for a meagre seven per cent of the overall employment in the country.

The reasons cited for the decline in the organised sector jobs include closures of industrial units and a wave of Voluntary Retirement Scheme in an effort to "**right size**" PSUs. Public sector banks shed over 1.0 lakh jobs between 2000-01 and 2001-02 through VRS. Official figures show that nearly 90,000 employees in various PSUs took VRS in 1999-2000 and 2000-01.

It would be better to look into the estimates of employment generation in India in recent years from the Table 12.9.

**TABLE 12.9. Estimates of Employment**

Year	Total Employment (million)	Annual Percentage increase in total employment	Additional Employment Generated (million)
1989-90	292.89	—	—
1990-91	298.73	1.99	5.84
1991-92	301.73	1.00	3.00
1992-93	308.31	2.18	6.58
1993-94	313.33	1.63	5.02
1994-95	320.51	2.29	7.18
1996-97	389.70	2.47	—

*Source :* Planning Commission (Reproduced in Economic Survey, 1995-96, p.182) and 1997-98, p. 138.

Table 12.9 reveals that the country experienced an increasing trend in

additional employment generation, i.e., from 3.00 million in 1990-91 to 7.18 million in 1994-95.

The annual percentage increase in total employment registered an increasing trend from 1.00 per cent in 1991-92 to 2.18 per cent in 1992-93 and thereafter registering a decline of 2.29 per cent in 1994-95, the rate of increase in employment further increased to 2.47 per cent in 1996-97.

The Economic Survey, 1995-96 made the following observation in connection with the employment generation during the post-reform era. “By according the highest priority to labour intensive growth in its economic reform policies, the additional employment increased from 3.00 million in 1991-92 to 7.18 million in 1994-95. Additional employment opportunities of the order of 18.48 million were generated during 1992-93 to 1994-95. This implied an average rate of employment growth at 2.03 per cent per annum, which is higher than the annual average rate of employment growth of 1.78 per cent during the preceding seven years (1985-92). These trends are reassuring that the employment content of growth has increased in the process of economic reforms.”

In the mean time, various employment generating schemes have been introduced in India during this period of economic reforms. Now it is to be seen how far all these schemes are implemented properly and can provide additional job opportunities practically.

If all these schemes failed to provide sufficient number of job opportunities then it may lead to a situation similar to “jobless growth” which might lead to social tensions.

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## **Essay # 10. Global Economic Recession and its Impact on Unemployment Problem in India:**

After facing the brunt of the Great Depression of 1930, the world economy again started to experience the current recessionary trend in its economic activity since 2007 along with a serious degree of financial turmoil.

The current recession has once again shown its ugly need with a slump in aggregate demand in most of the developed and developing countries of the

world especially in industries related to motor vehicles, electronics, consumer durables, textiles, realty sector etc.

The first sign of recession was experienced in USA in December 2007 and that has gradually deepened in US and other countries of the world under the present regime of globalisation.

Indian economy has also started to face the brunt of global recession in 2008-09. As a result, the growth rate attained by the industrial sector has come down from 11.2 per cent in 2006-07 to mere 3.0 per cent in 2008-09. The global recession has seriously affected some of our export oriented industries leading to huge laying off of workers.

India's export oriented leather industry employing 2.5 million workers would be forced to lay off around 5.0 lakh workers with the worsening scenario in USA and Europe. Similar threat is apprehended in vehicle industry, diamond Jewellery industry, garments industry, readymade garments industry, handicrafts industry etc.

Impact of the economic recession was also felt in terms of job losses in different industries. Industry Department opined the impact of job losses to the extent of over 10.0 lakh in the handicraft sector and another 10.0 lakh in the textile sector in the years that followed.

The Labour Bureau of the Ministry of Labour and Employment conducted a survey on the economic slowdown on employment in India. A sample size of 2581 units taken from eight major sectors, covering 20 centres across 11 states were taken up for the survey.

The survey report reveals that the total employment in all these eight sectors had come down from 16.2 million in September 2008 to 15.7 million by December 2008 showing a total job losses of 5.0 lakh during this three month period.

However, the scenario of lay-offs would be much more serious in the coming months. According to the latest study made by Citigroup, the country does not appear to have remain unscathed from the massive lay-offs witnessed throughout the world and the extent of unemployment could rise further with the home coming of migrant workers or declining remittances from abroad.

The report further stated that although there is a job loss of about 5.0 lakh during the three month period (Oct—Dec. 2008), with export oriented sectors such as genes and jewellery and textiles being most impacted but this statistics only covers the organised sectors which comprises just 10 per cent of the country's work force close to 385 million.

Although India's unemployment rate is officially stated at 8.2 per cent but the extent of disguised unemployment prevailing especially in rural areas can magnify the problem into serious proportion.

However, employment opportunities in 2009-10 were affected by the global financial crisis and economic slowdown in India. While comprehensive employment data for the year are not available, some sample surveys conducted by the Labour Bureau, Ministry of Labour and Employment, indicated employment losses in the wake of global financial crisis and economic slowdown.

The Government was concerned about the possible impact of financial crisis on the Indian economy, including employment and several measures, financial and fiscal, were taken. Sample survey of the Labour Bureau indicated job gains in the sectors covered.

Thus, even on the basis of this small sample, estimated employment in the selected sectors had experienced a net addition of 1.51 lakh during the last one year from October 2008 to September 2009. However, the situation has improved in India in recent years due to stimulus packages provided by the government and improvement in global scenario.

### **Government Employment Generation Schemes in India**

Some of the flagship programmes of employment generation being implemented by the Central government are:

#### **[Swarnjayanthi Gram Swarojgar Yojana \(SGSY\)](#)**

It was launched in April 1999 as a major programme for self-employment of the rural poor after restructuring the then existing Integrated Rural Development Programme (IRDP) and combining it with other allied schemes like TRYSEM, DWCRA, SITRA, GKY and Million Wells Scheme for effective implementation under a single banner called SGSY.

#### **[Prime Minister's Employment Generation Programme \(PMEGP\)](#)**

The scheme was announced by the Prime Minister on 15 August, 2008 in his address from the Red Fort. This is credit linked scheme formed by merging erstwhile REGP and PMRY scheme.

KVIC is the nodal agency at the national level.

Its main aim is to generate continuous and sustainable employment opportunities in rural and urban areas of the country.

#### **Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)**

MGNREGA guarantees 100 days of employment in a financial year to a rural household whose adult members are willing to do unskilled manual work. This Act is an important step towards the realisation of the right to work. It is also expected to enhance people's livelihood on a sustained basis, by developing the economic and social infrastructure in rural areas.

#### **Swarna Jayanti Shahari Rozgar Yojana (SJSRY)**

This scheme came into effect on 1 December 1997 with an aim to provide gainful employment to the urban unemployed and under-employed poor by encouraging them to set up self-employment ventures.

The government has launched this rationalised SJSRY to replace the three existing schemes -- Nehru Rozgar Yojana (NRY), Urban Basic Services for the Poor (UBSP), and PM's Integrated Urban Poverty Eradication Programme (PMI UPEP).

#### **Pradhan Mantri Gram Sadak Yojana (PMGSY)**

The scheme comes under the authority of the ministry of rural development and was begun on 25 December 2000.

The goal was to provide roads to all villages (1) with a population of 1,000 persons and above by 2003, (2) with a population of 500 persons and above by 2007, (3) in hill states, tribal and desert area villages with a population of 500 persons and above by 2003, and (4) in hill states, tribal and desert area villages with a population of 250 persons and above by 2007.

#### **Samagra Awas Yojana (SAY)**

Launched in 1999-2000, this is a comprehensive housing scheme with a view to ensure the integrated provision of shelter, sanitation and drinking water. The basic objective of SAY is to improve the quality of life of the people as well as the overall habitat in rural areas.

#### **Pradhan Mantri Gramodaya Yojana (PMGY)**

PMGY was launched in 2000-01 in order to achieve the objective of sustainable human development at the village level. The PMGY envisages allocation of additional central funds to the states for basic minimum services in order to focus on certain priority areas. PMGY has five components, namely primary health, primary education, rural shelter, rural drinking water and nutrition.

#### **Sampoorna Grameen Rozgar Yojana (SGRY)**

SGRY was launched in September 2001 by merging the erstwhile schemes of Jawahar Gram Samridhi Yojana (JGSY) and Employment Assurance Scheme (EAS). The objective is to provide additional wage employment in the rural areas and food security, along with the creation of durable community, social and economic infrastructure in rural

areas. The SGRY is open to all rural poor in need of wage employment and desire to do manual work.

#### Rural Housing Schemes

Rural housing schemes such as Indira Awaas Yojana (IAY) aim at providing dwelling units, free of cost to the poor families of the SCs, STs, freed bonded labourers and also the non- SC/ST persons living below poverty Line (BPL) in the rural areas. The scheme is funded on a cost-sharing basis of 75:25 between the Centre and states.

#### Antyodaya Anna Yojana (AAY)

AAY was launched in December 2000. Under the scheme, one crore of the poorest among the BPL families covered under the targeted PDS are identified and 25 kg of food grains were made available to each eligible family at a highly subsidized rate of Rs 2 per kg for wheat and Rs 3 per kg for rice. This quantity has been enhanced from 25 to 35 kg with effect from April, 2002.

#### Annapurna

Launched with effect from 1st April, 2000, it aims at providing food security to meet the requirement of those senior citizens who, though eligible, have remained uncovered under the national old age pension scheme (NOAPS).

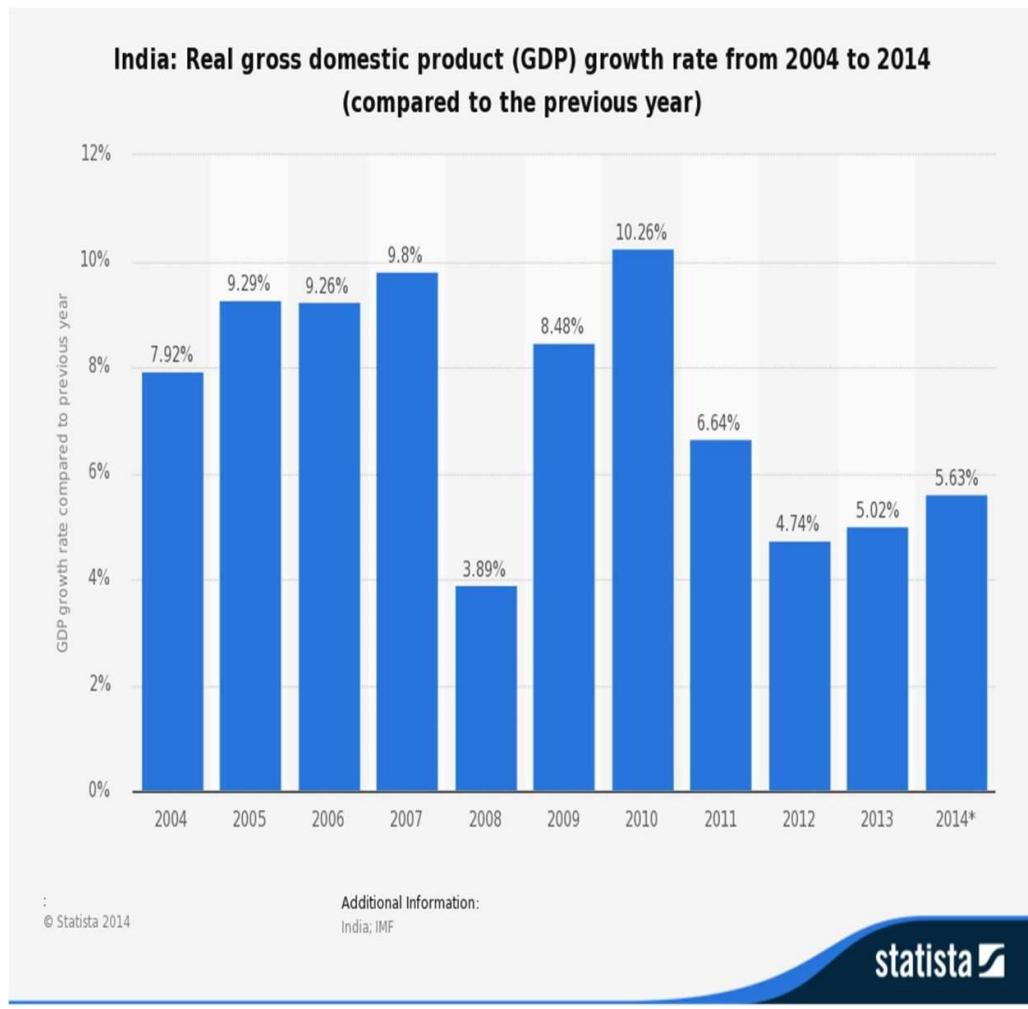
The scheme is targeted to cover 20% of persons eligible to receive pension under NOAPS. Funds are released to the food and civil supplies department of the state governments in one instalment. This department ties up with Food Corporation of India (FCI) to release food grains district-wise after payment at central issue price (CIP) at FCI offices.

#### Valmiki Ambedkar Awas Yojana (VAMBAY)

VAMBAY was kicked off in December 2001 targeted to improve the living conditions of the urban slum dwellers living below the poverty line without adequate shelter. The scheme has the objective of facilitating the construction and up-gradation of dwelling units for slum dwellers. Besides, it offers a healthy environment through community toilets under Nirmal Bharat Abhiyan, a component of the scheme. The Centre offers a subsidy of 50%, the balance 50% is arranged by the state government.

## Unit 4<sup>th</sup>

# India - Economic Growth and Development



## Indian Economic Growth

- India has sustained rapid growth of GDP for most of the last two decades leading to rising per capita incomes and a reduction in absolute poverty. Per capita incomes (measured in US \$) have doubled in 12 years
- But India has one third of all the people in the world living below the official global poverty line.  
It has more poor people than the whole of sub-Saharan Africa
- Per capita income is \$1,270, placing India just inside the Middle Income Country category
- India's per capita income is 1/20th that of the UK
- Life expectancy at birth is 65 years and 44% of children under 5 are malnourished. The literacy rate for the population aged 15 years and above is only 63% compared to a 71% figure for lower middle income countries.
- Despite a strong attempt to become an open economy, exports of goods and services from India account for only 15% of GDP although this will rise further in the years ahead
- India runs persistent trade and fiscal deficits and has suffered from high inflation in recent years □ India's growth rate has slowed and high inflation is a constraint on competitiveness and growth.

- Investments by Indian businessmen abroad have overtaken foreign direct investment for the first time – reflecting a lack of confidence among Indian entrepreneurs about their home economy

## Development path

India has followed a different path of development from many other countries. India went more quickly from agriculture to services that tend to be less tightly regulated than heavy industry.

That said there are some emerging manufacturing giants in the Indian economy.

## Supply-side factors supporting Indian growth and development

1. A fast-growing population of working age. There are 700 million Indians under the age of 35 and the demographics look good for Indian growth in the next twenty years at least. India is experiencing demographic transition that has increased the share of the working-age population from 58 percent to 64 percent over the last two decades.
2. India has a strong legal system and many English-language speakers – this has been a key to attracting inward investment from companies such as those specialising in IT outsourcing.
3. Wage costs are low in India and India has made strides in recent years in closing some of the productivity gap between her and other countries at later stages of development.
4. India's economy has successfully developed highly advanced and attractive clusters of businesses in the technology space – witness the rapid emergence of Bangalore as a hub for global software businesses. External economies of scale have deepened their competitive advantages in many related industries.

## Growth and Development Limiters for India

Despite optimism for India's prospects for economic growth and development, there are a number of obstacles which may yet see growth and development falter.

- Poor infrastructure - notably in transport and power networks
- Low productivity and weak human capital. A high % of workers are low-skilled and work in small businesses
- High inflation and a persistent trade deficit
- Low national savings as a share of GDP, low share of capital investment
- Relatively closed economy - India is a net importer of primary products

## Indian Development – An Infrastructure Gap

India is a good case study to use when discussing the problems that persist when a country cannot rely on adequate critical infrastructure such as roads, railways, power and basic sanitation. India wants to build \$1 trillion worth of infrastructure in the next five years but the government expects the private sector to fund half of it – this is unlikely! Poor infrastructure hurts the Indian economy in numerous ways:

1. Causes higher energy costs and irregular energy supplies for nearly every business and especially India's emerging manufacturing sectors – there were huge power blackouts in 2012

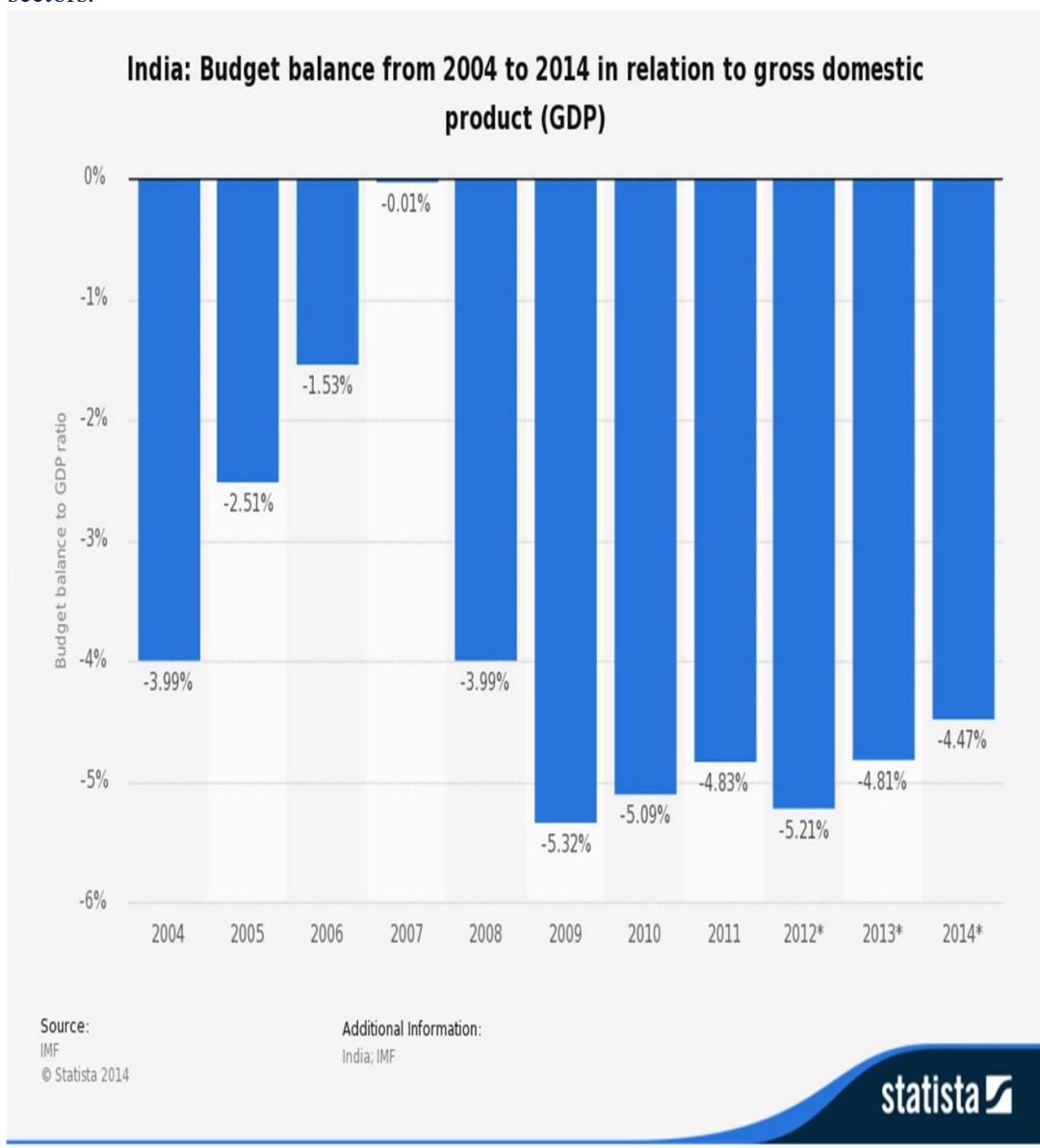
2. It is more expensive to transport products across the country and it creates delays at ports hamper export businesses and delays at airports which increases the cost of international freight.
3. It makes India less attractive to inward FDI
4. It adds to the cost of living and limits the extent to which millions of India's lowest income families can escape extreme poverty
5. A creaking infrastructure damages the reputation and potential of India's tourism industry

Despite these growth constraints, India's expansion far exceeds that of the vast majority of developed nations – to put this into some context, India is delivering 30 years of US economic advance every ten years!

### Relative importance of services in India

- One of the key differences for India contrasted with countries such as China, Japan and South Korea is that the Indian economy is heavily reliant on service industries especially in her export sector
- The country has a comparative advantage in many service industries such as business software.
- One consequence of this structural difference in the economy is that India has not yet seen the rapid urbanization experienced in other nations; more than 60 per cent Indians still live in rural areas.
- Productivity growth in Indian agriculture has been fairly low and this has limited the potential to release people from the land to move into towns and cities and find work in manufacturing

sectors.



India's

### Budget Deficit

#### Cleaning the Ganges

In a report on India in the Financial Times in 2012, it was claimed that "India's failure to adopt enough of the large-scale, labour-intensive manufacturing that has propelled the successful development of China and other east Asian countries is now regarded as one of the greatest weaknesses of the Indian economy." India's growth has been impressive in recent years but this is a country whose development is hampered by endemic structural problems. India requires significant investment in infrastructure, manufacturing and agriculture for the rapid growth rates of the last fifteen to twenty years to be sustained.

Poverty Estimation In India –

C Rangarajan and Tendulkar Committee – Hello friends welcome To StudyDhaba.com .Here We are Sharing One Of the Most important issue – Poverty Estimation in India.

### Poverty Estimation In India

- Poverty in India is Big issues for Government .
- To Measures Exact numbers of Poor People And Per capita expenditure various methods Had been adopted by Government of India.
- The official measure of Indian government, before 2005, was based on food security and it was defined from per capita expenditure for a person to consume enough calories and be able to pay for associated essentials to survive.
- Since 2005, Indian government adopted the Tendulkar methodology which moved away from calorie anchor to a basket of goods and used rural, urban and regional minimum expenditure per capita necessary to survive.
- The Planning Commission has been estimating the number of people below the poverty line (BPL) at both the state and national level based on consumer expenditure information collected as part of the National Sample Survey Organization (NSSO) since the Sixth Five Year Plan.
- The latest available data from such surveys is from NSSO conducted in 2004-05.

### Government Of India Formed various Committees for Poverty Estimation In India

1. Alagh Committee (1977),
2. Lakdawala Committee (1989)
3. Tendulkar Committee (2005)
4. Saxena committee
5. Hashim Committee
6. C . Rangarajan Committee ( 2012)

### Tendulkar committee report on poverty

In 2005, another expert group to review methodology for poverty estimation, chaired by Suresh Tendulkar, was constituted by the Planning Commission to address the following three shortcomings of the previous methods:

1. consumption patterns were linked to the 1973-74 poverty line baskets (PLBs) of goods and services, whereas there were significant changes in the consumption patterns of the poor since that time, which were not reflected in the poverty estimates;
2. there were issues with the adjustment of prices for inflation, both spatially (across regions) and temporally (across time); and
3. earlier poverty lines assumed that health and education would be provided by the State and formulated poverty lines accordingly

It recommended four major changes: List of Recommended Changes are Given below

1. A shift away from calorie consumption based poverty estimation;
2. A uniform poverty line basket (PLB) across rural and urban India;
3. A change in the price adjustment procedure to correct spatial and temporal issues with price adjustment; and
4. Incorporation of private expenditure on health and education while estimating poverty.

The Committee recommended using Mixed Reference Period (MRP) based estimates, as opposed to Uniform Reference Period (URP) based estimates that were used in earlier methods for estimating poverty.

It based its calculations on the consumption of the following items: cereal, pulses, milk, edible oil, non-vegetarian items, vegetables, fresh fruits, dry fruits, sugar, salt & spices, other food, intoxicants, fuel, clothing, footwear, education, medical (non-institutional and institutional), entertainment, personal & toilet goods, other goods, other services and durables.

The Committee computed new poverty lines for rural and urban areas of each state. To do this, it used data on value and quantity consumed of the items mentioned above by the population that was classified as poor by the previous urban poverty line.

It concluded that the all India poverty line was Rs 446.68 per capita per month in rural areas and Rs 578.80 per capita per month in urban areas in 2004-05. The following table outlines the manner in which the percentage of population below the poverty line changed after the application of the Tendulkar Committee's methodology.

Poverty Line Estimation In India . Comparison Given below read and Understand both Methods of Poverty Estimation in India

Committees	Tendulkar	C Rangarajana
Set Up By	Planning Commission	Planning Commission
Set Up In	2005	2012
Committees	Tendulkar	C Rangarajana
Submitted Report	2009	2014
Poverty Estimation Method	Per capita Expenditure Monthly	Monthly Expenditure of family of five.
Urban Poverty Line Per Day per Person	33	47

Urban Poverty Line Per Month per Person	1000	1407
Urban Poverty Line Per Month, Family of Five Members	5000	7035
Rural poverty line Per Day Per Person	27	32
Rural poverty line (Rs) per Month Per Person	816	972
Rural poverty line (Rs) Per month Family Of Five Members	4080	4860
BPL ( Below Poverty Line ) In crore	27 crore	37 crore
Calorie Expenditure	only calorific value in Expenditure	Calorie +Protein + fat
Calories In Rural Areas	2400	2155
Calories In Urban areas	2100	2090
Main Focus Areas	Only counts Expenditure on food, health, education, clothing.	1-food 2- nonfood items such as education, 3-healthcare, 4-clothing, C Rangarajana
Committees	Tendulkar	5-transport 6-rent. 7- non-food items that meet nutritional requirements.

- C Rangarajan Committee Was Set up By Planning commission In 2012 And Submitted Report In 2014.
- The Planning commission had set up the five-member expert group under Rangarajan to review the methodology for measurement of poverty.

- The committee was set up in the backdrop of national outrage over the Planning Commission's suggested poverty line of Rs 22 a day for rural areas.
- The Rangarajan committee estimation is based on an independent large survey of households by Center for Monitoring Indian Economy (CMIE).
- It has also used different methodology wherein a household is considered poor if it is unable to save.
- The methods also include on certain normative levels of adequate nourishment, clothing, house rent, conveyance, education and also behavioral determination of non-food expenses.
- It also considered average requirements of calories, protein and fats based on ICMR norms differentiated by age and gender.
- Based on this methodology, Rangarajan committee estimated the number of poor were 19 per cent higher in rural areas and 41 per cent more in urban areas than what was estimated using Tendulkar committee formula.
- Tendulkar, an economist, had devised the formula to assess poverty line in 2005, which the Planning Commission had used to estimate poverty in 2009-10 and 2011-12

## Economic Inequality in India: Levels, Causes

### Economic Inequality

A wealthy business-person and a comfortably-off college/university lecturer are materially unequal but a lecturer is not poor. Social inequality means that certain individuals or groups have more material resources than others. Poverty implies some insufficiency in the material resources of an individual or group. There is considerable disagreement about the concept of 'poverty'. Is not being able to afford scooter poverty? Is not being able to send one's child to a good English-medium school poverty? Some might include such situations in poverty, but others may hold that such situations involve inequality rather than poverty.

The exploitation of the poor by the rich can be contained by reducing the level of inequality between the rich and the poor, which in turn depends upon reducing poverty through economic reforms. If economic reforms bring about steady and sustained growth in the economy (which, in fact, is their main objective), the poor could benefit in two ways. First experience has shown that growth (particularly the agricultural growth) trickles down to the poor. Second, sustained growth creates an environment which is, on the whole, congenial for empowerment of the poor. The dependence of the poor on the groups dominating them becomes less precarious owing to expansion of opportunities for employment, education, occupational mobility, and for achieving higher social status. The poor would also find it easier to mobilise for political action at the same time as

pragmatic considerations induce a mood favouring accommodating the poor among the groups confronting them.

It may be pointed here that the economic reforms undertaken so far have definitely helped achieve some stable and sustained growth. The Economic Survey presented in the parliament in May 1998 had shown that growth was not adequate. But, the figures now show that we did fairly well in the last one decade or so. The growth of GDP is now rising. There is increase in the growth rate in agriculture as well as industry.

Agricultural production in 1999-2000 is expected to be more by 6.5 per cent in comparison to 1998-99. There has been little increase in the export growth. Inflation was just 1.7 per cent in first week of August 1999. Thus, though the economic reforms are taking place, yet many support measures are needed to make them work effective.

## Monetary Policy and Fiscal Policy of India

Monetary policy in a planned economy of India cannot be framed independently of fiscal policy as achieving growth with price stability are the objectives of both these policies. In India the Reserve Bank of India has often adopted accommodative monetary policy to Government's fiscal policy.

Prior to 1991 when economic reforms were initiated the basic goal of monetary policy was to neutralize the impact of large fiscal deficits of the Government. To boost public sector investment for accelerating economic growth there was large increase in Government expenditure under various Five Year plans which was financed by borrowing by the Government and deficit financing (i.e., monetisation of budget deficit).

Both Government borrowing from the market and deficit financing leads to the increase in aggregate demand and have therefore potential for causing inflation. Therefore, to ensure adequate funds to meet the borrowing requirements of the Government the statutory liquidity ratio (SLR) of the banks was raised to the maximum limit of 38.5 per cent. That is, banks were to buy government securities to this extent.

Besides, to check inflation, cash reserve ratio (CRR) of banks was raised to a high level of 15 per cent. The high cash reserve leaves less funds with the banks to lend to the private commercial sector. In this way large expansion of credit for private sector was prevented.

To quote C. Rangarajan the former Governor of the Reserve Bank of India, “Until the overall reforms process was initiated in 1991 the basic goal of monetary management took the form of compensatory increase in the cash reserve ratio (CRR) for banks, controls on the growth of commercial credit (mainly to the private enterprises sector) and adjustments of administered interest rates. The fixation of CRR and SLR at their maximum levels crowded out credit for the commercial sector. Thus, even when money supply was growing at a rapid rate, private sector could not get the needed credit for financing industry and trade”.

Explaining the monetary policy adopted prior to reform process of 1991, Dr. Y.V. Reddy, also a former Governor of the Reserve Bank of India writes, “given the command and controlled nature of the Indian economy, the RBI had to resort to direct instruments like interest rate regulation selective credit control and cash Reserve Ratio (CRR) as major policy instruments. These instruments were used to neutralize the monetary impact of the Government’s budgetary operations”.

In the recent post-reform years, mainly, 2008-09 accommodative nature of monetary policy to the Government’s fiscal policy may be noted. In October 2008, a severe global financial crisis gripped the world economy following from the bankruptcy of Lehman’s brothers in the US. This affected the growth of our exports and also led to the capital outflows from the Indian economy leading to the depreciation of the Indian economy and crash in Indian stock market. As a result, industrial and overall growth of the Indian economy started declining.

To check the economic slowdown the Government increased its expenditure, especially on infrastructure projects, and cut indirect taxes such as excise duty service tax to boost private sector investment and expenditure. To supplement and accommodate Government expansionary policy, the Reserve Bank reversed its earlier tight monetary policy in October 2008 and to boost private sector investment it reduced its repo rate from 9 per cent in July 2008 to 7.5 per cent in Oct. 2008 and further to 4.75 per cent in March 2009.

Similarly, RBI reduced cash reserve ratio (CRR) from 9 per cent in July 2008 to 6.5 per cent in Oct. 2008 and further to 5 per cent in March 2009 to make more funds available with banks to buy Government securities for financing its borrowing and also to the private sector for expanding investment.

Thus, the RBI’s monetary policy has been accommodatory in the sense that it provided support to Government’s fiscal stimulus package to promote investment and growth. When in the later half of 2009-10 inflation rate again started rising the RBI began the process of withdrawing from the accommodative monetary policy stance in Oct. 2009 and started tightening its monetary policy to fight inflation.

## Centre-State Financial Relations in India

The distribution of powers in countries adopting the federal system of government defines the financial relations between the Central and State governments.

However, there are some special problems that have to be solved within the federal financial system in determining the basis of division and the amount that should be divided between the Centre and the State.

**Development of Thought:**

The Indian Constitution provides for the appointment of a Finance Commission every five years to determine the criteria and amount of finance to be divided between the Centre and the States. Transfer of resources takes place in the following three ways: share in taxes and duties, grants and loans.

However transfers through the Finance Commission contribute only about one-third of the total transfers from the Centre to the States. The rest are channeled through the Planning Commission and discretionary grants from the Centre to the States.

This has led to arbitrary distribution with backward states suffering a disadvantage and has led to an erosion of state autonomy. The revenue raising capacity of the states is also restricted because of the nature of the taxes assigned to them.

The scope of the Finance Commission should therefore be enlarged to reduce the interference of the Centre in the financial management of the States. In the context of raising revenues the recommendation of the Tenth Finance Commission to increase the role of industry, needs to be seriously considered.

**Conclusion:**

Ultimately the basic issue is efficiency in fiscal management and self restraint. In the context of resources mobilization, the tax structure needs to be rationalized and tax evasion and other loopholes need to be plugged.

Before the question of division of finances between Centre and State arises, it is necessary to determine the basis of division and the amount that should be divided.

The Indian Constitution recognizes that due to changing needs and circumstances it might become necessary to change the criteria and amount of division between the two levels of government (Centre and State) from time to time. Hence it did not lay down any hard and fast rules in this regard.

Instead it provided for the appointment of a Finance Commission at the expiry of every year or earlier, if necessary, to investigate these questions.

The Commission appointed under Article 280 of the Constitution and is entrusted with the task of recommending;

- (i) The distribution between the Union and the States of the net proceeds of taxes which are to be, or may be, divided between them and the location between the States of the respective shares of such proceeds;

- (ii) The principles which should govern the grants-in-aid of the revenue of the States out of the Consolidated Fund of India; and
- (iii) Any other matter referred to the Commission by the President in the interests of sound finance.

The Ninth Finance Commission was appointed with N.P.K. Salve as deputy chairman in June 1987. It submitted its Second Report in December 1989. The Tenth Finance Commission was constituted with the deputy chairmanship of K.C. Pant.

The Finance Commissions have concerned themselves with allocating net proceeds from income tax, Union excise duties, additional duties of excise, estate duty in respect of property other than agricultural land, grants in-aid in lieu of jute export duty (issue that concerned the first two Commissions only), taxes railway fares and freights (levied for the first time in 1957), and grants-in-aid to fill in the budgetary gaps of the States.

In addition, some Finance Commissions gave grants for up gradation of standards of administration. The Sixth and Seventh Finance Commissions were also asked to undertake a general review of the State's indebtedness to the Centre and examine the policy and arrangements in regard to the financing of relief expenditure.

The Twelfth finance commission with Mr. M.S. Ahluwalia as Deputy Chairman is moving ahead with economic reforms.

The main taxes shared between the Centre and the State governments are the income tax and the Union excise duties though recommendations regarding some other taxes (e.g. estate duty) are also generally made.

The principle that has been followed in deciding this division is that taxes likely to have an effect upon the economic life of the country as a whole are levied by the Centre while taxes which have no effect in States other than the known ones from which they are collected are levied by the States.

However, since 10 per resources of the Central government yield a substantial surplus, while

State governments experience heavy deficits, a mechanism of transfer of resource from the Centre to the States has been provided. In addition to this, Article 275 those of the Constitution provides for grants-in-aid to the States in need of assistance.

Different sums can be fixed for different States, so that the weaker States can be given specific assistance to meet the necessary expenditure in the proper discharge of their duties to the people. Article 282 provides for grants by the Union government to the State governments for any public purpose. Under Article 275 grants-in-aid are fixed on the advice of the Finance Commission, while under Article 282 grants can be fixed by the Central government on its own discretion. The States governments also borrow from the Centre to carry out the various developmental and rehabilitation programmes. Thus transfer of resources from the Centre to the State government takes place in the following three ways-(i) share in taxes and duties, (ii) grants, and (iii) loans. In addition to transfer of resources from the Centre to the States according to the recommendations of the Finance Commission, there are two other sources of transfer- (i) assistance for Plan purposes from the Planning Commission, and (ii) discretionary grants from the Centre to the States.

These sources of transfer have contributed substantially more resources than statutory transfers (which are transfers through the Finance Commission) and reflect the considerable power that the Central government enjoys in influencing the decision-making process at the State level. For most of the period of planning, statutory transfers have remained less than one-third of total transfers, the remaining two-thirds having

been contributed by the Planning Commission as assistance for Plan purpose or by the Central Government under the head of ‘discretionary grants’.

There were no objective criteria to decide the distribution of non-statutory transfers and this introduced an element of arbitrariness in the whole scheme. Everything depended on what the Centre thought about the needs of the States. Basically, Plan assistance was meant to enable the State to undertake certain schemes according to Plan priorities.

In actual practice, however, the States were presented with a choice of schemes-each with predetermined proportions of loans and grants assistance.

Though the Planning Commission had no statutory basis (as against the Finance Commission which is an ad quennial body statutorily set up to recommend devolution of resources from the Centre to the States), it tended to take up the functions of the Finance Commission and for a considerable period of planning, has remained the more important source of transfer. Since it was not guided by any objective criteria, the whole scheme introduced arbitrariness in the determination of resource transfers.

It was only from 1969-70 onwards that objective criteria were adopted for the Plan assistance among the States. The formula used for the purpose was known as the Gadgil formula which gave 60 per cent weight age to population, percent to per capita income if below national average, 10 per cent of tax effort in relation to per capita income, 10 percent to continuing major and medium irrigation projects, and 10 per cent to special problems of individual States (like relating to metropolitan areas, floods, chronically drought affected areas tribal areas).

Under the new formula, it is stated that 30 per cent of total Plan assistance would be given in the form of grants and 70 per cent in the form of This provision did not apply to Jammu and Kashmir, Assam and North- Eastern States in whose case 10 percent was to be given in the form of loans and rest 90 per cent in the form of grants.

In its meeting held in August 1980, the National Development Council accepted a modified Gadgil formula raising the percentage of resources to be transferred to the States whose per capita income was less than the national average from 10 per cent to 20 per cent. Under the modified Gadgil formula 60 percent of the assistance is to be given on basis of population, 20 per cent the States having per capita income below the national average, per cent on basis of per capita tax effort and 10 per cent for special problems.

The Constitution provides for division of financial powers between the Centers the States. However the revenue-raising capacity of the States is restricted use of the nature of taxes assigned to them. Since land is limited, the scope increasing land revenue is also limited. Similarly, taxes on agricultural income, excise duties on intoxicants, taxes on motor vehicles, entertainments, etc., are comparatively less elastic than the taxes assigned to the Centre. Sales Tax the only tax levied by the States which has substantial elasticity.

Because of economic progress registered by the country in the last three decades, the base of income tax, Union excise duties, customs duties and other important central taxes has expanded considerably. This has given immense powers to the central government to increase its resources with the passage of time.

This lure of financial relations between the Centre and the State governments elastic sources of revenue for the States and more elastic sources of revenue the Centre places the States at a distinct disadvantage.

While demands on States’ resources are increasing rapidly because of the pressure of development ices, especially in the field of social welfare, their income has failed to ease correspondingly.

Accordingly, vertical imbalances have accentuated over years and the dependence of the State governments on the Centre has considerably increased. This has made them vulnerable to increasing pressure in the Central government to its lines.

Where the State government belongs a different political party these pressures give rise to open conflict seriously jeopardizing the effectiveness of the policy measures introduced by the concerned State government.

This “strong Centre and the weak States” arrangement was introduced intentionally by the framers of the Constitution in a bid to stall the divisive forces operating in the economy. The partition and its after effects created a strong public opinion in favour of such an arrangement. The one-party rule at the Centre and the States further cemented this relationship and the role of the State became more and more secondary. As pointed out in the Document on Cent State Relations’ adopted by the West Bengal government in December 19791 structure of the Indian Constitution is more unitary than federal. By vesting residuary powers in the Centre and by keeping 47 items in the concurrent list strengthened the base of Central control and vested the Central government with practically unlimited powers to interfere in the governance of States.

Though law and order is a State subject, the Centre has not hesitated in interfering in this field through the establishment of the Central Reserve Police, the Border Security Force, the Industrial Security Force, etc. Education, which was till recently State subject, has been transferred to the concurrent list by the 42nd amendment to the Constitution.

All these processes in the political field have considerably eroded independence of the States and their political and economic powers.

Therefore quite recently, demands for increase in State autonomy have been raised various quarters. While no one denies the importance of a strong Centre for preserving the integrity of the nation, it is necessary to give a serious thought to these demands.

Grant of a certain amount of autonomy, at least in the sphere originally contemplated by the Constitution, is necessary to fulfill the democratic ambitions of the people. A ‘strong Centre’ without ‘strong States’ is not conceivable.

Transfers through the Finance Commission (which is a statutory body) contribute only about one-third of total transfers from the Centre to the State this means that about two-thirds of the transfers are channeled through the Planning Commission or the Central Government directly. For a considerable period of planning, the Planning Commission was not guided by any objective criteria to determine the share of different States in its assistance and this introduced an aura of arbitrariness in the whole transfer mechanism.

Since the Centre contributed a large amount of resources in the form of discretion- grants to the States, it acquired considerable powers to affect the decision making process at the State level.

This led to a further erosion of autonomy of the State.

The process of resource transfers through the Planning Commission and the Finance Commission has failed in correcting the “horizontal imbalance” among the federating units and disparities in their per capita incomes are growing. Plan assistance is provided 70 per cent in the form of loans and 30 per cent in the form of grants.

Since the ratio is a fixed one and does not discriminate between advanced and backward States, it amounts to discrimination against backward States.

Since advanced States have a relatively better economic position they should be granted a greater percentage of resources in the form of loans while backward States should receive a larger percentage in the form of grants.

Noncompliance to this common sense logic has resulted in a paradoxical situation where the comparatively richer States received a higher per capita grant than poorer States.

For example, during 1969-70, rich States like Punjab and Haryana received a higher per capita grant than the poor States like Uttar Pradesh, Madhya Pradesh, Bihar and Andhra Pradesh. Bihar with lowest per capita income also received the lowest per capita grant. As far as transfers through the Finance Commission are concerned, all Finance Commissions sought to give due importance to backward States. However, there was no clear-cut bias in favour of backward States. The ultimate result was that advanced States cornered a major share of the actual devolution of resources from the Centre to the States. For example, the four advanced industrial States of Maharashtra, Gujarat, Tamil Nadu and West Bengal have consistently obtained more than one-third of total income tax transfers. However, the distribution of proceeds from Union excise duties was more judicious.

All Finance Commissions gave undue importance to budgetary needs while deciding the allocation of grants-in-aid. They did not realize that advanced States could also incur large budgetary deficits (even deliberately at times) and qualify for larger grants-in-aid. This led to a paradoxical situation in some instances as richer States got more grants-in-aid compared to poorer States:

The third constituent of resource transfer, viz., discretionary grants is not guided by any distinct philosophy of helping the poorer States to a greater extent. It is guided more by political consideration than by anything else. In any case, discretionary grants also do not seem to have helped the backward States more m-a-vis the advanced States.

In suggesting any reforms in the federal finance structure, the above problems should be constantly kept in mind. It is also imperative to remember that the Centre-State financial relations form a part of Centre-State relations in general whose character is to a larger extent, political.

It is unfortunate that in this country, the question of State autonomy is raised mostly to gain political advantages and is not guided by sound economic logic as it should be. Excepting the two communist parties which have argued for State autonomy on clear economic grounds, all other parties clamoring for State autonomy have narrow sectarian outlook.

This is the basic reason why in this country ‘regional’ is viewed as something ‘anti-national’. Selfish and corrupt politicians have stalled the process of true federalism. Therefore, a smooth and truly beneficial federal financing stem in this country can evolve only when a true federal spirit develops.

Since is not foreseeable in the immediate future, a compromise has to be struck between a ‘strong Centre’ policy and ‘State autonomy’ demand. Politically the centre should remain strong but it should reduce its interference in the financial sphere of the States. To accomplish this, some of the steps that can be initiated in the first instance are:

The scope of the Finance Commission should be enlarged considerable since it is a statutory body. This would reduce the interference of the Centre in the financial management of the States and the ‘arbitrariness of discretionary grants’ that accompanies such interference.

In addition, it would reduce the atmosphere of suspicion and distrust in the States over the role of the Centre in federal finance system.

Some States have demanded the setting up of a permanent Finance Commission instead of one constituted in five years. This is sought to be justified on the following considerations: (i) a permanent Finance Commission would reduce the scope for the Central government to make discretionary transfers in an ad hoc manner to the States.

Since under the existing provision, Finance Commissions are appointed once in about five years; the scope for making discretionary grants by the Centre automatically grew. This introduced an element of arbitrariness in the transfer mechanism.

The Finance Commission, being an impartial body, would be able to ensure that Central transfers were not made to particular States on considerations which may not be fair or acceptable to the rest of the States; and (ii) when a Finance Commission is appointed, it has to start on a clean slate, collect the material required for its work from the State governments and the Central government, and then initiate such studies and analysis as it requires.

A permanent Finance Commission (as the Australian Grants Commission in Australia) would be able to keep under review various aspects of the finances of the Centre and the state governments, special features of particular States, and the factors which affect their finances. This suggestion did not find favour with the Seventh Finance Commission since it felt that if a permanent Commission is set up, there might well be a tendency for members to be regarded as full time employees of the Central government. This would be unhealthy from the point of view of the Commission's function vis-a-vis the State governments.

Besides, under the present arrangement, new persons with a fresh approach and unbiased opinions can be inducted into the Finance Commission. On these grounds, the Seventh Finance Commission did not support the idea of a permanent Commission.

However, it called for the establishment of an expert non-political agency by the Central government to perform such functions as the Secretariat of the Commission is expected to perform. In addition, it can be entrusted to play a watching and advisory role with regard to Centre-State financial relations generally.

This is a sound suggestion and should be implemented. The expert non-political agency can collect vital information regarding Centre-State finances to enable the Finance Commission (whenever appointed) to start work without loss of time. It can also oversee the implementation of the recommendations of the Finance Commission as accepted by the Central government. In addition to these measures, adequate steps should be undertaken to narrow down inter-State disparities by adopting a set of criteria distinctly biased in favour of backward States. This can be ensured by giving more weightage to backwardness reflected through various economic and social indicators like per capita income, level of literacy, road length, administrative services, hospital beds, etc.

Further it is necessary to enlarge the very quantum of resources transferred from the Centre to the States. In this context, the proposal of the Rajamannar Committee to widen the base of devolution of resources to the States by including

Corporation tax, customs duties and all excise duties in the divisible pool, needs consideration. These taxes and duties are highly elastic and can help considerably enlarging the revenue base of the States which are in dire need of more finance to fulfill the social and economic responsibilities which the development process is forcing them to shoulder.

The Tenth Finance Commission established under the chairmanship of K.C. I Pant recommended a major role for industry in the field of public finance.

Looking at both vertical and horizontal equity i.e. sharing of resources between the Union and the states and again, among the states, the nexus between industry, trade and the public finance can hardly be over emphasized.

The programme for removing the distortions in the industrial policy in the context of the changing global economic scene was set in motion in the Eighties but it gathered greater

momentum in the last few years. Major changes have taken place in the industrial policy. As the economy opens up and becomes more and more outward looking, greater challenges and opportunities will come our way. These have to be carefully and comprehensively assessed and the emerging possibilities fully exploited.

The major tasks of the Finance Commission are to assess the resource position and the needs of the Central and the state governments, and to consider issues like reduction of fiscal deficit, striking a balance between revenue receipts and expenditure and creating surplus for capital investment, and the efficiency of fiscal management of governments. What is of crucial concern at this stage is not only what the state can do to promote industry but also as to how industry would be able to help governments in raising resources in a sustainable manner?

A question which is being posed by some knowledgeable people is regarding the fate of the weaker states which have comparatively fewer logistical advantages. In this regime, with foreign investment playing a more meaningful role, the choice of location would obviously be greatly influenced by the availability of social and economic infrastructure. If industry goes where infrastructure is, as it perhaps would, how would the weaker states compete unless the quality and spread of their infrastructure is improved to an acceptable level? And this is where the states may look to the captains of industry for a helping hand especially in areas of physical infrastructure like power, roads and communication and also the human infrastructure i.e., professionally and technically trained manpower which would meet the emerging requirements of industry and industry related services.

In their anxiety to woo industry, the states have been following for many years the policy of offering packages of incentives, including tax concessions. This has sometimes resulted in unhealthy competition among the states, abandonment of revenues, and even destabilization of industry.

On the subject of consignment tax many states have, favored the imposition of consignment tax which, it was stated, would curb evasion of sales tax presently taking place in the garb of branch transfers and consignment dispatches while often such transactions are, in effect, inter-state sales.

It has also been urged that far from distorting the present pattern of trade, imposition of consignment tax would lead to smoother flow of trade and better tax compliance.

Sales tax barriers, or octroi barriers, or barriers against the movement of food grain etc., lead to wastage of man-hours through idle time, wastage of fuel and reduction in the efficiency of the capital employed through lower turnaround of vehicles.

The industry's views on the matter would be welcome particularly on how to replace the fiscal and physical barriers through more sophisticated ways of compliance with the law. Another basic question which needs to be considered by the Centre and the state governments is whether the ever increasing demand on the governments, Central or state, can continue to be satisfied without reordering priorities, without insisting upon greater efficiency in fiscal management and without exercising some measure of self restraint.

## Sources of Government Revenue

The following points highlight the nine main sources of government revenue. The sources are: 1. Tax 2. Rates 3. Fees 4. Licence Fee 5. Surplus of the public sector units 6. Fine and penalties 7. Gifts and grants 8. Printing of paper money 9. Borrowings.

### Source # 1. Tax:

A tax is a compulsory levy imposed by a public authority against which tax payers cannot claim anything. It is not imposed as a penalty for only legal offence. The essence of a tax, as distinguished from other charges by the government, is the absence of a direct quid pro quo (i.e., exchange of favour) between the tax payer and the public authority.

Tax has three important features:

#### ADVERTISEMENTS:

- (i) It is a compulsory contribution, to the state from the citizen. Anyone refusing to pay tax is punished under law. Nobody can object to taxation on the ground that he is not getting the benefit of certain state services,
- (ii) It is the personal obligation of the individual to pay taxes under all circumstances,
- (iii) There is no direct relationship between benefit and tax payment.

### Source # 2. Rates:

Rates refer to local taxation, i.e., taxation levied by (or for) local rather than central government. Normally rates are proportional to the estimated rentable value of business and domestic properties. Rates are often criticised as being unrelated to income.

### Source # 3. Fees:

#### ADVERTISEMENTS:

Fee is a payment to defray the cost of each recurring service undertaken by the government, primarily in the public interest.

### Source # 4. Licence fee:

A licence fee is paid in those instances in which the government authority is invoked simply to confer a permission or a privilege.

### Source # 5. Surplus of the public sector units:

The government acts like a business- person and the public acts like its customers. The government may either sell goods or render services like train, city bus, electricity, transport, posts and telegraphs, water supply, etc. The government also earns revenue from the production of commodities like steel, oil, life-saving drugs, etc.

### Source # 6. Fine and penalties:

They are the charges imposed on persons as a punishment for contravention of a law. The main purpose of these is not to raise revenue from the public but to force them to follow law and order of the country.

### Source # 7. Gifts and grants:

#### ADVERTISEMENTS:

Gifts are voluntary contribution from private individuals or non-government donors to the government fund for specific purposes such as relief fund, defence fund during war or an emergency. However, this source provides a small portion of government revenue.

Source # 8. Printing of paper money:

It is another source of revenue of the government. It is a method of creating extra resources. This method is normally avoided because if once this method of financing is started, it becomes difficult to stop it.

Source # 9. Borrowings:

Borrowings from the public is another source of government revenue. It includes loans from the public in the form of deposits, bonds, etc. and also from the foreign agencies and organisations.

## **UNIT--I**

# **Technological Progress and Economic Growth**

## **Introduction**

Technical progress is defined as new, and better ways of doing things, and new techniques for using scarce resources more productively.

An improved technology yields greater output from the same quantity of resources.

A formal neo-classical definition of technical progress states that it is an autonomous phenomenon causing the aggregate production function of an economy to shift upwards. This brings about a higher level of output for each different level of capital-labor ratio.

Technical progress involves two activities: process innovation and product innovation.

No sharp distinction between process innovation and product innovation because a new process requires, same product innovation and product innovation involves some elements of a new process.

Process innovation is placed much emphasis because many literatures concern much on the effects of technical change on factor productivity or new ways of satisfying existing wants, rather than on satisfying new wants.

Producing a new technology involves two processes: invention and innovation.

Invention entails the conception of a basic idea. This is the product of laboratory scientists. Innovation is the application of that idea to something directly useful to humankind. This is the work of engineers.

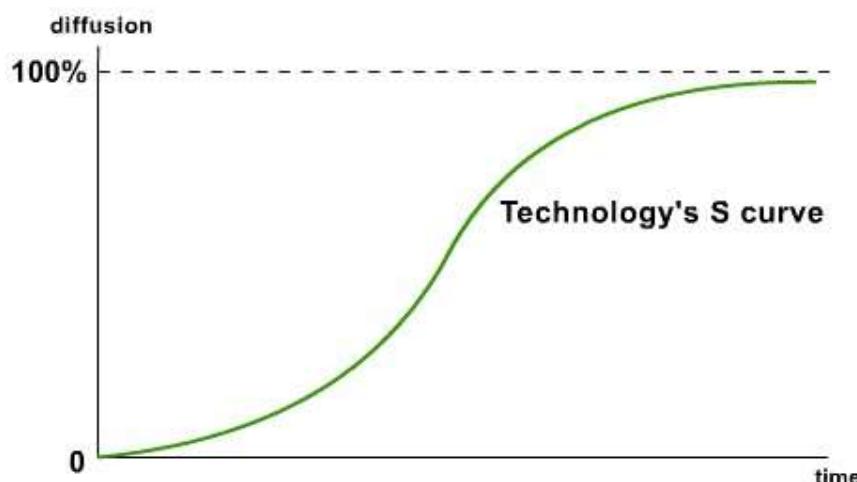
Innovation provides more efficient and cheaper ways to make existing goods. It can also result in creating new products.

Joseph Schumpeter states that technical progress is partly technological and partly economic in nature. Inventions are the emergence of new scientific or technological ideas that may be part of a random, exogenous process. An innovation is an economic process that occurs as a response to perceived profit opportunities, through an act of foresight of the capitalist entrepreneurs, who create or realize these opportunities through innovations.

## 2 The characteristics of technological progress

Technology is a complex set of knowledge, ideas and methods and is likely to be the result of a variety of different activities, both intentional and accidental.

Technological progress is a gradual process consisting of a sequence of small increments lying along a continuous path.



For example, a generator and electric lights were demonstrated in 1876. Until six years later, Thomas Edison opened the first commercial generator to power electric lights in the Wall Street district of New York. Only in the 1930s, 60 years later, the Rural Electrification Act provided the financing to bring electric power to most rural areas of the United States.

It seems that the new idea spreads slowly initially, then it begins to be applied more often, gradually attaining widespread acceptance and adoption; and finally it reaches 100% diffusion as the last potential users are won over.

While the growth path of technology is continuous, it does not generally exhibit a constant slope or growth rate; technology can grow rapidly, stagnate, or even decline. The path may take sudden sharp turns.

Technology is partially nonrival in nature. If one person uses an idea or method, that does not prevent another from using it. Thus the marginal cost of using a particular form of technology is zero, meaning that competitive market forces will tend to drive the price of existing technology toward zero.

Creativity and innovation will tend to be very low if nonrival ideas are freely used by anyone. Therefore, the creators of the new ideas get no reward from their creator of an idea to use the product or process exclusively for a specified number of years.

For example, the Coca-Cola Company has kept its formula secret for over 100 years; its idea is protected by the complexity of a formula that no one has been able to reproduce exactly.

Some growth economists describe technology as path-dependent. The ability to create new technologies depends on the level of technology already accumulated. It means that previous technologies are often difficult to abandon.

Often, technology is not excludable. If old knowledge is not available, then others cannot create new knowledge. Thus, patent laws set limits on the length of time that a patent remains in effect.

The formal recognition of intellectual property rights is likely to facilitate the spread of technology. Patents and copyrights permit the owners of intellectual property to sell and grant their rights to others.

As long as the price for the use of the idea exceeds the possible loss of monopoly profit, the owner of the idea should be willing to let others use the idea.

If a certain idea can be productively used elsewhere in the economy, others should be willing to pay for the right to use the idea.

## 4.2 The causes of technological progress

### (1) Research and development (R&D) spending decisions made by firms

With the increase of R&D spending, it is more likely for a firm to discover and develop a new product.

If the new product is successful, the firm's future profits will increase. If the expected present value of profits exceeds the expected cost of research, the firm will start on a new R&D project.

### (4) Patent laws

Weaker protection of new products, smaller expected profits can be gained from new products. Thus, lesser incentives for firms to engage in R&D.

Even in the presence of patent laws, protection is incomplete. Other firms may learn ways of making another product not covered by the patent. They may learn how to make a better product, thus eliminating the market for the original product.

### (3) The fertility of research

If research is very fertile, it means R&D spending leads to many new products. Firms will have more incentives to do R&D, and R&D and technological progress will be higher.

### (4) The appropriability of research results

If firms cannot fully capture the profits from the development of new products, they will not engage in R&D and technological progress will be slow.

Determinants of the appropriability of research results:

- a. If it is widely believed that the discovery of a new product will lead to a subsequent quicker pace in the discovery of other better products, there may be little payoff to bring first. Thus, a highly fertile field of research may not generate high levels of R&D.
- b. Too little protection will lead to little R&D. Too much protection will make it difficult for new R&D. Hence, R&D will be lowered.

(5) Innovations may occur in response to pressures on the commodity markets.

With the rise of population and the increase of the scarcity of land, greater pressure on the demand for agricultural commodities. This may induce innovations in agriculture to take advantage of increasing profit opportunities.

(6) Innovations are most likely to occur in rapidly growing sectors of the economy.

Market expansion increases profitability and makes firms to reap the benefits of scale – economies, which are characteristic of modern industrial innovations.

Greater demand makes available investible funds that are required for new net investment. Firms in the industry will put in a better position to absorb any potential risks associated with new technology.

(7) Continuous competition in oligopolistic markets may lead firms to invest resources in a systematic search for new technology.

#### 4.4 Technological progress as an externality to investment

Bradford De Long and Lawrence Summers found a strong statistical correlation between investment in productive equipment and the countries' rate of economic growth. Their statistical analysis found that equipment investment causes economic growth.

Indeed, new ideas and technologies are in some ways linked to the specific equipment, buildings, and tools used in production.

Some statistical studies suggest that the effect of equipment investment on economic growth is stronger in developing economies than it is in the more developed economies.

New technologies often seemed to be embodied in new machines, and the introduction of a new technology usually coincided with the introduction of new machines or equipment.

Structures also enable new ideas and methods to be implemented. New ideas cannot be put into practice unless people are trained to apply and use them. Without an investment in education and training, much new technology would not be used.

Therefore, technological progress is not an independent process, completely separate from investment in equipment, structures, and human capital.

## 4.5 Learning by doing

The fact that economic growth accelerated over the past 200 years implies that we have also learned to create new methods, tools, and ideas at a more rapid pace.

Learning-by-doing process is also a potential source of economic growth because experience causes per-worker output to rise.

For an economy as a whole, learning could remain a constant proportion of the doing. New firms replace old ones, new production runs replace the production runs of older products. Each new firm product, or industry leads to another complete phase of learning by doing, and thus in the whole economy and over time there may be overall reduction in learning.

Individual firms and industries begin new production runs when the learning by doing from further production of old products diminishes, even though initially costs may be higher when new products are introduced.

Eventually, learning by doing reduces cost below those of the previous production run, and across all firms and industries, economy wide learning by doing, combined with continued introduction of new products and process, reduces unit costs over time.

Learning has long been suggested as a potential source of technological progress. But the learning-by-doing model does not address the motivations for learning.

Learning just happens without a conscious effort. Technological progress is endogenous because it is related to other variables within the model, but the learning-by-doing model is short on explaining how production generates learning.

The fact that a lot of doing does not seem to be accompanied by much learning suggests that learning is not an incidental and automatic consequence of doing.

## 4.6 Growth as the result of costly innovative activity

Philippe Aghion and Peter Howitt, Gene Grossman and Elhanan Helpman, and Paul Romer are those who have developed models of endogenous growth based on the assumption that R&D activities are carried out by profit – seeking entrepreneurs. R&D is regarded as a costly activity that is carried out with the intent to produce new products and earn temporary profits.

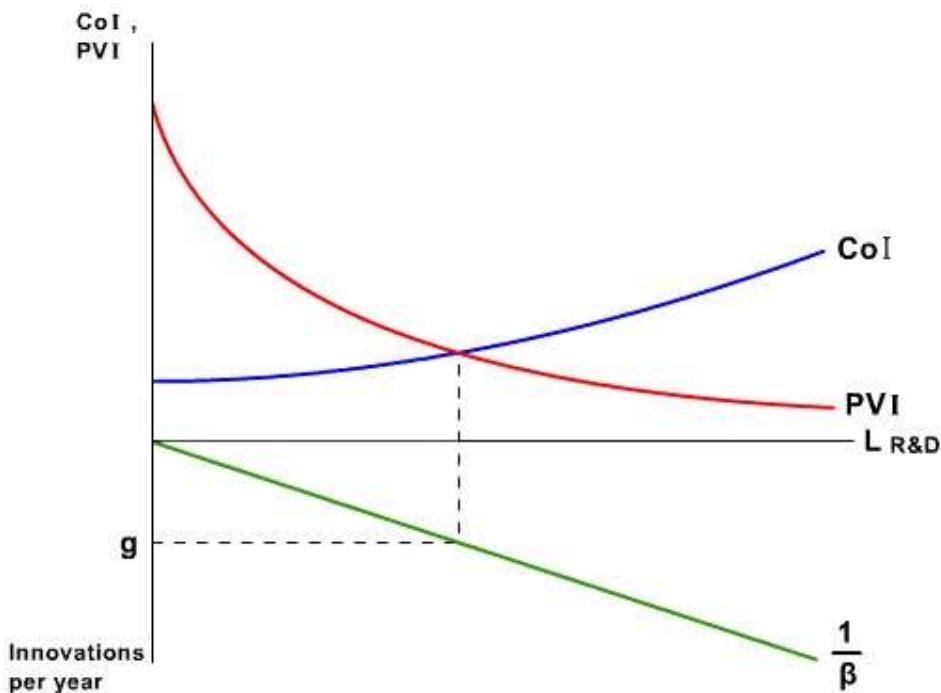
Since the cost of R&D activities must be covered, the assumption of imperfect competition is introduced. The greater the potential profit earned by the monolithic producer, the greater will be the amount of innovative activity.

Endogenous technological progress is a function of the supply of labor  $L$ , future profit  $\Pi$ , the amount of resources needed to create an innovation  $\beta$  and the interest rate with which future profit is discounted  $r$ .

$$\text{i.e. } g = f(L, \pi, \beta, r)$$

Where  $g$  = the number of innovations per year.

The cost of innovation and the present value of innovation determine the equilibrium amount of resources that competitive entrepreneurs devote to innovative activity.



The number of innovations per year remains constant if nothing else in the model changes. But that implies slower growth as the total number of accumulated innovations grows.

The number of innovations per year must grow in line with the accumulated level of technology if the growth of technology is to remain constant.

#### 4.7 R&D model formulated by Romer (1990), Grossman and Helpman (1991), and Aghion and Howitt (1992)

Assume that the effectiveness of labor ( $A$ ) represents knowledge or technology.

Production function in which labor, capital, and technology are combined to produce improvements in technology.

Both the R&D and goods production functions are assumed to be generalized Cobb-Douglas production functions.

The fraction of output saved and the fractions of the labor force and the capital stock used in the R&D sector are taken as exogenous and constant.

There are two sectors, a goods-producing sector where output is produced and a R&D sector where additions to the stock of knowledge are made.

Fraction  $a_L$  of the labor force is used in the R&D sector and fraction  $1 - a_L$  in the goods-producing sector. Fraction  $a_K$  of the capital stock is used in the R&D sector and fraction  $1 - a_K$  in the goods-producing sector.

Two sectors can use the full stock of knowledge ( $\mathbf{A}$ ).

The quantity of output produced at time  $t$ :

$$Y(t) = [(1 - a_K) K(t)]^\alpha [A(t)(1 - a_L) L(t)]^{1-\alpha}, \quad 0 < \alpha < 1 \quad \dots \dots \dots (1)$$

(1) implies constant returns to capital and labor.

The production of new ideas depends on the quantities of capital and labor engaged in research and on the level of technology:

$$A^{\square}(t) = G[a_K k(t), a_L L(t), A(t)] \quad \dots \dots \dots (2)$$

Under the assumption of generalized Cobb-Douglas production function for knowledge, it is not assumed to have constant returns to scale to capital and labor:

$$A^{\square}(t) = B[a_K K(t)]^\beta [a_L L(t)]^\gamma A(t)^\theta, \quad \beta > 0, \gamma \geq 0, \quad B > 0 \quad \dots \dots \dots (3)$$

where  $B$  is a shift parameter in order to analyze the results of changes in other determinants of the success of R&D.

No restriction is placed on since there exists no strong basis for restricting how increases in the stock of knowledge affect the production of new knowledge.

If  $\theta = 1$ ,  $A^{\square}$  is proportional to  $A$ ; the effect is stronger if  $\theta > 1$ , and is weaker if  $\theta < 1$ .

Depreciation is set to zero:  $K^{\square}(t) = s Y(t) \quad \dots \dots \dots (4)$

Treat population growth as exogenous:  $L^{\square}(t) = n L(t), \quad n \geq 0 \quad \dots \dots \dots (5)$

#### 4.7.1 R&D model without capital

#### (A) The dynamics of knowledge accumulation

Without capital, set  $\alpha=\beta=0$ . Equations (1) and (3):

$$Y(t) = A(t) (1 - a_L) L(t) \dots \quad (6)$$

$$\mathbf{A}^{\square}(t) = \mathbf{B} [ \mathbf{a}_L \mathbf{L}(t) ]^\gamma \mathbf{A}(t)^{\theta} \quad \dots \quad (7)$$

The growth rate of  $\mathbf{A}$ ,  $g_{\mathbf{A}}(t)$  :

$$AA(t) \square(t) = B [ a_L L(t) A(t) ]_Y A(t)\theta = B a_L Y L(t)_Y A(t)\theta - 1 \quad (8)$$

Since  $\mathbf{B}$  and  $\mathbf{a}_L$  are constant, whether  $\mathbf{g}_A$  is rising, falling, or constant depends on the behavior of  $\mathbf{L}^y \mathbf{A}^{\theta-1}$ .

Equation (7) implies that  $\mathbf{g}_A$  is always positive.

Equation (8) implies the growth rate of  $\mathbf{g}_A$ :

$$\frac{dg}{dt} = g_A(t) = B \cdot a_L^\gamma \left[ \gamma L(t)^{\gamma-1} \cdot dL(t) \cdot A(t)^{\theta-1} + L(t)^\gamma (\theta-1) \cdot A(t) \right] dt^{\theta-2}$$

□

$$= B a_L \cdot \gamma L(t)^{\gamma-1} \cdot dL(t) + (\theta-1) A \cdot L(t)^\gamma$$

$$= g_A(t) [ \gamma n + (\theta-1) g_A(t) ] \quad \dots \dots \dots \quad (9)$$

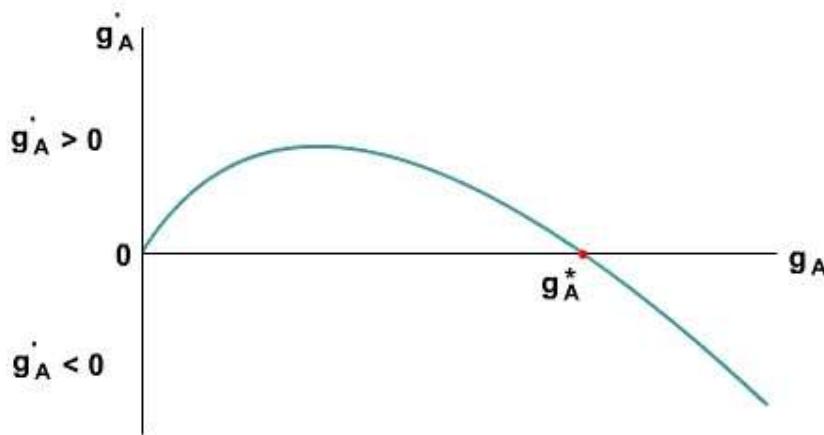
 shows that  $\mathbf{g}_A$  is rising,  $\mathbf{g}_{\square\square A} > 0$ , if  $\gamma n + (\theta - 1)$   $\mathbf{g}_A$  is positive.  $\mathbf{g}_A$  is falling,  $\mathbf{g}_{\square\square A} < 0$ ,

if  $\gamma n + (\theta - 1) g_A$  is negative. In steady state,  $\gamma n + (\theta - 1) g_A = 0$ ,  $g \square A = 0$ :

$$= \frac{\gamma n}{1 - \theta} \equiv g_A^* \quad \dots \dots \dots \quad (10)$$

In case of  $\theta < 1$ , (9) implies that when  $\theta < 1$ ,  $g_A - g_A^* < 0$ ,  $g_A$  is galling if  $g_A$  exceeds  $g_A^*$ .

**g<sub>AA</sub> > 0, g<sub>A</sub> is rising if g<sub>A</sub> is less than g<sub>A</sub><sup>\*</sup>.**



Ultimately,  $\mathbf{g}_A$  converges to  $\mathbf{g}_A^*$ . Once  $\mathbf{g}_A^*$  is reached, both  $\mathbf{A}$  and  $\mathbf{Y/L}$  grow steadily at this rate, thus the economy is on a balanced growth path.



implies that  $\mathbf{g}_A^*$  is an increasing function of the rate of population growth  $\mathbf{n}$ .

The model does not imply that countries with greater population enjoy greater income growth. It only means that higher worldwide population growth raises worldwide income growth.

Higher population is beneficial to the growth of worldwide knowledge in the sense that the larger the population is, the more people there are to make new discoveries.

When  $\theta < 1$  and  $n = 0$ , equation (9) implies:

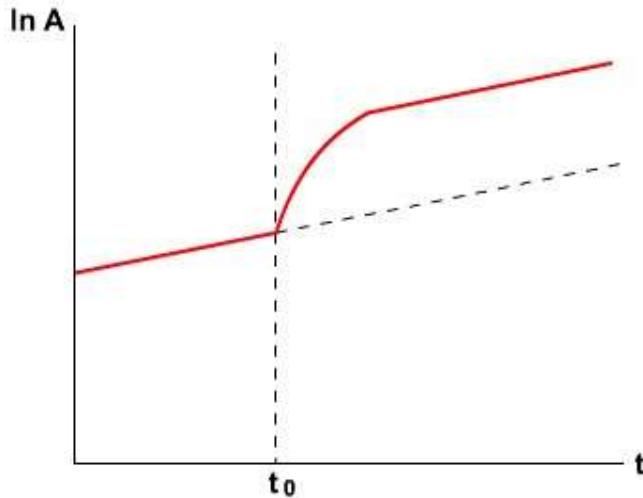
$$g_{\square \square A}(t) = [(\theta - 1) g_A(t)] g_A(t) < 0$$

it adding to the stock of knowledge becomes more difficult,  $g_{\text{RGA}}$  is negative and hence growth would slow down in the absence of population growth.

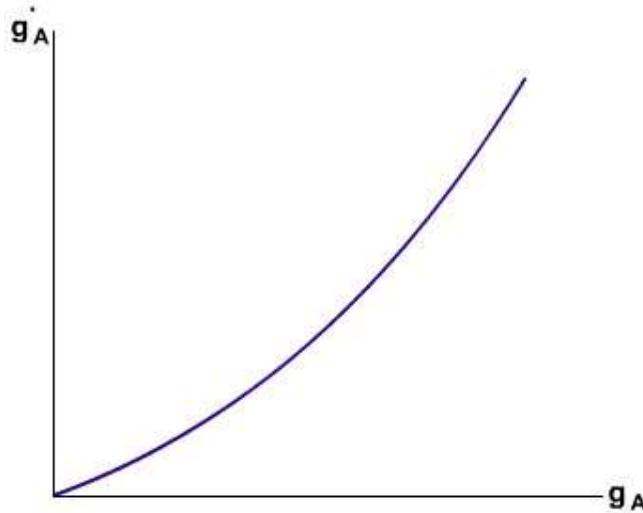
**(10)** also implies that although the rate of population growth affects long-run growth, the fraction of the labor force engaged in R&D ( $a_L$ ) does not.

When  $\theta < 1$ , the increase in  $a_L$  has only a level effect (slope remains zero) but not a growth effect on the path of  $A$ .

Although **(8)** implies that the increase in  $a_L$  causes an immediate increase in  $g_A$ , the level of  $A$  moves gradually to a parallel path higher than its initial one. This is the level effect.

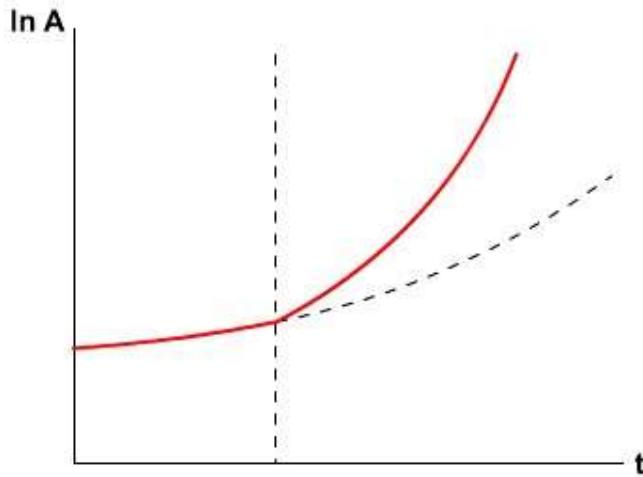


When  $\theta > 1$ , equation **(9)** implies that  $g_A$  is increasing in  $g_A$ . Such  $g_A$  is positive, it also implies that  $g_A$  must be positive.



The economy now exhibits ever-increasing growth rather than converging to a balanced growth path. The more rapidly  $g_A$  rises, the more rapidly its growth rate rises.

The increase in  $a_L$  leads to an ever-widening gap between the new path of  $A$  and its original path.

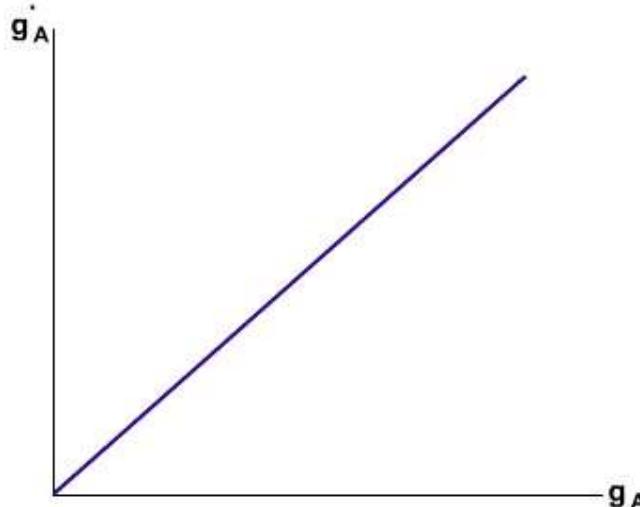


When  $\theta = 1$ , equation (8) and (9) become:

$$g_A(t) = B a_L^\gamma L(t)^\gamma \quad \dots \quad (11) \quad g_A(t) = \gamma n g_A(t)$$

.....(12)

(12) implies that if population growth is positive,  $g_A$  is growing over time.



(12) also implies that if  $n = 0$  or  $\gamma = 0$ ,  $g_A$  is constant over time. There is no adjustment toward a balanced growth path. The economy immediately exhibits steady growth.



As equation (6) (7) (11) shown, the growth rate of knowledge, output, and output per worker are all equal to  $B\alpha_L^Y L^Y$ . Thus, in this case  $\alpha_L$  affects the long-run growth rate of the economy.

(B) The importance of returns to scale to produced factors

This model states that knowledge is the only produced factor.

If  $\theta = 1$ , 1% increase in  $A$  causes only 1% increase in  $A$ . This implies the jump in  $A$  has no effect on its growth rate.

If  $\theta > 1$ , 1% increase in  $\mathbf{A}$  causes more than 1% increase in  $\mathbf{A}$ . This implies the increase in  $\mathbf{A}$  raises the growth rate.

If  $\theta < 1$ , 1% increase in  $A$  results in an increase of less than 1% in  $A$ , and so the growth rate of knowledge falls.

#### 4.7.2 R & D model with capital

The model is now described by equations **(1)** **(3)** **(5)** including two endogenous stock variables **A** and **K**.

Subs. (1) into (4):

$$K_{\square}(t) = s y(t) = s [(1 - a_K) K] [{}^{\alpha} A (1 - a_L) L]^{1-\alpha} = s (1 - a_K)^{\alpha} K^{\alpha} (1 - a_L)^{1-\alpha} A^{1-\alpha} L^{1-\alpha} \dots \quad (13)$$

Divide both sides of (13) by  $K(t)$  and define  $C_K \equiv s(1 - a_K)^{\alpha}(1 - a_L)^{1-\alpha}$ :

since  $\underline{AL} \square 1-\alpha = (AL)1-\alpha(K-1)1-\alpha = (AL)1-\alpha K - 1 + \alpha = \square \square \underline{K} K \alpha \square \square \square (AL)1-\alpha$

□ K □

Whether  $g_K$  is rising, falling, or holding constant depends on the behavior of  $AL/K$ .

The growth rate of AL/K,  $g_K$ :

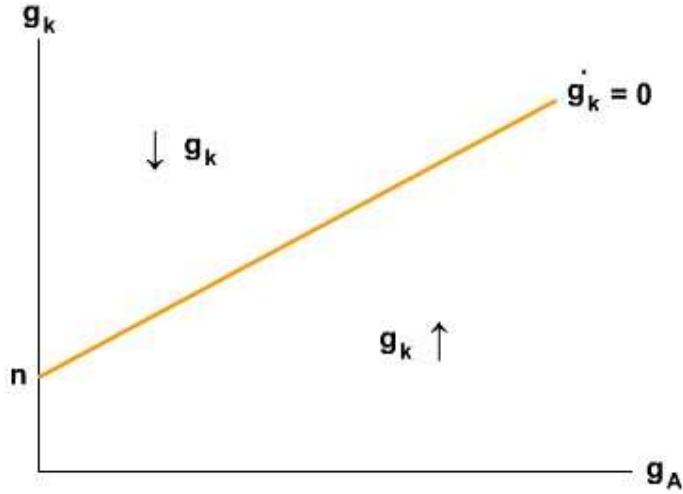
$$g_{\square_k} = g_A + n - g_k \dots \quad (15)$$

Positive relationship between  $g_A$  and  $g_K$ :

$$\frac{dg_K}{dg_A} = 1 > 0$$

If  $g_A + n - g_K > 0$ ,  $g_K$  is rising,  $\bar{g}_K > 0$ . If  $g_A + n - g_K < 0$ ,  $g_K$  is falling,  $\bar{g}_K < 0$ .

If  $\mathbf{g}_A + \mathbf{n} - \mathbf{g}_K = 0$ ,  $\mathbf{g}_K$  is constant,  $\mathbf{g}_{\square K} = 0$ .



Divide both sides of (3) by  $A(t)$ :

$$\underline{\mathbf{A}}\square\square(\underline{(tt)})\equiv g_{\mathbf{A}}(t) = B(\alpha K)\beta (a L L)_Y A^{\theta-1} = B \alpha K \beta a L Y A^{\theta-1}$$

$$\equiv C_A K(t)^\beta L(t)^\gamma A(t)^{\theta-1} \text{ where } C_A \equiv B \alpha K^\beta \alpha L^\gamma \dots \quad 16)$$

$$\frac{dA(t)}{dt} = C_A \cdot B \cdot K(t)^\beta \cdot \frac{dK(t)}{dt} \cdot L(t)^\gamma \cdot A(t)^{\theta-1} + C_B \cdot K(t)^\beta \cdot A(t)^{\theta-1} \cdot \gamma L(t)^{\gamma-1} \cdot \frac{dL(t)}{dt}$$

dt

+  $\square\square\square K(t)\beta L(t)^{\gamma(\theta-1)} A(t)^{\theta-2} \cdot \underline{dA dt(t)}$   $\square\square\square\square\square$

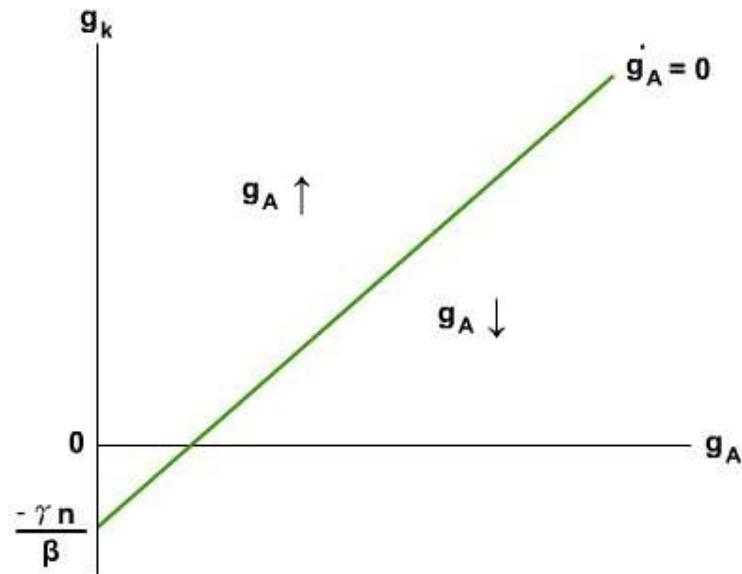
$$= C_A \cdot BK(t)^\beta \cdot K^{\square}(t)^\perp \cdot L(t)^\gamma A(t)^{\theta-1} + \gamma L(t)^\gamma L^\square(t)^\perp K(t)^\beta \cdot A(t)^{\theta-1}$$

$$+ (\theta - 1) K(t) \beta L(t)^{\gamma} A(t)^{\theta-1} A(t) \\ A(t) \\ \square$$

$$= \mathbf{C} \mathbf{A} \mathbf{K}(t) \beta L(t) \gamma A(t)^{\theta-1} \square \square \square \beta \underline{K} \underline{K} \square((tt)) + \gamma \underline{L} \underline{L} \square((tt)) + (\theta - 1) \underline{A} \underline{A} \square \square ((tt)) \square \square \square$$

the behavior of  $\mathbf{g} \square_A (\mathbf{t})$  depends on  $\beta g_K + \gamma n + (\theta - 1) g_A$

(17) implies that  $g_A$  is rising when  $\beta g_K + \gamma n + (\theta - 1) > 0$  and vice versa.  $g_A$  is constant when  $\beta g_K + \gamma n + (\theta - 1) = 0$ .



n: The set of points where  $\mathbf{g}_A$  is constant has an intercept of  $- \beta$ .  $\mathbf{g}_A$  is

constant  $\Rightarrow \mathbf{g}_A = \mathbf{0} \Rightarrow \beta \mathbf{g}_K + \gamma \mathbf{n} = (1-\theta) \mathbf{g}_A$

n

when  $\mathbf{g}_A = \mathbf{0}$ ,  $\beta \mathbf{g}_K = -\gamma \mathbf{n} \Rightarrow -\beta$

$$\frac{(1-\theta)}{2}$$

The set of points where  $\mathbf{g}_A$  is constant has a slope of  $\beta$  :

$$\beta g_k = (1-\theta) g_A - \gamma n \Rightarrow g_A = (1-\theta) \frac{\beta g_k}{\gamma} - \frac{\gamma n}{\gamma}$$

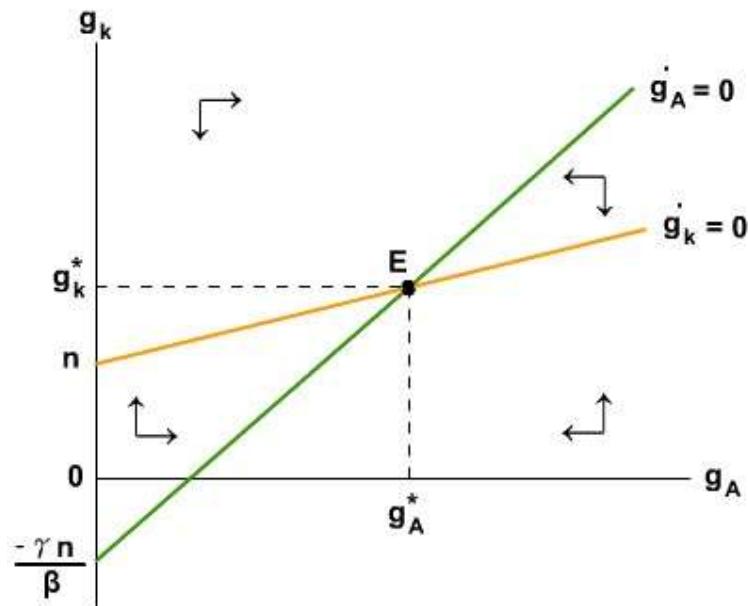
where  $\theta < 1 \Rightarrow$  the slope is positive

Positive relationship between  $g_{\text{CO}_A}$  and  $g_K$ :

$$dg_K = \beta > 0$$

Equation (3) shows that the degree of returns to scale to  $\mathbf{K}$  and  $\mathbf{A}$  in knowledge production is  $\beta + \theta$ .

When  $\beta + \theta < 1$ , the slope of  $(1 - \theta)/\beta$  is greater than 1. thus, the locus of points where  $g_{\square A} = 0$  is steeper than the locus where  $g_{\square K} = 0$ .



Regardless of where  $\mathbf{g}_A$  and  $\mathbf{g}_K$  begin, they converge to point  $\mathbf{E}$  where  $\mathbf{g}_{\square\square A}$  and  $\mathbf{g}_{\square K}$  are zero:

From (15): set  $\mathbf{g}_{\square_k} = \mathbf{0} \Rightarrow \mathbf{g}_A^* + \mathbf{n} - \mathbf{g}_k^* = \mathbf{0}$  ..... (18)

From (17): set  $\mathbf{g}_A = \mathbf{0} \Rightarrow \beta \mathbf{g}_K^* + \gamma \mathbf{n} - (\theta - 1) \mathbf{g}_A^* = \mathbf{0}$  ..... (19)

Rearrange (18):  $g_K^* = g_A^* + n$  ..... (20)

Subs. (20) into (19):

$$\beta (\mathbf{g}_A^* + \mathbf{n}) + \gamma \mathbf{n} + (\theta - 1) \mathbf{g}_A^* = \mathbf{0} \Rightarrow \beta \mathbf{g}_A^* + \beta \mathbf{n} + \gamma \mathbf{n} + (\theta - 1) \mathbf{g}_A^* = \mathbf{0}$$

$$\Rightarrow \beta \mathbf{g_A}^* + (\beta + \gamma) \mathbf{n} + (\theta - 1) \mathbf{g_A}^* = \mathbf{0}$$

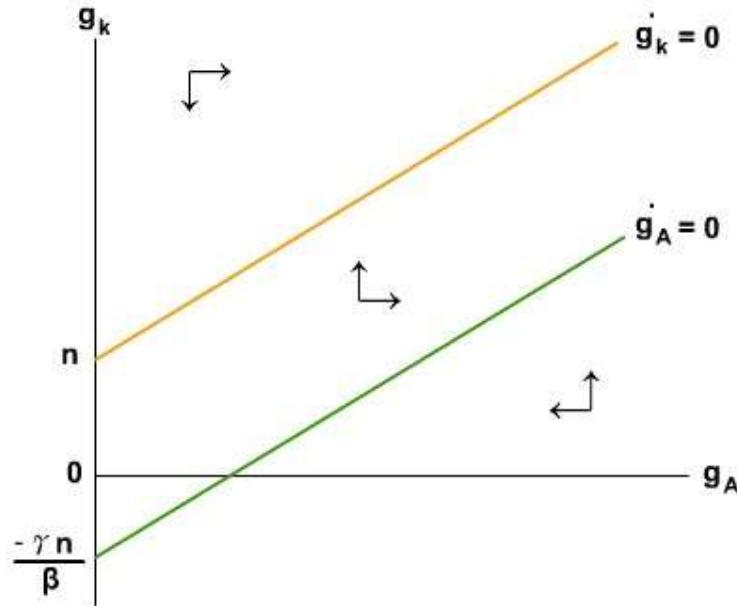
$$\Rightarrow -(\beta\beta \pm -\gamma\theta) + n = gA^* \Rightarrow gA^* = 1(-\beta(+\theta\psi + \beta n)) \quad (21)$$

(20) shows that the long-run growth rate of the economy is endogenous, and long-run growth is an increasing function of population growth and is zero if population growth is zero.

The fraction of the labor force and the capital stock engaged in R & D,  $a_L$  and  $a_K$ , do not affect long-run growth.

When  $\beta + \theta > 1$ , the loci where  $g_A$  and  $g_K$  are constant diverge. Regardless of where the economy starts, it eventually enters the region between the two loci.

The growth rates of **A** and **K**, and the growth rate of output increase continually.



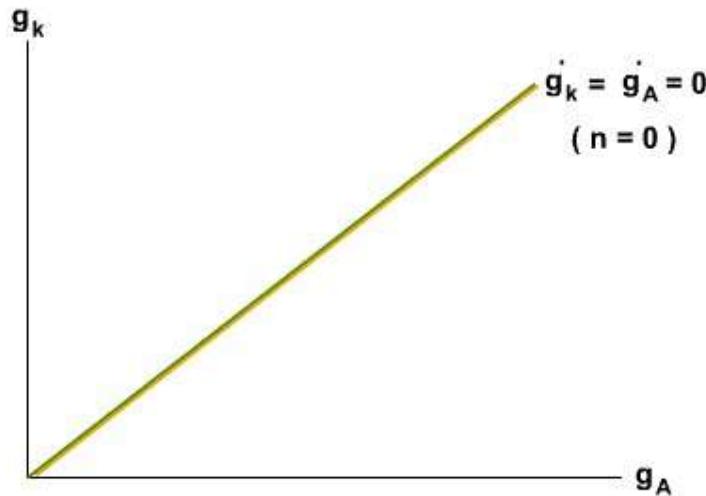
When  $\beta + \theta = 1$ , the slope  $(1 - \theta) / \beta = 1$ , and thus the loci of  $\dot{g}_A = 0$  and  $\dot{g}_K = 0$  have the same slope:

From (15): as  $\dot{g}_K = 0$ ,  $g_A = g_K - n \Rightarrow \text{slope} = 1$

If  $n > 0$ , the  $\dot{g}_K = 0$  line lies above the  $\dot{g}_A = 0$  line.

Regardless of where the economy starts, it eventually enters the region between the two loci.  
The growth rates of both **A** and **K**, and the growth rate of output increase continually.

If  $n = 0$ , the two loci lie on top of one another. Regardless of where the economy begins, it converges to a balanced growth path.



## SKILL -5<sup>th</sup> SEMESTER

### Mathematical economics

#### Role of Mathematics in Economics

Mathematics is a science of space numbers. It is no more a branch of economics. However, tools of mathematics are frequently applied to interpret economics phenomena. Thus mathematical analysis is merely an approach to economic analysis. It should not and does not differ from the non-mathematical analysis. The purpose of any theoretical analysis is to derive a set of conclusions or theorems from a given set of assumptions via a process of reasoning. In mathematical economics the assumptions and conclusions are stated in mathematical symbols rather than in words and in equations rather than in sentences.

The use of mathematics in economics substantiates the following advantage;;

- (i) The language of mathematics used is more concise and precise.
- (ii) There exists a rich treasure of mathematical theorems at our disposal which can be used to interpret economic theories.
- (iii) It enables us to distinguish between different variables such as exogenous and endogenous variables, implicit and explicit variables involved in the economic theories.

Thus mathematical economics refers to application of mathematics to purely theoretical aspects of economic analysis with little or no error of measurement of the variables under study.

#### Some mathematical tools used in economics

1. **Matrices and Determinants:** Matrices and determinants are applied in various phenomena of economic analysis and management such as linear programming, game theory, General equilibrium analysis, input-output analysis etc.
2. **Functions, Limits and Continuity:** The concepts of functions, limits and continuity are of fundamental importance in economics. These concepts enable us to have a clear understanding of the nature of the function, and its derivatives i.e the study of changes that occur in one variable as a result of change in other (dependent) variable. These concepts are very useful in demand, supply analysis and production and consumption function.
3. **Maxima and Minima:** The concepts of maxima and minima play a very useful role in almost all fields of micro and macro economics. The concepts are used to understand utility maximization of the consumers, profit maximization and cost minimization of the producers.
4. **Differential equations and difference equations:** Differential equations are used frequently in economics. They are used to establish the conditions for dynamic stability micro economic models of market equilibrium and to trace the time path of

economic variables under various conditions. They are used to find total cost and total revenue functions from the marginal cost and marginal revenue functions.

Difference equations are widely used in economics to determine the conditions of dynamic stability in lagged economic models such as cobweb model, Harrod- Domar Growth model etc.

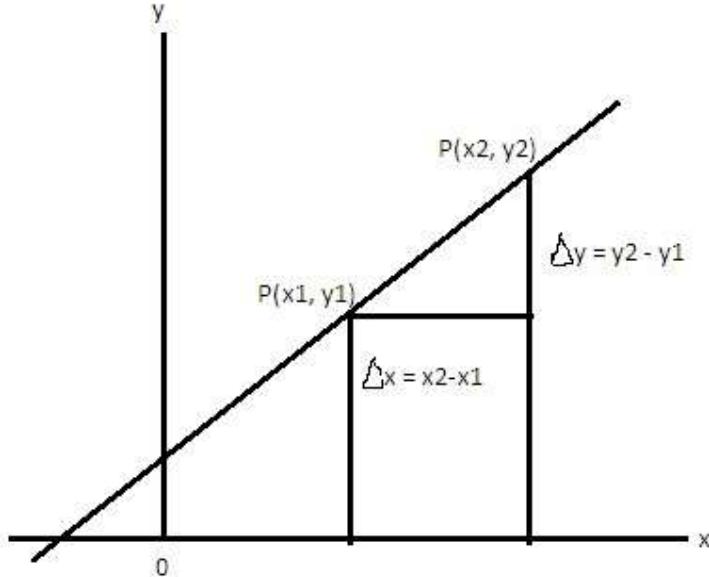
## Coordinate Geometry

**Straight Line:** A straight line is defined as a connection of two collinear points. The equation of a straight line is generally written as

$$Y = mx + c$$

Which is a linear equation. Here 'm' is called the slope of the line and 'c' is called the intercept.

**Slope of line:** The slope of line is a measure of steepness. The slope of line measures the change in the dependent variable  $y$  ( $\Delta y$ ) divided by a change in the independent variable  $x$  ( $\Delta x$ ). The greater the absolute value of the slope, the steeper the line and vice versa. A positively sloped line moves up from left to right and a negatively sloped straight line moves down from left to right. The slope of a horizontal line for which  $\Delta y = 0$ , is zero. The slope of a vertical line for which  $\Delta x = 0$  does not exist.



Let  $P(x_1, y_1)$  and  $P(x_2, y_2)$  are two points on a line. Then the slope  $m$  of the line is

defined as  $m = (\Delta y / \Delta x) = (y_2 - y_1) / (x_2 - x_1) = \text{vertical change} / \text{horizontal change}$

## Solved problems

Q 1. Find the distance between two points (1,4) and (3,5).

Ans. To find the distance between any two points. We use the formula

$$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Here  $x_1 = 1$ ,  $x_2 = 3$  and  $y_1 = 4$ ,  $y_2 = 5$

$$\text{Therefore } AB = \sqrt{(3-1)^2 + (5-4)^2} = \sqrt{4+1} = \sqrt{5}.$$

Q2. Find the distance between two points (4, -6) and (3, 8).

Ans. Here  $x_1 = 4$ ,  $x_2 = 3$  and  $y_1 = -6$ ,  $y_2 = 8$

$$\text{Therefore } AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(3-4)^2 + (8+6)^2} = \sqrt{1^2 + 14^2} = \sqrt{1 + 196} = \sqrt{197}.$$

Q3. Find the slope of line passing through two points (-1,0) and (1,0).

Ans. The slope  $m = (\Delta y)/(\Delta x) = (y_2 - y_1)/(x_2 - x_1) = 0 - 0 / 1 - (-1) = 0 / 2 = 0$ .

Q4. Find the slope of the line passing through points (0,0) and (2,5)

Ans. Here  $x_1 = 0$ ,  $x_2 = 2$  and  $y_2 = 0$ ,  $y_1 = 5$

$$\text{Slope } (m) = (\Delta y)/(\Delta x) = (y_2 - y_1)/(x_2 - x_1) = 5 - 0 / 2 - 0 = 5/2.$$

Q5. Find the slope of line  $3y = 9x - 2$

Ans.  $3y = 9x - 2$  can be re written as

$$Y = (9x - 2) / 3 = 3x - 2/3$$

Comparing with  $y = mx + c$  we get

$$\text{Slope } (m) = 3$$

Q6. Find the slope and intercept of the line  $\sqrt{3}x + y = 12$ .

$$\text{Ans. } (\sqrt{3}x) + y = 12 \text{ or } y = -(\sqrt{3}x) + 12$$

Comparing with  $y = mx + c$  we get

$$\text{Slope } (m) = -\sqrt{3}, \text{ and intercept } (c) = 12$$

Q7. Find the equation of a straight line whose slope is  $-2/5$  and intercept is 6.

Ans. Given  $m = -2/5$  and  $c = 6$

Therefore the equation of the st. line is  $y = mx + c$

i.e  $y = (-2/5)x + 6$  or  $5y = -2x + 6 \times 5$

or  $5y + 2x - 30 = 0$  is the required

equation.

## Equation of a straight line in intercept form

The equation of a st. line making intercepts 'a' and 'b' on x-axis and y-axis is respectively is

given by  $x/a + y/b = 1$

Q8. Find the equation of a st. line making intercepts 2 and -5 on x-axis and y-axis respectively

Ans. The equation of a st. line in intercept form is  $x/a + y/b = 1$

Here  $a = 2$ ,  $b = -5$ , therefore the required equation is  $x/2 + y/-5 = 1$

Or  $5x - 2y = 10$  (Ans)

Q9. Find equation of a st. line passing through points (3,5) and (4,7).

Ans. The equation of a st. line passing through two points  $(x_1, y_1)$  and  $(x_2, y_2)$

is given by  $y - y_1 = [(y_2 - y_1)/(x_2 - x_1)](x - x_1)$  here  $x_1 = 3$ ,  $x_2 = 4$  and  $y_1 = 5$ ,

$y_2 = 7$  so the equation is  $y - 5 = [(7-5)/(4-3)](x-3)$  or  $y - 5 = 2(x-3)$  or  $y - 5 =$

$2x - 6$  hence  $y = 2x - 1$  Ans.

Q10. Find the linear demand function for the following demand schedule for watches sold at 2 different prices

No. of watches sold	price per unit
20	90
30	60

Ans. Here demand curve passes through two points with co-ordinates (20,90) and (30,60)

The linear demand curve passing through 2 points  $(x_1, y_1)$  and  $(x_2, y_2)$

is given by  $y - y_1 = [(y_2 - y_1)/(x_2 - x_1)](x - x_1)$

Where  $x$  = quantity demand and  $y$  = price

Therefore the linear demand curve is

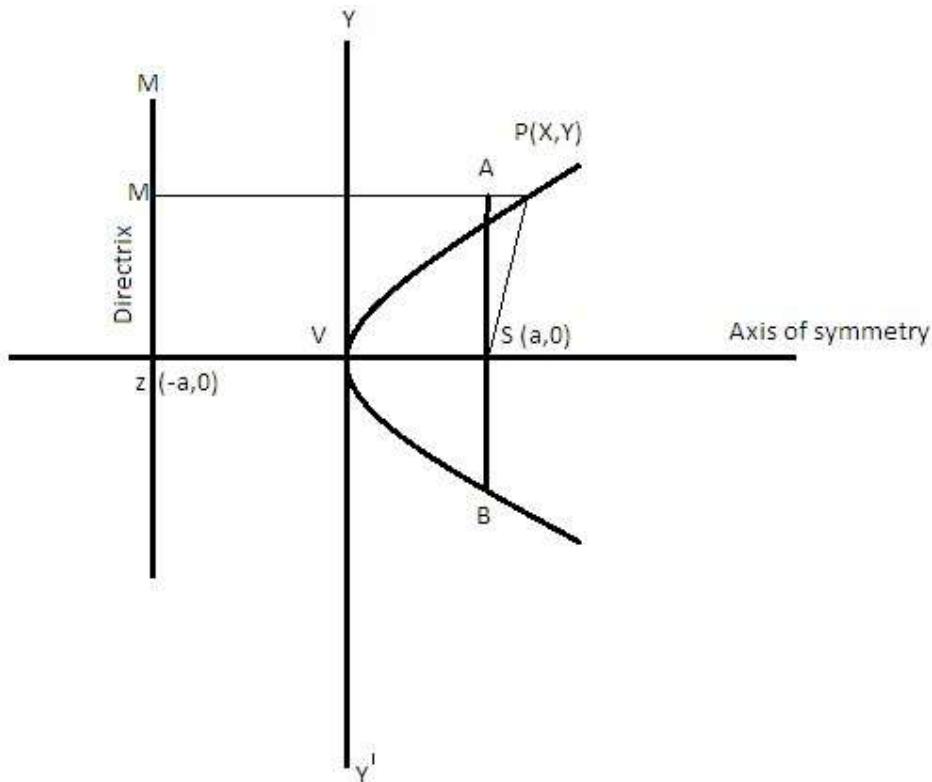
$$Y - 90 = [(60-90)/(30-20)](x-20)$$

$$\text{Or } y - 90 = -30/10 (x - 20) = -3(x - 20) = -3x + 60$$

Or  $y + 3x - 150 = 0$  Ans.

## Parabola

**Definition:** A parabola is a set of points each of which is equidistant from a given point called the focus (s) and from a given line called a directrix (ZM). The directrix is parallel to and at a distance 'a' from the y-axis. Its equation is  $x + a = 0$

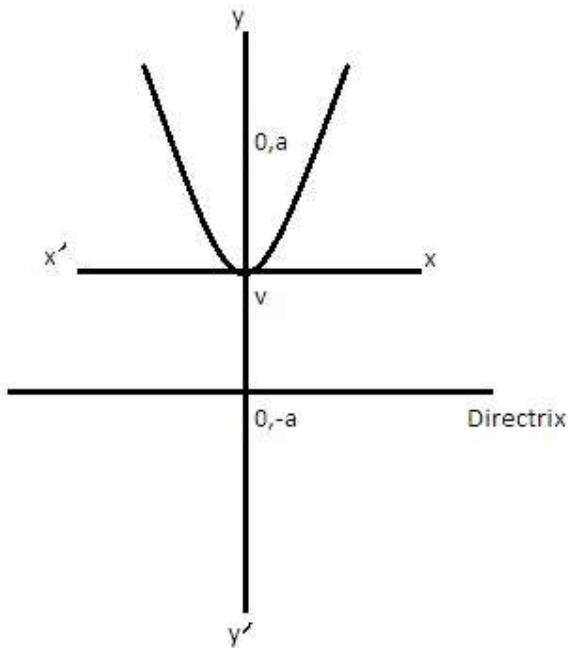


The line through the focus (s) and perpendicular to the directrix (ZM) is called the 'axis' of the parabola. The point on the axis midway between the focus (s) and directrix (ZM) is called the vertex. The line segment joining two points of a parabola and is known as Latus rectum whose length is equal to  $4a$ .

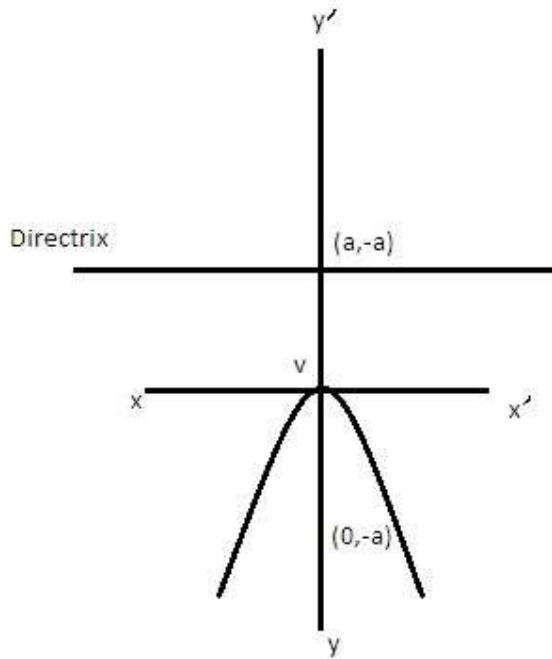
The equation of a parabola with vertex at origin is given by  $y^2 = 4ax$ . This is a right handed parabola.

The equation of a left handed parabola is similarly given by  $y^2 = -4ax$ .

The equation of an upward parabola is given by  $y^2 = 4ay$ .



Similarly the equation of a downward parabola is given by  $x^2 = -4ay$



If the vertex of the parabola is the point  $(h, k)$  instead the point of origin, the above four cases become

Equation Directrix

$$(i) \quad (y-k)^2 = 4a(x-h) \quad x = h - a$$

(ii)	$(y-k)^2 = -4a(x-h)$	$x = h + a$
(iii)	$(x-h)^2 = 4a(y-k)$	$y = k - a$
(iv)	$(x-h)^2 = 4a(y-k)$	$y = k + a$

Q1. Find the focus and directrix of the parabola  $y^2 = 8x$ .

Sol.  $y^2 = 8x$ .

Compare it with the general equation of the parabola  $y^2 = 4ax$ ; we get

$$4a = 8 \quad \text{or} \quad a = 2$$

Therefore co-ordinates of focus are  $(a, 0) = (2, 0)$

Directrix  $x + a = 0 \quad \text{or} \quad x + 2 = 0$

Q2. Find the focus ,directrix and latusrectum of the parabola.  $y^2 = -16x$

Sol.  $y^2 = -16x$

Compare it with left handed parabola  $y^2 = -4ax$ . We get

$$\text{i.e } -4a = -16 \quad \text{or } a = 4$$

Therefore the co-ordinates of focus are  $(-4, 0)$

The directrix is  $x - a = 0 \quad \text{or} \quad x -$

$$4 = 0 \quad \text{L.R.} = 4a = 4 \cdot 4 = 16.$$

Q3. Find the standard form for the parabola  $y^2 + 2y - 12x - 3 = 0$

Sol.  $y^2 + 2y - 12x - 3 = 0$

Or  $y^2 + 2y + 1 = 12x + 4$

Or  $(y + 1)^2 = 12(x + 1/3)$

Compare it with  $(y - k)^2 = 4a(x - h)$ .

we get  $K = -1, h = -1/3$  or vertex is

$(-1/3, -1)$

$$4a = 12 \quad \text{or } a = 3$$

Therefore the directrix is  $x = h - a = (-1/3) - 3 = -10/3$

$$\text{Or } x + 10/3 = 0$$

The focus is  $(h+a, k) = (-1/3)+3, -1 = 8/3, -1$

Q4. Find the vertex focus and directrix for the parabola  $y = x^2 + 4x$

Sol.  $y = x^2 + 4x$

$$(x+4)^2 = y + 4$$

Compare it with  $(x-h)^2 = 4a(y-k)$  – case iii

above we get  $h = -2, k = -4$

therefore vertex is  $(h, k) = (-2, -4)$  since  $4a = 1 \Rightarrow a = 1/4$

$= 1/4$  therefore focus is  $(h, k+a) = (-2, -4+1/4) = (-2, -15/4)$

Directrix is  $y = k - a$

Or  $y = -4-1/4$  or  $y = -17/4$

Or  $y + 17/4 = 0$  Ans

Q5. Find the co-ordinates of vertex, focus, equation of directrix and latus rectum for the parabola

$$x^2 - 2x - 12y + 25 = 0$$

Sol.  $x^2 - 2x - 12y + 25 = 0$

$$x^2 - 2x = 12y - 25$$

$$(x-1)^2 - 1 = 12y - 25 \quad \text{or} \quad (x-1)^2 = 12y - 24$$

$(x-1)^2 = 12(y-2)$  which is an upword parabola.

Compare it with general form of upword parabola  $(x-h)^2 = 4a(y-k)$

$(y-k)$  we get  $h = 1, k = 2$  therefore coordinates of vertex are  $(h,k) = (1, 2)$

since  $4a = 12$  or  $a = 3$  coordinates of focus are  $(h, k+a) = (1, 2+3) = (1, 5)$

Directrix is given by  $y = k - a$

Or  $y = 2-3 = -1$  or  $y = -1$  or  $y + 1 = 0$

$$L.R = 4a = 4.3 = 12$$

Q6. A firm produces an output at variable cost given by  $\Pi = ax^3 - bx^2 + cx$ . Show that average variable cost (AVC) is a parabola

$$\text{Sol. } VC = ax^3 - bx^2 + cx$$

$$\text{Therefore } AVC = (ax^3 - bx^2 + cx)/x = ax^2 - bx + c.$$

$$\text{Denoting } AVC \text{ by } y, \text{ we get } Y = ax^2 - bx + c$$

$$ax^2 - bx = y - c \quad a(x^2 - bx/a) =$$

$$y - c \quad \text{or } a[(x - b/2a)^2 - b^2/4a^2] = y - c \quad a[(x - b/2a)^2] = y - c + b^2/4a^2 = y -$$

$$(4ac - b^2)/4a \quad \text{or } (x - b/2a)^2 = 1/a[y - (4ac - b^2)/4a]$$

which is of the form

$$(x - h)^2 = 4a(y - k)$$

is an upword parabola

Q7. Show that the demand curve corresponding to the demand law  $P = 4 - (x^2/100)$  is a parabola

$$\text{Sol. } P = 4 - (x^2/100) \quad \text{where } P = \text{price and } x = \text{demand}$$

$$\text{Therefore } TR = P \cdot x = x(4 - x^2/100) = 4x - x^3/100$$

$$\text{Therefore } AR = TR/x = [4x - (x^3/100)]/x = 4 - x^2/100$$

Since AR is also the demand curve and denoting AR by y we get

$$Y = 4 - x^2/100 \quad \text{or } x^2/100 = 4 - y \quad \text{or } x^2 = -100(y - 4)$$

Which is a down word parabola of the form  $(x - h)^2 = -4a(y - k)$ . so the demand curve is a parabola.

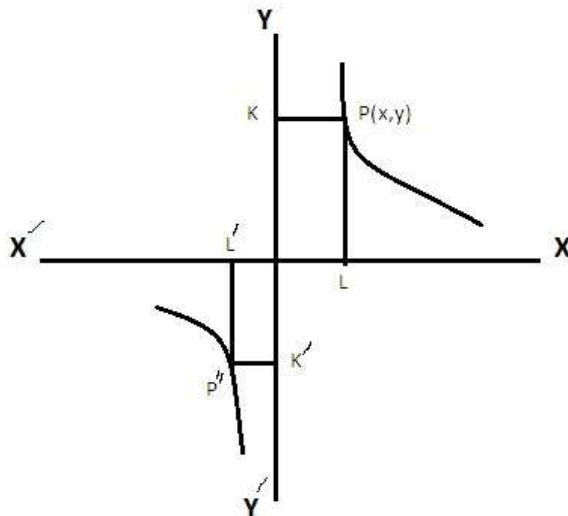
## Rectangular Hyperbola

**Definition:** A rectangular hyperbola is defined as the locus of a point which moves in such a way that the product of its perpendicular distance from a fixed line to each is a positive constant say  $C^2$ . Fixed lines perpendicular to each other are called asymptotes and their point of intersection is called the centre of rectangular hyperbola.

## Equation of rectangular Hyperbola

By definition  $PLx PK = c^2$  where  $c^2$  is a constant i.e.  $xy = c^2$  which is a equation of a rectangular hyperbola. In case the asymptotes of rectangular hyperbola are parallel to axis and the centre of rect. Hyp. is  $(a,b)$ , then the equation of the rectangular hyperbola becomes

$$(x-a)(x-b) = c^2$$



Average fixed cost defined as total fixed cost divided by level of output i.e  $TFC/x$  is represented by a rectangular hyperbola. In this case output axis and cost axis are the asymptotes and the product of the distance of any point on AFC curve from the two axis is always equal to fixed cost ( a positive constant)

Q. if the total cost curve is  $\Pi = ax(x+b)/x + c$ , where  $a, b$  and  $c$  are +ve constants. Show that average cost curve is rectangular hyperbola.

$$\text{Sol. } TC = \Pi = ax(x+b)/x + c$$

$$\text{Therefore } AC = \Pi/x = *ax(x+b)/x + c/x = a(x+b)/x + c$$

Let AC is denoted by  $y$  we get

$$Y = a(x+b)/x + c \quad \text{or} \quad y(x+c) = a(x+b) \quad \text{or} \quad xy + yc$$

$$= ax + ab \quad ax - ay - cy = -ab \quad \text{or} \quad ax + ac - xy - cy$$

$$= -ab + ac \quad a(x+c) - y(x+c) = -ab + ac$$

$$(x+c)(a-y) = -ab + ac$$

$(x+c)(y-a) = ab - ac$  which is the form  $(x-a)(y-b) = c^2$ , so it is a rectangular hyperbola.

## Functions

**Definition:** A function  $f$  is a rule which assigns to each value of a variable ( $x$ ) called the argument of the function, one and only one value [ $f(x)$ ] referred to as the value of the function at  $x$ . The domain of a function refers to the set of all possible values of  $x$ ; the range is the set of all possible values for  $f(x)$ .

functions are generally defined by algebraic formulas. A function is usually expressed as

$y = f(x)$  in which  $y$  is dependent variable and  $x$  is independent variable and ' $f$ ' denotes the unspecified relationship between  $y$  and  $x$ . It is a single valued function since there is a unique  $y$  in the range for each specified  $x$ . The converse may not necessarily be true.

## Types of function

Functions frequently used in economics are

1. **Constant functions:** A zero degree polynomial function is called a constant function e.g  $f(x) = k$

where  $k = \text{constant}$ .

2. **Linear Function:** A polynomial function of degree 1 is called a linear function e.g  $f(x) = mx + c$ . where  $m$  and  $c$  are constants.

3. **Quadratic Function:** A polynomial function of degree 2 is called a quadratic function e.g  $f(x) = ax^2 + bx + c$  where  $a \neq 0$

4. **Polynomial function:** A function of the form

$f(x) = a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^{n-2} + \dots + a_0$  where  $n$  is non-negative integer,  $a_n \neq 0$  is called a polynomial function

5. **Rational function:** A function expressed as the ratio of two polynomials is called a rational function. Thus  $y = f(x)/g(x)$  where  $f(x)$  and  $g(x)$  are both polynomials in  $x$  is a rational function.

6. **Even function:** A function  $f$  is said to be an even function if  $f(-x) = f(x)$ . e.g  $f(x) = x^2 + 4$  is an even function for all values of  $x$ .

7. **odd function:** A function  $f$  is said to be odd function if  $f(-x) = -f(x)$  e.g.  $f(x) = x^3$  is an odd function for all values of  $x$ .

8. **Monotone Function:** A function is monotone if it is either increasing or decreasing. A function is increasing if  $f(x_1) < f(x_2)$  for  $x_1 < x_2$ .

A function is decreasing if  $f(x_1) > f(x_2)$  for  $x_1 < x_2$ .

**9. Non Algebraic function:** A function is said to be non algebraic function if the relation which involves the finite terms and variables are not affected by the operation of addition, subtraction, multiplication, division, powers and roots, exponential function, logarithmic function, trigonometric function are called non-algebraic functions.

## Solved Problems

Q1. Given  $f(x) = x^2 + 4x - 5$ . Find  $f(2)$  and  $f(-3)$

Sol. (i)  $f(x) = x^2 + 4x - 5$

$$\text{Put } x = 2 \text{ we get } f(2) = 2^2 + 4 \cdot 2 - 5 = 4 + 8 - 5 = 7$$

(ii) Put  $x = -3$  we get

$$f(-3) = (-3)^2 + 4 \cdot (-3) - 5 = 9 - 12 - 5 = -8 \text{ Ans}$$

Q2.  $f(x) = x^2 - 5x + 3$  (i)  $f(0)$ , (ii)  $f(-2)$  (iii)  $f(1/2)$

Sol. (i)  $f(x) = x^2 - 5x + 3$

$$\text{Put } x = 0 \text{ we get } f(0) = 0 - 5 \cdot 0 + 3 = \text{Ans.}$$

(ii) put  $x = -2$  we get  $f(-2) = (-2)^2 - 5$

$$(-2)^2 - 5 = 4 - 10 + 3 = 17 \text{ Ans}$$

$$(III) \text{ put } x = 1/2 \text{ we get } f(1/2) = (1/2)^2 - 5 \cdot (1/2) + 3 = 1/4 - 5/2$$

$$+ 3 = (1 - 10 + 12)/4 = 3/4 \text{ Ans.}$$

Q3. If  $f(x) = e^{-x}$ , find  $f(-a)/f(b)$

Sol.  $F(x) = e^{-x}$

$$\text{Put } x = -a \text{ we have } f(-a) = e^{-(-a)} = e^a$$

$$\text{Put } x = b \text{ we get } f(b) = e^{-b}$$

$$\text{Therefore } f(-a)/f(b) = e^a/e^{-b} = e^{a-b} = e^{a+b} \text{ Ans}$$

Q4. If  $f(x) = x^2 - 5x + 3$  then find  $f(f(x))$

Sol.  $f(x) = x^2 - 5x + 3$

$$\text{Put } x = f(x) = x^2 - 5x + 3$$

$$\text{Therefore } f(f(x)) = (x^2 - 5x + 3)^2 - 5(x^2 - 5x + 3) + 3 = x^4 + 25x^2 + 9 - 10x^3 - 30x + 6x^2 - 5x^2 + 25x - 15 + 3$$

$$f(f(x)) = x^4 - 10x^3 + 26x^2 - 5x - 3 \text{ Ans}$$

Q5. If  $f(x) = (1/x) + ax$  and  $f(1/5) = 28/5$  find the value of a.

Sol.  $f(x) = (1/x) + ax$

Put  $x = 1/5$  we get  $f(1/5) = (1/1/5) + a.(1/5)$

$f(1/5) = 5 + a/5$  since  $f(1/5) = 28/5$  we get

$5 + a/5 = 28/5$  or  $a/5 = (28/5) - 5 = 3/5$  or a

= 3 Ans

### Limits

**Definition:** If the functional values  $f(x)$  of a function  $f$  draw closer to one and only one finite real number L for all values of x as x draws closer to 'a' from both sides, but does not equal a, L is defined as the limit of  $f(x)$  as x approaches 'a' and is written as

$$\lim_{x \rightarrow a} f(x) = L$$

### Solved problems

Q1. Evaluate (i)  $\lim_{x \rightarrow 7} (x-7)/x^2 - 49$  (ii)  $\lim_{x \rightarrow -7} (x-7)/x^2 - 49$  (iii)  $\lim_{x \rightarrow 2} (x^2 - 4)/x - 2$  (iv)  $\lim_{x \rightarrow -3} (x^2 - 9)/x - 3$

Sol. (i)  $\lim_{x \rightarrow 7} (x-7)/x^2 - 49 = \lim_{x \rightarrow 7} (x-7)/(x-7)(x+7) = 1/(7+7) = 1/14$  Ans

(ii)  $\lim_{x \rightarrow -7} (x-7)/x^2 - 49 = \lim_{x \rightarrow -7} (x-7)/(x-7)(x+7) = 1/(17+7) = 1/0$

Hence limit does not exist.

(iii)  $\lim_{x \rightarrow 2} (x^2 - 4)/x - 2$  By factorizing the numerator

$$\lim_{x \rightarrow 2} (x+2)(x-2)/(x-2) = -2 + 2 = 0$$
 Ans

(iv)  $\lim_{x \rightarrow -3} (x^2 - 9)/x - 3$  By factorizing the numerator

$$\lim_{x \rightarrow -3} (x-3)(x+3)/(x-3) = -3 + 3 = 0$$
 Ans

Q2. Evaluate  $\lim_{x \rightarrow 6} (x^2 - 2x - 24)/x - 6$

$$x \rightarrow 6$$

Sol By factorizing the numerator

$$\lim_{x \rightarrow 6} (x-6)(x+4) / (x-6) = \lim_{x \rightarrow 6} (x+4) = 6+4 = 10 \text{ Ans}$$

$$Q3. \text{ Evaluate } \lim_{x \rightarrow \infty} (3x^2 - 7x) / 4x^2 - 21$$

$$x \rightarrow \infty$$

Sol. As  $x \rightarrow \infty$  numerator and denominator become infinite. In such a case we must divide all terms by the highest power of  $x$  in the function.

Thus divide both numerator and denominator by  $x^2$

$$\lim_{x \rightarrow \infty} (3x^2 - 7x) / 4x^2 - 21 = \lim_{x \rightarrow \infty} [(3x^2 - 7x)/x^2] / [(4x^2 - 21)/x^2] = \lim_{x \rightarrow \infty} (3 - 7/x) / (4 - 21/x^2) = \frac{3}{4}$$

since as  $x \rightarrow \infty, 1/x, 1/x^2, 1/x^3 \rightarrow 0$

$$Q4. \text{ Evaluate } \lim_{x \rightarrow \infty} 4x^3 - 7x^2 + 8x / 4x^4 + 8x^2$$

$$x \rightarrow \infty$$

Do your self

$$Q5 \text{ Prove that } \lim_{h \rightarrow 0} [(x+h)^m - x^m] / h = mx^{m-1}$$

$$h \rightarrow 0$$

$$\text{Sol. } \lim_{h \rightarrow 0} [(x+h)^m - x^m] / h = \lim_{h \rightarrow 0} [x^m (1 + h/x)^m - x^m] / h$$

$$h \rightarrow 0 \quad h \rightarrow 0$$

Expanding by bi-nominal theorem

$$= \lim_{h \rightarrow 0} [x^m (1 + m h/x) + m(m-1)/2! (h/x)^2 + m(m-1)(m-2)/3! (h/x)^3 + \dots - x^m] / h$$

$$= \lim_{h \rightarrow 0} [x^m (1 + m h/x) + m(m-1)/2 (h/x)^2 + m(m-1)(m-2)/6 (h/x)^3 + \dots - 1] / h$$

$$= \lim_{h \rightarrow 0} [x^m (h/x) (m + m(m-1)/2 (h/x) + m(m-1)(m-2)/6 (h/x)^2 + \dots + 1)] / h$$

$$h \rightarrow 0$$

$$= (x^m / x) m = x^{m-1} \cdot m \text{ Ans}$$

$$Q6. \text{ Evaluate } \lim_{x \rightarrow 4} (x^2 - 16) / (\sqrt{x^2 + 9}) - 5$$

$$x \rightarrow 4$$

$$\text{sol. } \lim_{x \rightarrow 4} (x^2 - 16) / (\sqrt{x^2 + 9}) - 5$$

$$x \rightarrow 4$$

it assumes the form 0/0 when  $x = 4$ . By rationalization. We get

$$\text{. Limit } (x^2 - 16) / (\sqrt{x^2 + 9}) - 5 \times (\sqrt{x^2 + 9}) - 5 / (\sqrt{x^2 + 9}) -$$

$$5] \quad x \rightarrow 4$$

$$\text{=. Limit } [(x^2 - 16) (\sqrt{x^2 + 9}) + 5] / (\sqrt{x^2 + 9})^2 - 5^2$$

$$x \rightarrow 4$$

$$\text{=. Limit } [(x^2 - 16) (\sqrt{x^2 + 9}) + 5] / (x^2 - 16)$$

$$x \rightarrow 4$$

$$\text{=. Limit } (\sqrt{x^2 + 9}) + 5 = (\sqrt{4^2 + 9}) + 5 = 5 + 5 = 10 \text{ Ans}$$

$$x \rightarrow 4$$

## Continuity

**Definition:** A function which has no breaks in its curve is called a continuous function. It can be drawn without lifting the pencil from the paper. A function 'f' is continuous at  $x = a$ , if

- (1)  $F(x)$  is defined i.e exists at  $x = a$
- (2)  $\lim_{x \rightarrow a} f(x)$  exists and
- (3)  $\lim_{x \rightarrow a} f(x) = f(a)$

All these three conditions must be satisfied for a function to be continuous

Q1. Indicate whether the following functions are continuous at the specified points

(i)  $f(x) = 5x^2 - 8x + 9$  at  $x = 3$  sol.  
 $f(x) = 5x^2 - 8x + 9$  Put  $x = 3$  we  
get  $f(3) = 5.3^2 - 8.3 + 9 = 45 - 24 + 9 = 30$  therefore  $f(3)$  exists  
(ii)  $\lim_{x \rightarrow 3} f(x) = \lim_{x \rightarrow 3} 5x^2 - 8x + 9 = 5.3^2 - 8.3$   
 $+ 9 = 30$   $x \rightarrow 3$   $x \rightarrow 3$

Therefore limit exists at  $x = 3$

since  $f(3) = \lim_{x \rightarrow 3} f(x) =$

$$30 \quad x \rightarrow 3$$

Hence  $f(x)$  is continuous at  $x = 3$

Q2.  $f(x) = (x^2 + 3x + 12)/(x-3)$  at  $x = 4$

Sol.  $f(x) = (x^2 + 3x + 12)/(x-3)$  Put  $x = 4$

(i)  $f(4) = (4^2 + 3.4 + 12)/4-3 = 40/1 = 40$   
(ii)  $\lim_{x \rightarrow 4} (x^2 + 3x + 12)/(x-3) = (4^2 + 3.4 + 12)/4-3 = 40/1 = 40$   $x \rightarrow 4$   
since  $f(4) = \lim_{x \rightarrow 4} f(x)$ , the function is continuous at  
 $x = 4$   $x \rightarrow 4$

Q3.  $f(x) = (x-3)/x^2 - 9$  at  $x = 3$

Sol.  $f(x) = (x-3)/x^2 - 9$

(i)  $f(3) = (3-3)/3^2 - 9 = 0/0$  so  $f(3)$  does not exist

Thus the function is not continuous at  $x = 3$ , even if its limit exists at  $x = 3$

(ii)  $\lim_{x \rightarrow 3} (x-3)/x^2 - 9 = \lim_{x \rightarrow 3} x-3/(x-3)(x+3) = \lim_{x \rightarrow 3} 1/(x+3) = 1/3+3 = 1/6$

(iii) Since  $\lim_{x \rightarrow 3} f(x) = 1/6 \neq f(3)$   
 $x \rightarrow 3$

hence it is not continuous at  $x = 3$

## Derivative

**Definition:** Given a function  $y = f(x)$ , the derivative of the function written as  $f'(x)$  or  $dy/dx$  is defined as  $f'(x) = dy/dx = \lim_{\Delta x \rightarrow 0} [f(x + \Delta x) - f(x)]/\Delta x$

$$\Delta x \rightarrow 0$$

Or  $f'(x) = dy/dx = \lim_{h \rightarrow 0} [f(x + h) - f(x)]/h$

## Rules of Differentiation

The process of finding the derivative of a function is called Differentiation.<sup>1</sup> In the previous chapter, the required derivative of a function is worked out by taking the limit of the difference quotient. It would be tedious, however, to have to do this every time we wanted to find the derivative of a function, for there are various rules of differentiation that will enable us to find the derivative of a desired function directly. Students are advised to equip themselves with the following rules to be able to apply them in the subsequent topics like marginal analysis, optimisation (Unconstrained and Constrained) problems.

Following are some of the rules of Differentiation.

### 1. Constant Function Rule

The derivative of a constant function  $(x) = A$ , where  $A$  is a constant, is zero.

I.e. if  $(x) = A$  then  $f'(x) = 0$

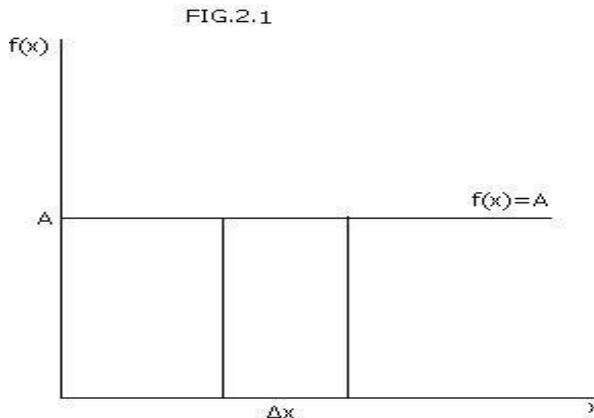
The reason for  $f'(x) = 0$  for  $f(x) = A$  is easy to see intuitively by having a look at the graph (Fig 2.1) of a constant function. The graph is a horizontal straight line with a zero Slope throughout.

Example 2.1. Given  $(x) = -5$                      $f'(x) = 0$

$(x) = 10$                      $f'(x) = 0$

---

<sup>1</sup> Differentiation is an operation that transforms a function  $f$  into another function  $f'$ .



## 2. Linear Function Rule

The derivative of a linear function  $(x) = a + bx$  with  $a$  and  $b$  constants is equal to  $b$ . For example the derivative of a function  $(x) = 3 + 2x$  is 2. It is obvious that the derivative of a linear function is the multiplicative constant of the variable. The important implication of this result is that for a linear function the rate at which variable  $y$  changes with respect to a change in  $x$  is same at every value of  $x$ .

**Example 2.2.** Find the derivative of

- a.  $q = 10 - 2p$ ; where  $q$  is quantity demanded and  $p$  the price
- b.  $C = 5 + \frac{1}{2}Y$ ; where  $C$  is consumption,  $Y$  is income

**Solution a.** Given  $q = 3 - 2p \Rightarrow dq = -2$  means that quantity demanded falls by two

$$dp$$

units for every one unit increase in the price ( $s$ )

Given

$$\Rightarrow \frac{dc}{dY} = 1/2$$

The derivative  $\frac{dc}{dY}$  or  $C'$  is called marginal propensity to consume (mpc). In the above example

$$\frac{dy}{dx}$$

the value of  $mpc = 0.5 > 0$ . The graphical exposition of the function is shown in fig.2.3.

FIG 2.3

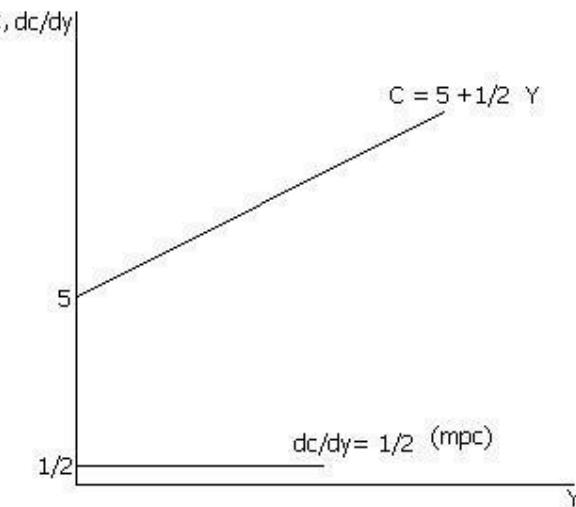
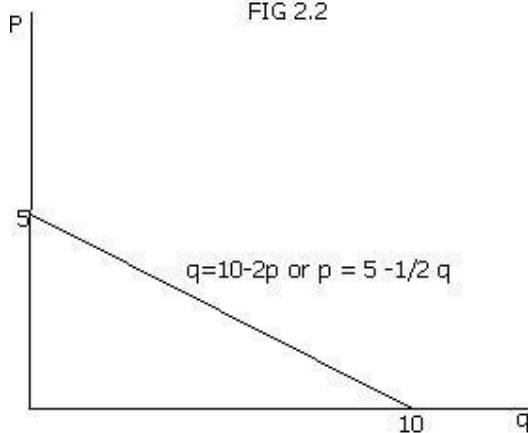


FIG 2.2



### 3. Power Function Rule.

The derivative of a function  $(x) = x^n$ ; where  $n$  is any arbitrary constant is  $n$  multiplied by the variable raised to the power  $n - 1$ .

i.e if  $f(x) = x^n$  then

$$f'(x) = nx^{n-1}.$$

For  $n = 2$ , the rule was already confirmed in the example 10 of the previous chapter.

Few remarks about the power function  $(x) = x^n$

- If  $n > 1$ ; the derivative of the function will be increasing function of  $x$
- If  $n = 1$ ; the derivative of the function will remain constant function and will be equal to 1
- If  $n < 1$ ; the derivative of the function will be decreasing function of  $x$ .

Example 2.3. find the derivative of the following functions given below and draw there respective Graphs to illustrate the remarks about power function.

a.  $(x) = x^{\frac{3}{2}}$

b.  $(x) = x^{\frac{3}{2}}$

c.  $(x) = x^{\frac{1}{2}}$

$\frac{3}{2}$

$\frac{1}{2}$

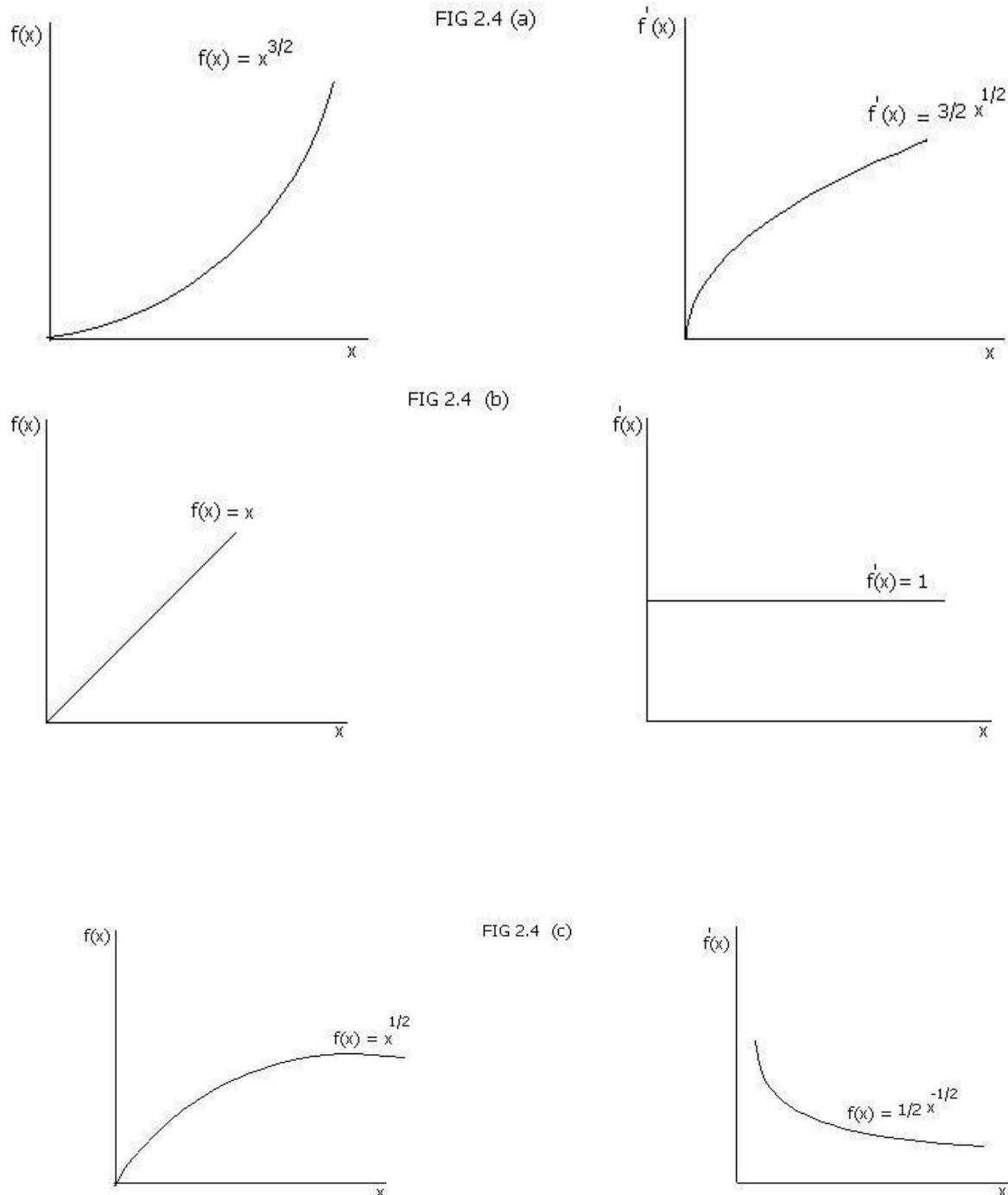
Solution. a). Given  $f(x) = x^{\frac{3}{2}} \Rightarrow f'(x) = \frac{3}{2}x^{\frac{3}{2}-1} = \frac{3}{2}x^{\frac{1}{2}}$

$x$

b) Given  $f(x) = x^{\frac{3}{2}} \Rightarrow f'(x) = \frac{3}{2}x^{\frac{1}{2}} = \frac{3}{2}\sqrt{x}$

$$\text{c) Given } f(x) = x^{\frac{1}{2}} \Rightarrow f'(x) = \frac{1}{2} x^{\frac{1}{2}-1} = \frac{1}{2} x^{-\frac{1}{2}} = \frac{1}{2\sqrt{x}}$$

the diagrammatic exposition of the above functions is shown in Fig. 2.4.<sup>2</sup>



<sup>2</sup> If  $x$  is considered as Labour input, then the three graphs portray increasing, constant and decreasing marginal physical productivity of Labour.

### 3.1. Generalised Power Function Rule

The generalised power function is symbolically written as  $(x) = (x)$  where  $g$  is a differentiable function and  $n$  is any real number. The derivative of such function is

$$f'(x) = n[g(x)]^{n-1} \cdot g'(x)$$

The above result shows, while differentiating power function, multiply the original index ( $n$ ) by  $g(x)$  raised to the power diminished by unity and also by the derivative  $g'(x)$ .

**Example 2.4.** Differentiate by applying power function rule to following functions

a.  $(x) = x^{-12}$     b.  $f(x) = 3(x)^4$     c.  $(x) = (x^2 + 3x^4)^5$     d.  $f(x) = \sqrt{x}$

**Solution** a) Given  $(x) = x^{-12} \Rightarrow f'(x) = -12x^{-12-1} = -12x^{-13}$

b) Given  $(x) = 3x^4 \Rightarrow f'(x) = 3 \cdot 4 \cdot x^{4-1} = 12x^3$ .

c) Given  $f(x) = (x^2 + 3x^4)^5$

Here  $(x) = (x^2 + 3x^4) \Rightarrow g'(x) = 2x + 12x^3$

$$\therefore f'(x) = 5(x^2 + 3x^4)^{5-1} \cdot (2x + 12x^3)$$

$$= 5(x^2 + 3x^4)^4 \cdot (2x + 12x^3)$$

d) Given  $f(x) = \sqrt{x} = x^{\frac{1}{2}} \Rightarrow f'(x) = \frac{1}{2} x^{\frac{1}{2}-1} = \frac{1}{2} x^{-\frac{1}{2}}$

#### 4. The derivative of Sum and Difference.

The derivative of sum (difference) of two functions is equal to the sum (difference) of their derivatives. i.e.

if  $f(x) = g(x) + h(x)$ , then  $f'(x) = g'(x) + h'(x)$  and (\*) if

$f(x) = g(x) - h(x)$ , then  $f'(x) = g'(x) - h'(x)$     (\*\*)

The rule set out above for the case of a combination of two functions only. But, if more than two functions appear in a combination, the rules can be applied several times in succession to give the derivative. It can be noticed, however, that the sum and difference rule extends at once to give the derivative of the algebraic sum of a number of functions as the similar algebraic sum of the derivatives of the separate functions. For example,

If  $f(x) = g(x) + h(x) + w(x)$ , then  $f'(x) = g'(x) + h'(x) + w'(x)$

And if  $f(x) = g(x) - h(x) - w(x)$ , then  $f'(x) = g'(x) - h'(x) - w'(x)$

The important deductions from (\*) and (\*\*) concerns the behaviour of constants in the process of derivation. A constant (additive) can be regarded as the case of a function of  $x$  which does not change in value as  $x$  varies. This means that the derivative of constant is zero. Hence an additive constant disappears when the derivative is taken.<sup>3</sup>

To better understand why a constant if added to a function disappears on differentiating.<sup>4</sup> Consider two functions  $f(x) = x^2$  and  $f(x) = x^2 + A$ , where  $A$  is a constant and plot them. The figure that emerges (fig 2.5) clearly reveals that the slope (derivative) of the functions at every point is same, the only difference that is apparent is that the graph of the later function is  $A$  steps away from the graph of the former function.

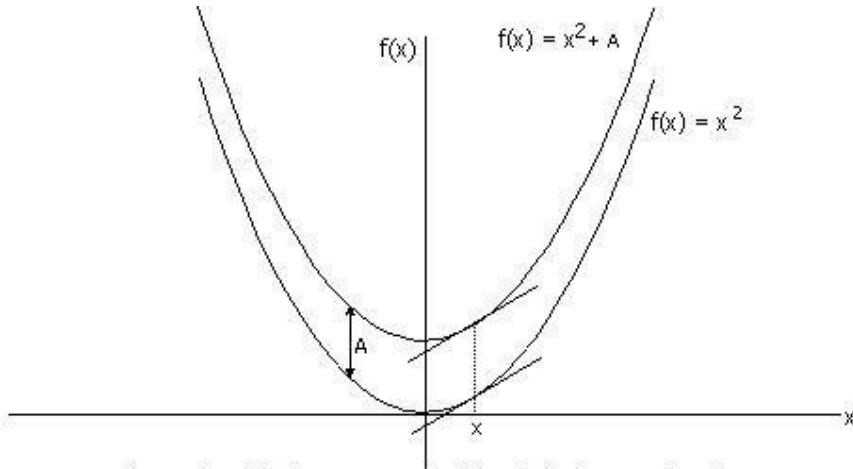


FIG 2.5 The graphs of the functions are parallel, and the functions have the same derivatives at each point.

**Example 2.5.** Find the derivative of the following functions.

a.  $(x) = 3x^4 + 2x^3 - x^2 + 10$

b.  $f(x) = \sqrt[3]{x} + 2x - 14$

c.  $(x) = ax^2 + bx + c$ ; where  $a, b, c$  are constants

**Solution.** a) Given  $(x) = 3x^4 + 2x^3 - x^2 + 10$

$$f'(x) = 3f'(x^4) + 2f'(x^3) - f'(x^2)$$

$$= 3 \cdot 4 x^3 + 2 \cdot 3 x^2 - 2x$$

$$= 12 x^3 + 6x^2 - 2x$$

---

<sup>3</sup> Multiplicative constants remain unaffected by taking the derivative of a function. If  $f(x) = 2x^4$ ; then  $f'(x) = 2 f'(x^4) = 8x^3$

<sup>4</sup> This fact provides mathematical explanation of the well known economic principle that fixed costs of a firm does not affect its marginal cost.

b) Given  $f(x) = \sqrt[3]{x} + 2x - 14$

$$f'(x) = f'(x)^{\frac{1}{2}} + 2f'(x)$$

$$= \frac{3}{2}(x)^{\frac{1}{2}} + 2$$

c) Given  $f(x) = ax^2 + bx + c$

$$f'(x) = af'(x^2) + bf'(x)$$

$$= 2ax + b$$

## 5 product function Rule

If  $(x) = h(x) \cdot g(x)$ , then

$$f'(x) = h(x) \cdot g'(x) + g(x) \cdot h'(x)$$

In words: the derivative of the product of two functions is equal to the derivative of the first function times the derivative of the second function plus the second function times the derivative of first function. The significant point to remember about the product function rule is that the derivative of the product of two functions is **not** the simple product of their separate derivatives i.e.  $f'(x) \neq g'(x) \cdot h'(x)$ . For example if  $h(x) = x^2$  and  $g(x) = 4x$  then  $(h \cdot g)'(x) =$

$(2x)(4x) = 4x^3$  it is obvious here that  $(h \cdot g)'(x) = 12x^2$  is not equal to  $h'(x) \cdot g'(x) = (2x)(4) = 8x$ .

### Verification by Product Rule: if $(x) = (x)^2 \cdot (4x)$

Consider  $h(x) = (x)^2$  and  $g(x) = 4x$  then

By applying product rule

$$f'(x) = h(x) \cdot g'(x) + g(x) \cdot h'(x)$$

$$= 2(4) + 4x(2x) = 4x^2 + 8x^2 = 12x^2$$

The same result was obtained when we first multiply the two functions and then differentiate the result directly. The obvious question that emerges is that why do we need product rule when we have another option of multiplying the functions and taking the derivative of the product directly. One response to the query is that multiplying first and then differentiating is applicable when the functions are given in some specific form, but the product rule is applicable even when the functions are given in general form.<sup>5</sup>

Example 2.6. Find the derivative of the following functions

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<sup>5</sup> For further exposition see Chiang A. C. Fundamental Methods of Mathematical Economics (4<sup>th</sup> ed.), McGraw-Hill (2005).

**a.**  $f(x) = 3x^4(2x^5 + 5x)$     **b.**  $f(x) = (\sqrt{x})(\sqrt[3]{x+2})$     **c.**  $f(x) = (x^4 + 1)(x^3 + 2)$

solution. a) Given  $f(x) = 3x^4(2x^5 + 5x)$

Let  $g(x) = 3x^4$  and  $h(x) = (2x^5 + 5x)$

Then  $g'(x) = 12x^3$  and  $h'(x) = (10x^4 + 5)$ . plug in these values in product rule formula

$$f'(x) = g(x).h'(x) + h(x).g'(x)$$

$$= 3x^4(10x^4 + 5). (2x^5 + 5x). (12x^3) = 54x^8 + 75x^4$$

b) Given  $f(x) = (\sqrt{x})(\sqrt[3]{x+2})$

Let  $g(x) = \sqrt{x}$  and  $h(x) = \sqrt[3]{x+2}$

Differentiating  $(x)$  and  $h(x)$  separately and substitute the values in the product rule formula

$$g'(x) = \frac{1}{2\sqrt{x}} \text{ and } h(x) = (x+2)^{\frac{3}{2}} \Rightarrow h'(x) = \frac{3}{2}(x)^{\frac{1}{2}}$$

$$\therefore f'(x) = g(x).h'(x) + h(x).g'(x)$$

$$= (\sqrt{x}).\frac{3}{2}(x)^{\frac{1}{2}} + (x+2)^{\frac{3}{2}} \left(\frac{1}{2\sqrt{x}}\right) = \frac{3}{2}x + \frac{1}{2\sqrt{x}}(x+2)^{\frac{3}{2}}$$

c) Given  $f(x) = (x^4 + 1)(x^3 + 2)$

Let  $g(x) = (x^4 + 1)$  and  $h(x) = (x^3 + 2)$

Differentiating  $(x)$  and  $h(x)$  separately and substitute the values in the product rule formula

$$g'(x) = 4x^3 - x^{-1} \text{ and } h'(x) = 3x^2$$

$$\therefore f'(x) = g(x).h'(x) + h(x).g'(x)$$

$$= (x^4 + x^1)(3x^2) + (x^3 + 2)(4x^3 - x^{-1})$$

## 6. Derivative of the Quotient of two Functions (Quotient Rule)

If  $(x) = \frac{g(x)}{h(x)}$ ; where  $g(x)$  and  $h(x)$  are both differentiable at  $x$  and  $h(x) \neq 0$   
 then  $h'(x)$

$$f'(x) = \frac{h(x) \cdot g'(x) - g(x) \cdot h'(x)}{[h(x)]^2}$$

In words: The derivative of a quotient is equal to the derivative of the numerator times the denominator minus the numerator times the derivative of the denominator, all divided by the square of the denominator.

Note: in the product rule formula, the two functions appear symmetrically, so that it is easy to remember. In the quotient rule however, the expression in the numerator must be in the right order. The simplest way to check whether the order of the expression in the numerator is appropriate or not, imagine that  $h(x) = 1$  so that  $h'(x) = 0$ . If on substituting the formula reduces to  $g'(x)$  then the signs are correct and if it reduces to  $-g'(x)$ , then the signs are wrong.

Example 2.7. Find the derivative of the following functions

a.  $(x) = x^{+1}$  where  $x \neq 1$

b.  $(x) = \frac{5x^6 + 2x^5 - 3x^4}{x}$  c.  $(x) = x^x$  d.  $f(x) = \frac{\sqrt{x+1}}{x}$

Solution a) Given  $f(x) = \frac{x^{+1}}{x-1}$  where  $x \neq 1$

let  $(x) = x + 1$  and  $h(x) = x - 1$  differentiate them individually we have.

$g'(x) = 1$  and  $h'(x) = 1$  substitute the value in the formula

$$\begin{aligned} f'(x) &= \frac{h(x) \cdot g'([xh](-x)) - g(x) \cdot h'([xh](-x))}{(x-1)^2} \\ &= \frac{(x-1)((1x)-1)(x_2+1)(1) - x(x_1-1)(-1)}{(x-1)^2} = -2 \end{aligned}$$

$\textcolor{blue}{5x_6+3x_4}$

b) Given  $f(x) = \frac{5x_6+3x_4}{2x_2-5}$

Let  $(x) = 5x^6 + 3x^4$  and  $h(x) = 2x^2 - 5$  differentiate individually we have

$g'(x) = 30x^5 + 12x^3$  and  $h'(x) = 4x$ , substitute the values in the formula

$$f'(x) = h \frac{(x).g'([xh](-x)g)]_2(x).h'(x)}{(2x^2-5).(30x^5+12x^3)-(5x^6+3x^4).(4x)} = \frac{40x^7-138x^5-60x^3}{(2x^2-5)^2} =$$

c) Given  $f(x) = c \frac{(x)}{x}$

If in the above example  $x$  is considered as the level of output and  $(x)$  as the cost of producing  $x$  units then  $f(x) = c \frac{(x)}{x}$  turns out to be general average cost function.

$x$

Let  $(x) = c(x)$  and  $h(x) = x$  differentiating individually we have

$g'(x) = c'(x)$  and  $h'(x) = 1$  substitute the values in the formula

$$f'(x) = h \frac{(x).g'([xh](-x)g)]_2(x).h'(x)}{x.c'(x)-c(x)} = \frac{1}{x} \left[ c'(x) - \frac{c(x)}{x} \right] \dots\dots\dots (*)$$

The economic meaning of the expression  $(*)$  is that for positive output levels ( $x > 0$ ), the marginal cost  $c'(x)$  exceeds the average cost  $c \frac{(x)}{x}$  if and only if the rate of change of the average cost as output increase is positive.

a) Given  $f(x) = \frac{\sqrt{x}+1}{x}$

Let  $(x) = \sqrt{x} + 1$  and  $h(x) = x$  differentiating  $g$  and  $h$  individually we have

$g'(x) = \frac{1}{2}\sqrt{x}$  and  $h'(x) = 1$  substitute the values in the formula

$$\begin{aligned} f'(x) &= h(x).g'([xh](-x)g)]_2(x).h'(x) \\ &= \frac{1}{x} \left( \frac{1}{2}\sqrt{x} \right) - (\sqrt{x}+1) \quad \frac{1}{x^2} \cdot \frac{3}{2}\sqrt{x} - \sqrt{x}-1 \end{aligned}$$

$$= \underline{\hspace{2cm}} - \underline{\hspace{2cm}}^2 x_2 = ^2 x_2$$

## 7. Function of a function rule Chain Rule or Composite Function Rule

If  $z$  is a function of  $y$ , and  $y$  is a function of  $x$ , that is if  $z = f(y)$  and  $y = g(x)$  then  $z$  is called the composite function of  $x$  and the derivative of  $z$  with respect to  $x$  is equal to the derivative of  $z$  with respect to  $y$ , times the derivative of  $y$  with respect to  $x$ . This is expressed symbolically as.

$$\frac{dz}{dx} = \frac{dz}{dy} \frac{dy}{dx}$$

The main idea behind the chain rule is that the change in the value of the variable  $x$  affects the variable  $y$ , according to the function  $y = g(x)$ , and a change in the variable  $y$ , in turn, affects the variable  $z$  according to the function  $z = f(y)$ .

**Example 2.8.** Differentiate the following (Using Chain Rule)

a.  $= y^{10}$  Where  $y = 2 + 3x$     b.  $y = (3x^2 + 7)^{10}$     c.  $y = x - x^6$ ; where  $x = \frac{1}{z} + 1$

**Solution.**

a) Given  $z = y^{10}$  Where  $y = 2 + 3x$

Differentiate  $z$  with respect to  $y$  and  $y$  with respect to  $x$

$$\frac{dz}{dy} = 10y^9 \quad \frac{dy}{dx} = 3$$

Substitute the values in the formula

$$\frac{dz}{dx} = \frac{dz}{dy} \cdot \frac{dy}{dx} = 10y^9 \cdot 3 = 30y^9 = 30(2 + 3x)^9$$

b) Given  $y = (3x^2 + 7)^{10}$  let  $y = u^{10}$  where  $u = 3x^2 + 7$

Differentiating  $y$  with respect to  $u$  and  $u$  with respect to  $x$

$$\frac{dy}{du} = 10u^9 \quad \frac{du}{dx} = 6x$$

Substitute the values in the formula

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx} = 10u^9 \cdot 6x = 60x \cdot u^9 = 60(3x^2 + 7)^9$$

c) Given  $y = x - \frac{x^6}{z}$ ; where  $x = z + 1$

Differentiate  $y$  with respect to  $x$  and  $x$  with respect to  $z$

$$\frac{dy}{dx} = 1 - 6x^5 \text{ and } \frac{dx}{dz} = -z^2$$

Substitute the values in the formula

$$\frac{dy}{dz} = \frac{dy}{dx} \cdot \frac{dx}{dz} = (1 - 6x^5)(-z^2) = 1 - 6(z+1)^5(-z^2)$$

Example 2.9. Given a profit function of a firm  $\pi = f(y)$ , where output  $y$  is a function of labour input  $L$ , or  $y = g(L)$ , find  $\frac{d\pi}{dL}$ . By using Chain rule.

$$dL$$

Solution. Given  $\pi = \pi(y)$  and  $y = g(L)$

Differentiating  $\pi$  with respect to  $y$  and  $y$  with respect to  $L$

$$\pi' \text{ Or } \frac{d\pi}{dy} = f'(y) \text{ and } y' \text{ Or } \frac{dy}{dL} = g'(L)$$

Substitute the values in the formula

$$\frac{d\pi}{dL} = \frac{d\pi}{dy} \cdot \frac{dy}{dL} = f'(g(L)) \cdot g'(L).^6$$

Or  $f$

### 8. Inverse Function Rule.

If  $y = f(x)$ , an inverse function  $x = g(y)$ , that is  $g(y) = f^{-1}(y)$  exists if each value of  $y$  yields one and only one value of  $x$ . If the inverse function exists, the inverse function rule states that the derivative of the inverse function is the reciprocal of the derivative of the original function that is

$$\frac{dx}{dy} = \frac{1}{\frac{dy}{dx}}$$

Alternatively we can write

$$f^{-1}(y) = \frac{1}{f'(x)}$$

Example 2.10. Find the derivative for the inverse of the following functions:

<sup>6</sup> The Leibniz's notation of remembering chain rule although easy suffers from the defect of not specifying where

$\frac{dy}{dx} = \frac{dy}{dx} \cdot \frac{dx}{dx}$

'(g(L). g'(L)) makes it the derivatives ( , ) are actually calculated second way of writing the chain rule i.e.  $f$

obvious that  $f'$  is calculated at  $g(L)$  where as  $g'$  is calculated at  $L$ .

- a.  $y = mx$       b.  $q = L^{1/2}$       c.  $L = q^2$       d.  $Q = 30 - 3P$

Solution. a) Given  $y = mx$

Differentiating with respect to  $x$  we have

$$\frac{dy}{dx} = m$$

$$\therefore \frac{dx}{dy} = \frac{1}{m} = \frac{1}{\frac{dy}{dx}}$$

b) Given  $q = L^{1/2}$

Differentiating with respect to  $L$  we have

$$\frac{dq}{dL} = \frac{1}{2\sqrt{L}}$$

$$\therefore \frac{dL}{dq} = \frac{1}{\frac{dq}{dL}} = \frac{1}{\frac{1}{2\sqrt{L}}} = 2\sqrt{L}$$

c) Given  $L = q^2$

Differentiating with respect to  $q$  we have

$$\frac{dL}{dq} = 2q$$

$$\therefore \frac{dq}{dL} = \frac{1}{\frac{dL}{dq}} = \frac{1}{2q}$$

D ) Given  $Q = 30 - 3P$

Differentiating with respect to  $P$  we have

$$\begin{aligned} \frac{dQ}{dp} &= -3 \\ \therefore \frac{dp}{dQ} &= \frac{-1}{3} \end{aligned}$$

### 1.1. Higher Order Derivatives : Convexity and Concavity of a Function

Up to this point we were dealing with the first order derivatives  $f'(x)$  or  $\frac{dy}{dx}$ . since the first derivative of a function is also a function of  $x$ , it too should be differentiable with respect to  $x$ , provided the conditions of differentiability are first satisfied. The method of obtaining the second and even higher order derivatives of a function introduces nothing new. Once the first order derivative is obtained by the suitable method already discussed, the second order derivative is obtained by further use of the rules, this time applied to the first derivative is considered as a function of  $x$ . the second order derivative of a function  $(x)$  denoted by

$$f''(x) \text{ or } \frac{(f'(x))}{dx} \text{ or } \frac{d^2y}{dx^2}$$

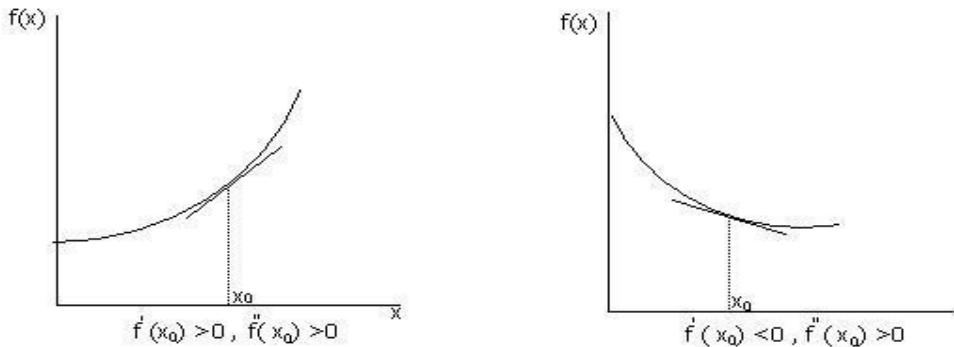
In economics we obtain many useful results by focussing on the first and second derivative of a function. The sign, positive or negative in particular, of a second derivative of a function leads us to an important and simple method of determining the convexity or concavity of a function.

- A twice differentiable function  $(x)$  is strictly convex at  $x = x_0$  if  $f''(x_0) > 0$ . This means that the function  $(x)$  changes at an increasing rate as  $x$  increases through the value  $x_0$ .
- A twice differentiable function  $(x)$  is strictly concave at  $x = x_0$  if  $f''(x_0) < 0$ . This means that the function  $(x)$  changes at a decreasing rate as  $x$  increases through the value  $x_0$ .

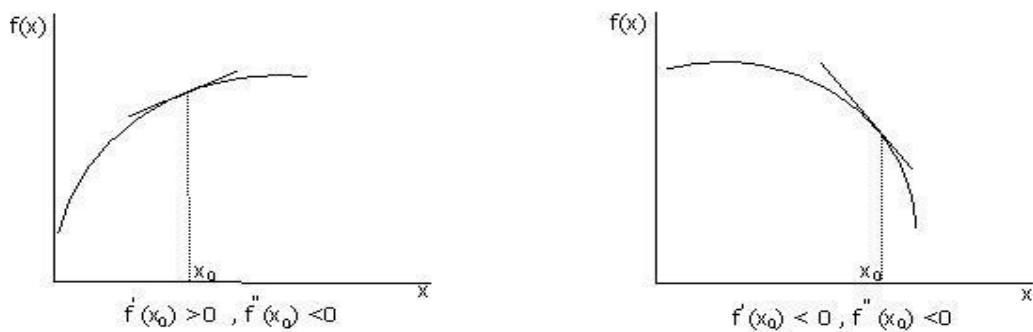
A function whose second derivative is sometimes positive and sometimes negative is neither convex nor concave everywhere. However, we can, sometimes find intervals over which the function is either convex or concave. Some possible shapes of strictly convex and concave functions are shown in fig. 2.6

FIG 2.6

possible shapes of the strictly convex functions



Possible shapes of Strictly concave functions



Example 2.11. check the convexity or concavity of the following.

a.  $(x) = 10 - x^2$     b.  $(x) = x^2$     c.  $(x) = -\frac{2}{3}(x)^3 + 10x^2 + 5x$ ; where  $x \geq 0$

Solution.

a) Here  $f(x) = 10 - x^2$

Differentiating with respect to  $x$

$$f'(x) = -2x$$

Differentiating again with respect to  $x$  we have

$$f''(x) = -2 < 0$$

Since the second derivative is less than zero, it confirms that the given function is strictly concave.<sup>6</sup>

b) Given  $f(x) = x^2$

Differentiating with respect to  $x$

<sup>6</sup> The precise geometric classification of a strictly concave function is that if we choose any two points on its curve and join them by a straight line, the line segment will lie completely below the curve except at the end points. For strict convex functions, the line segment will lie entirely above the curve.

$$f'(x) = 2x$$

Differentiating again with respect to  $x$  we have

$$f''(x) = 2 > 0$$

Since the second derivative is greater than zero, it confirms that the given function is strictly convex.

c) Given  $f(x) = -\frac{2}{3}x^3 + 10x^2 + 5x$

Differentiating with respect to  $x$

$$f'(x) = -2x^2 + 20x + 5$$

Differentiating again with respect to  $x$

$$f''(x) = -4x + 20$$

Since  $x$  can take values greater than or equal to zero. It follows that the function is convex on the interval  $[0, 5]$  and concave on the interval  $(5, \infty)$ . That is

$$f''(x) = -4x + 20 > 0 \text{ When } x < 5 \text{ (convex)}$$

$$f''(x) = -4x + 20 < 0 \text{ When } x > 5 \text{ (concave)}$$

OR

## Rules of differentiation

1. **Constant function Rule:** The derivative of a constant function  $f(x) = k$ , where  $k$  is constant is zero Example, given  $f(x) = 8$ ,  $f'(x) = 0$ .
2. **Linear function Rule:** The derivative of linear function  $f(x) = mx + b$  is equal to  $m$ , the coefficient of  $x$ .  $f(x) = 3x + 2$ . Then  $f'(x) = 3$  Ans Given  $f(x) = 5 - (1/4)x$ , then  $f'(x) = -1/4$
3. **Power function Rule:** The derivative of a power function  $f(x) = kx^n$  where  $k$  is a constant and  $n$  is any real number is equal to the coefficient  $k$  times the exponent  $n$  multiplied by the variable  $x$  raised to power  $n-1$ .  
i.e  $f(x) = k \cdot x^n$  then  $f'(x) = km \cdot x^{n-1}$  example  $f(x) = 4x^3$  then  $f'(x) = 4 \cdot 3x^{3-1} = 12x^2$  Ans

4. **The Rule of Sums and Differences:** The derivative of a sum of two functions  $f(x) = g(x) + h(x)$  where  $g(x)$  and  $h(x)$  are both differentiable is equal to the sum of the derivative of the individual functions. Similarly, the derivative of the difference of two functions is equal to the difference of the derivatives of the function.

Given  $f(x) = g(x) \pm h(x)$ , then  $f'(x) = g'(x) \pm h'(x)$

Example (i)  $f(x) = 12x^5 - 4x^4$  then  $f'(x) = 12.5x^4 - 4.4x^3 = 60x^4 - 16x^3$

$$(iii) f(x) = 9x^2 + 2x - 3 \text{ then } f'(x) = 9.2x + 2 - 0 = 18x + 2 \text{ Ans}$$

5. **The Product Rule:** The derivative of a product  $f(x) = g(x) \cdot h(x)$  where  $g(x)$  and  $h(x)$  are both differentiable functions, is equal to the first function multiplied by the derivative of the 2<sup>nd</sup> function plus the 2<sup>nd</sup> function multiplied by the derivative of the first function i.e

Given  $f(x) = g(x) \cdot h(x)$  then  $f'(x) = g(x) \cdot h'(x) + h(x) \cdot g'(x)$

Example Given  $f(x) = (3x)(2x-5)$  then  $dy/dx = f'(x) = 3x^3 (d/dx)(2x-5) + (2x-5) d/dx(3x^3) = 3x^3 \cdot 2 + (2x-5)(9x^2) = 6x^3 + 18x^3 - 45x^2 = 24x^3 - 45x^2 \text{ Ans}$

6. **The quotient Rule:** The derivative of a quotient  $f(x) = g(x) / h(x)$  where  $g(x)$  and  $h(x)$  are both differentiable and  $h(x) \neq 0$  is equal to the denominator times the derivative of the numerator minus the numerator times the derivative of the denominator all divided by the denominator squared. Give  $f(x) = g(x) / h(x)$  then  $f'(x) = *h(x).g'(x) - g(x)h'(x) / *h(x)^2$

Example  $f(x) = 5x^3/(4x+3)$  then  $f'(x) = *(4x+3)(15x^2) - 5x^3(4) / (4x+3)^2 = (60x^3 + 45x^2 - 20x^3) / (4x+3)^2 = (40x^3 + 45x^2) / (4x+3)^2 \text{ Ans}$

## Solved Problems

1. Differentiate the following using appropriate rules (i)  $f(x) = 17$  (ii)  $y = -12$  (iii)  $y = 8x^4$  (iv)  $y = -6x^5$  (v)  $f(x) = 18 \sqrt{x}$

Sol. (i)  $f(x) = 17$  therefore  $f'(x) = 0$

$$(ii) Y = -12 \text{ therefore } dy/dx = y' = 0$$

$$(iii) Y = 8x^4, dy/dx = y' = 32x^{4-1} = 32x^3$$

$$(iv) Y = -6x^5, dy/dx = y' = -6.5x^{5-1} = -30x^4$$

$$(v) f(x) = 18 \sqrt{x} = 18x^{1/2}, f'(x) = 18 \cdot \frac{1}{2}(x^{1/2-1}) = 9x^{-1/2} = 9/\sqrt{x} \text{ Ans}$$

Q2. Differentiate (i)  $y = (4x^2 - 3)(2x^5)$  (ii)  $y = 7x^9(3x^2 - 12)$

Sol. (i)  $y = (4x^2 - 3)(2x^5)$  using product rule we have

$$\begin{aligned} dy/dx &= (4x^2 - 3)d/dx(2x^5) + (2x^5)d/dx(4x^2 - 3) = (4x^2 - 3)(10x^4) + (8x)(2x^5) \\ &= 40x^6 - 30x^4 + 16x^6 = 56x^6 - 30x^4 \end{aligned}$$

$$(ii) y = 7x^9(3x^2 - 12) \text{ using product rule } dy/dx = 7x^9d/dx(3x^2 - 12) + (3x^2 - 12)d/dx(7x^9)$$

$$= 7x^9(6x) + (3x^2 - 12)63x^8 = 42x^{10} + 189x^{10} - 756x^8 = 231x^{10} - 756x^8 \text{ Ans}$$

Q3. Differentiate (i)  $y = (10x^8 - 6x^7)/2x$  (ii)  $y = 4x^5 / 1-3x \quad x \neq 1/3$

$$\text{Sol. (i) } y = (10x^8 - 6x^7)/2x \text{ then } dy/dx = [2x d/dx(10x^8 - 6x^7) - (10x^8 - 6x^7)d/dx(2x)]/(2x)^2$$

$$= [(80x^7 - 42x^6)2x - (10x^8 - 6x^7)2]/4x^2 = [(160x^8 - 84x^7) - (20x^8 - 12x^7)]/4x^2 = (140x^8 - 72x^7)/4x^2$$

$$= 4x^2(35x^6 - 18x^5)/4x^2 = (35x^6 - 18x^5) \text{ Ans}$$

$$(ii) y = 4x^5 / 1-3x \quad dy/dx = [d/dx(4x^5)(1-3x) - 4x^5 d/dx(1-3x)] / (1-3x)^2 = [(20x^4)$$

$$(1-3x) - 4x^5 (-3)] / (1-3x)^2$$

$$= (20x^4 - 60x^5 + 12x^5) / (1-3x)^2 = (20x^4 - 48x^5) / (1-3x)^2 \text{ Ans}$$

Q3. If  $y = (1 - \sqrt{x}) / (1 + \sqrt{x})$  find out the  $dy/dx$

Sol:  $y = (1 - \sqrt{x}) / (1 + \sqrt{x})$  Differential using quotient

$$\text{rule } dy/dx = * (1 + \sqrt{x}) d/dx (1 - \sqrt{x}) - (1 - \sqrt{x}) d/dx$$

$$(1 + \sqrt{x}) + / (1 + \sqrt{x})^2$$

$$= * (1 + \sqrt{x}) (-1/2x^{-1/2}) - (1 - \sqrt{x}) (1/2x^{-1/2}) + / (1 + \sqrt{x})^2 = [(-1/2\sqrt{x})(1 + \sqrt{x}) - (1/2\sqrt{x})(1 - \sqrt{x})] / (1 + \sqrt{x})^2$$

$$= (-1/2\sqrt{x}) - 1/2 - 1/2\sqrt{x} + 1/2 + / (1 + \sqrt{x})^2 = -2/2\sqrt{x} + / (1 + \sqrt{x})^2$$

$$dy/dx = -1/\sqrt{x}(1 + \sqrt{x})^2 \text{ Ans}$$

Q4. A demand function is given as  $q = 50 - 5p$ . Compute the price elasticity of demand at  $p=5$ .

Sol Given  $q = 50 - 5p$

Differentiate with respect to  $p$  we get.

$$dq/dp = -5, \text{ Now at } p = 5, q = 50 - 5.5 = 25$$

$$E_p = (-dq/dp) (p/q) = -(-5) \cdot 5/25 = 1 \text{ Ans}$$

Q5. For the law of demand  $q = 20/p+1$ , find elasticity at  $p=4$

Sol. Given  $q = 20/p+1$

$$\text{Diff. w.r.t } p \text{ we get } dq/dp = [(p+1) d/dp(20) - 20 d/dp(p+1)] / (p+1)^2 = (p+1)(0) - 20(1) / (p+1)^2$$

$$dq/dp = -20/(p+1)^2$$

$$\text{now at } p = 4, dq/dp = -20/(4+1)^2 = -4/5 \text{ also at } p$$

$$= 4, q = 20/4 + 1 = 4 \text{ therefore } E_p = -dq/dp (p/q)$$

$$= -(-4/5) (4/4) = 4/5 \text{ Ans}$$

Q6. Given the demand curve represented by  $p = 100 - 5q$  (i) Find marginal revenue for any output (ii) Find MR when output ( $q=0$ ) and  $q=4$

Sol.  $P = 100 - 5q$ , therefore  $R = p \cdot q = q(100 - 5q) = 100q - 5q^2$

Diff, w.r.t  $q$  we get,  $dR/dq = 100 - 10q$ , since  $dR/dq = MR$

Therefore  $MR = 100 - 10q$

(ii) when  $q=0$ ,  $MR = 100$  and when  $q = 4$ ,  $MR = 100 - 10(4) = 60$  Ans

Q7. The total cost is given as  $C = 0.005x^3 - 0.02x^2 - 30x + 3000$  Find total cost (i) when output ( $x$ ) = 4

(ii) AC when output = 10 (iii) MC when output = 3

Sol. (i)  $C = 0.005x^3 - 0.02x^2 - 30x + 3000$  at  $x = 4$

$$C = 0.005(4)^3 - 0.02(4)^2 - 30(4) + 3000 = 0.320 - 0.32 - 120 + 3000 = 2880 \text{ Ans}$$

$$AC = TC/x = C/x = [0.005x^3 - 0.02x^2 - 30x + 3000]/x$$

$$AC = 0.005x^2 - 0.02x - 30 + 3000/x \text{ at } x = 10$$

$$AC = 0.005(10)^2 - 0.02(10) - 30 + 300 = 500 - 0.20 - 30 + 300 = 270.3$$

$$MC = dc/dx = d/dx (0.005x^3 - 0.02x^2 - 30x + 3000) = 3(0.005x^2) - 2(0.02x) - 30 = 0.015x^2 - 0.04x - 30$$

$$\text{At } x = 3, MC = 0.015(3)^2 - 0.04(3) - 30 = 0.135 - 0.12 - 30 = -29.985 \text{ Ans}$$

**Integration:** Differentiation is the process of finding the derivative  $f'(x)$  of a function  $f(x)$ . Frequently in economics, however, we know that the rate of change of a function  $f'(x)$  and want to find the original function  $f(x)$ . Reversing the process of differentiation and finding the original function from the derivative is called Integration. The original function  $f(x)$  is called the integral of  $f'(x)$ .

Thus  $\int f'(x) dx = f(x) + C$

#### Rules of Integration:

1. The integral of a constant is  $\int k dx = kx + C$  where  $C$  is constant
2.  $\int x^n dx = (x^{n+1})/(n+1)$
3.  $\int x^{-1} dx = \int 1/x dx = \ln|x| + C$
4. The integral of an exponential function is  $\int a^{kx} dx = a^{kx}/(\ln a) + C$
5. The integral of a natural exponential function is  $\int e^{kx} dx = (e^{kx})/k + C$
6. The integral of the sum or difference of two or more functions equals the sum or difference of their integrals  $\int [f(x) + g(x)] dx = \int f(x) dx + \int g(x) dx$

#### Solved Problems

Q1 Evaluate (i)  $\int x^4 dx$  (ii)  $\int \sqrt{x} dx$  (iii)  $\int 6x^2 dx$

Sol. (i)  $\int x^4 dx = (x^{4+1})/4 + C = (x^5)/5 + C$  Ans

$$(ii) \int \sqrt{x} dx = \int x^{1/2} dx = (x^{1/2+1} / \frac{1}{2} + 1) + c = (x^{3/2} / 3/2) + c = 2/3 x^{3/2} + c \text{ Ans}$$

$$(iii) \int 6x^2 dx = 6 \int x^2 dx = 6(x^{2+1} / 2+1) + c = 6/3(x^3) + c = 2x^3 + c \text{ Ans}$$

Q2. Evaluate  $\int (3x^2 - x - 1) dx$

$$\text{Sol. } \int (3x^2 - x - 1) dx = \int 3x^2 dx - \int x dx - \int 1 dx = 3(x^{2+1} / 2+1) - x^{1+1} / 1+1 - x + c = 3/3(x^3) - 1/2(x^2) - x + c = x^3 - 1/2(x^2) - x + c \text{ Ans}$$

Q3. Find  $\int 3x^{-1} dx$

$$\text{Sol. } \int 3x^{-1} dx = 3 \int (1/x) dx = 3 \log x + c \text{ Ans}$$

Q4. Find (i)  $\int 9e^x dx$  (ii)  $\int 9e^{-3x} dx$

$$\text{Sol. (i) } \int 9e^x dx = 9 \int e^x dx = 9e^x + c, \quad \text{Since } e^x dx = e^x$$

$$(ii) \int 9e^{-3x} dx = 9 \int e^{-3x} dx = 9 e^{-3x} / -3 + c = -3e^{-3x} + c \text{ Ans}$$

Q5. Evaluate  $\int x(x^2+1)^{3/2} dx$  by substitution method

Sol. Put  $u = x^2 + 1$ .

Diff. w.r.t x we get  $du/dx = 2x$

Therefore  $x dx = \frac{1}{2} du$

$$\text{Hence } \int x(x^2+1)^{3/2} dx = \int u^{3/2} (1/2) du = 1/2 \int u^{3/2} du = [\frac{1}{2}(u^{(3/2)+1})/(3/2)+1] + c = [\frac{1}{2}(u^{5/2})/5/2] + c$$

$$= [\frac{1}{2}(u^{5/2})(2/5)] + c = 1/5(u^{5/2}) + c$$

Sub. The value of u we get

$$1/5(x^2+1)^{5/2} + c \text{ Ans}$$

Q6. Evaluate  $\int x/\sqrt{1+x^2} dx$

Sol.  $\int x/\sqrt{1+x^2} dx$  Put  $1+x^2 = u$

Diff. w.r.t x we get  $du/dx = 2x$

therefore  $x dx = (1/2) du$

$$\int x/\sqrt{1+x^2} dx = 1/2 \int du/\sqrt{u} =$$

$$1/2 \int u^{-1/2} du = [\frac{1}{2}(u^{(-1/2)+1})/(-1/2)+1] + c = 1/2 [u^{1/2}/1/2] + c$$

$$= u^{1/2} + c$$

Substitute the value of u we get  $\sqrt{1+x^2} + c \text{ Ans}$

Q7. Evaluate  $\int x^5/(x^{12}+1) dx$

Sol. Put  $x^6 = u$  and diff w r t x we get

$$du/dx = 6x^5 \text{ therefore } x^5 dx = 1/6 du$$

$$\int x^5/x^{12}+1 dx = 1/6 \int du/u^2+1 = 1/6 \tan^{-1} u + c = 1/6 \tan^{-1} x^5 + c \text{ Because } \int dx/x^2+1 = \tan^{-1} x$$

Q8. Evaluate  $\int 2x - 7/3 (x^2 - 7x + 6)^2 dx$

Put  $x^2 - 7x + 6 = u$  and diff w r t x we get  $du/dx = 2x - 7$

$$\int 2x - 7/3 (x^2 - 7x + 6)^2 dx = \int du/3u^2 = 1/3 \int (1/u^2) du = 1/3 \int u^{-2} du = 1/3 (u^{-2+1}/-2+1) + c = -1/3 u^{-1} + c$$

$$= -1/3 (1/u) + c = [-1/3 (1/x^2 - 7x + 6)] + c \text{ ans}$$

Q9 Evaluate  $\int e^x / (1 + e^x) dx$

Sol.  $\int e^x / (1 + e^x) dx$

Put  $1 + e^x = u$  and diff. w r t x we get  $du/dx = e^x$  and  $du = e^x dx$

$$\text{Therefore } \int e^x / (1 + e^x) dx = \int du/u = \log u + c$$

Substitute the value of u we get

$$\int e^x / (1 + e^x) dx = \log(1 + e^x) + c$$

Q10. If  $MR = 800 - 8q - 18q^2$ . Find TR and demand function.

Sol  $MR = 800 - 8q - 18q^2$

$$\begin{aligned} TR &= \int MR dq + c = \int (800 - 8q - 18q^2) dq + c = \int 800 dq - 8 \int q dq - 18 \int q^2 dq + c \\ &= 800q - (8q^2/2) - (18q^3/3) + c = 800q - 4q^2 - 6q^3 + c \end{aligned}$$

Demand function  $P = Tr/q$

$$\text{Or } P = (800q - 4q^2 - 6q^3)/q = 800 - 4q - 6q^2 \text{ Ans}$$

Q11. If marginal cost function is  $MC = 1 + 2x + x^2$ , Find total cost and cost function at fixed cost of Rs 100.

Sol.  $MC = 1 + 2x + x^2$

$$\text{Therefore } TC = \int MC dx = \int (1 + 2x + x^2) dx = \int 1 dx + \int 2x dx + \int x^2 dx = x + 2x^2/2 + x^3/3 + c = x + x^2 + x^3/3 + c$$

When  $x = 0$ , fixed cost = 100 we have  $100 = 0 + 0 + 0 + c$  or  $c = 100$

$$\text{Therefore } TC = x + x^2 + (x^3/3) + 100$$

$$AC = TC/x = [x + x^2 + (x^3/3) + 100]/x = 1 + x + (x^2/3) + 100/x \text{ Ans}$$

## Some Applications of Differentiation – Single Variable Case

In economics the differential calculus has had many prolific applications. It is convenient at this stage to list some of the functional relationships which recur most frequently in the work of the economists:

- A production function  $Q = f(L)$  which records the maximum amount of output that can be produced with given amount of labour.
- A cost function  $C = f(Q)$  records the total expenses  $C$  associated with production level  $Q$ .
- A utility function  $U(Q)$ , which measures the pleasure that the individual derives from the ownership of some quantity of  $Q$  of some commodity.
- A revenue function  $P.Q = Q.F(Q)$ , which shows the total income of the firm when it sells  $Q$  units of a commodity at the price  $P$  per unit; Economists have then adopted the following terminology:

Marginal product is the name given to  $\frac{dQ}{dL}$

Marginal cost refers  $dc/dq$

Marginal utility refers to  $\frac{du}{dq}$

Marginal revenue refers to  $dP \frac{}{dQ} (P.Q)$

$/dQ$

**Example 3.** (a) For the total revenue function  $TR = 500q - 2q^2$ , Find the value of MR when  $q = 20$

(b) If  $P = 80 - 4q$  is the linear demand function, write out the total revenue and hence the marginal revenue functions

Solution:

$$(a) \quad MR = \frac{d(TR)}{dq} = 500 - 4q$$

Thus when  $q = 20$

$$MR = 500 - 80 = 420$$

(b) We know by definition that  $TR = pq$ .

$$\Rightarrow TR = (80 - 4q)q = 80q - 4q^2$$

$$MR = \frac{d(TR)}{dq} =$$

$$\frac{80 - 8q}{dq}$$

**Example 4.** Given the following total cost function, determine the level of output that minimises the average cost and marginal cost:

$$TC = q^3 - 24q^2 + 600q$$

Solution: convert the total cost function into average cost by dividing by  $q$

$$AC = q^2 - 24q + 600$$

Now to find the minimum of the average cost function, set the first derivative of  $AC$  function equal to zero.

$$\frac{d(AC)}{dq} = 2q - 24 = 0$$

$$\Rightarrow q = 12$$

At  $q = 12$ , the average cost function reaches its optima. The next step is to take the second derivative of the average cost function to determine whether  $q=12$  is its minimum or not.

$$\frac{d^2(AC)}{dq^2} = 2 > 0$$

Since the second derivative of the average cost function is positive, it confirms that the function is minimum at  $q=12$

Now for the marginal cost function, following the same analogy

$$\frac{d}{dq}(TC) =$$

$$MC = 3q^2 - 48q + 600$$

To find the minimum point on the MC curve, set the first derivative of the marginal cost function equal to zero

$$MC' = 6q - 48 = 0 \Rightarrow q = 8$$

At  $q=8$ , the MC function reaches its optima. The next step is to take the second derivative of the  $MC'$  to determine whether  $q = 8$  is its minimum or not

$$MC'' = 6 > 0$$

Since the second derivative of the MC function is positive this implies that the MC function is minimum at  $q= 8$ .

**Example 5.** If  $C(x)$  is the total cost function, then using calculus show that at  $AC = MC$  at the minimum point of AC.

Solution. By definition  $AC = \frac{C(x)}{x}$

For the minimum value of the AC, we first set the first derivative equal to zero

$$AC' = \frac{x}{x^2} (C'(x) - c(x)) = 0 \Rightarrow AC' = \frac{C'(x) - c(x)}{x} = 0 \Rightarrow C'(x) = c(x) \Rightarrow MC = AC$$

Thus  $MC = AC$  only at minimum value of AC.

### 3.3.1. Profit Maximisation of a Firm

We will now see how calculus can help a firm maximise its profit. From the very elementary economics, the students are well acquainted with the marginal cost equals marginal revenue as a perquisite for profit maximisation. Let us see the derivation of this condition. If  $R(Q)$  is the revenue function of a firm and  $C(Q)$  the cost function. From these it follows that a profit function  $\pi$  may be formulae as

$$\pi = R(Q) - C(Q) \dots$$

(i) A firm sets its output where its marginal profit is zero.

We obtain this result formally using first order condition for a profit maximisation. We set the first derivative of the profit function, equation (i) with respect to quantity equal to zero.

$$\frac{d\pi}{dQ} = 0 \quad \text{(ii)} \dots$$

Equation (ii) is a necessary condition for profit to be maximised. Sufficiency requires, in addition, that the second order condition hold:

$$\frac{d^2\pi}{dQ^2}$$

$$\frac{d\pi}{dQ^2} < 0 \dots \dots \dots \text{(iii)}$$

Because profit is a function of revenue and cost, we can state the above in one additional way. The first order condition can be stated by setting the first order derivative of  $\pi = R(Q) - C(Q)$  equal to zero.

$$\begin{aligned} \frac{D\pi}{Dq} &= \frac{dR}{dQ} - \frac{dC}{dQ} \\ &= MR - MC = 0 \Rightarrow MR = MC \dots \dots \dots \text{(iv)} \end{aligned}$$

Equation (iv) is a first order condition which states that for profit to be maximised, the marginal cost must be equal to marginal revenue of the output.

For profit to be maximised, the second order condition must hold.

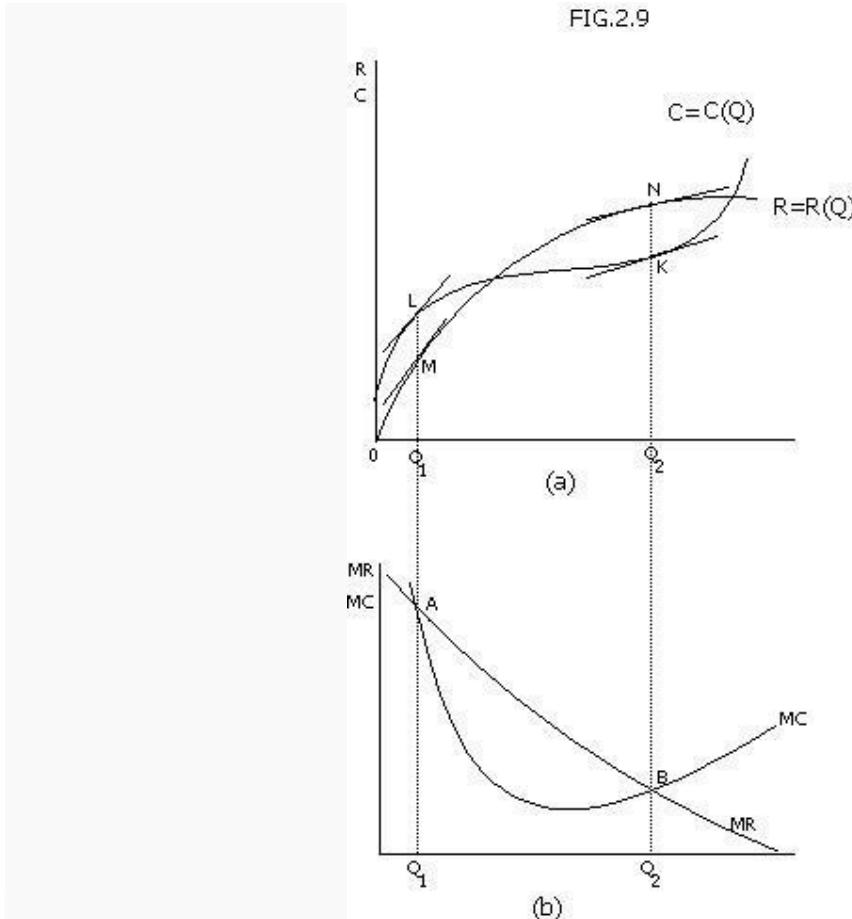
$$\frac{d^2\pi}{dQ^2} = \frac{d^2R}{dQ^2} - \frac{d^2C}{dQ^2} = \frac{d(MR)}{dQ} - \frac{d(MC)}{dQ} < 0$$

That is, for profit to be maximised, the slope of the marginal revenue curve,  $d(MR)/dQ$  must be

less than the slope of the marginal cost,  $(d(MC))/dQ$  curve.

The above conditions are illustrated in Fig.2.9. in Fig.2.9(a) we have drawn the total cost and revenue curves and in Fig 2.9(b) the marginal curves are drawn.

FIG.2.9



The necessary condition for profit maximisation is  $MR = MC$ . But as the diagram shows, we have two points A and B. which one should it be ? at point A the slope of the smaller than the slope of the marginal revenue curve i.e.  $\frac{d}{dQ} (MR) > \frac{d}{dQ} (MC)$ . thus point A or the out put

level  $Q_1$  violates the sufficient condition for relative maximum. It is point B or the output level  $Q_2$  where the MR curve is numerically

where both necessary as well as sufficient conditions are satisfied.<sup>7</sup>

**Example 6.** Given the total cost function  $C = 5q + q^2$  and the demand function  $q = 400 - 20p$ .

50

- (a) Find the total revenue function
- (b) Maximise the total revenue function
- (c) Maximise profit function

<sup>7</sup> In general  $TR = p(Q) \cdot Q$

$$MR = \frac{d(TR)}{dQ} = \frac{dp(Q) \cdot Q + p(Q) \cdot dQ}{dQ} = p(Q) + Q \frac{dp(Q)}{dQ}$$

Solution: (i) We know that

$$TR = p \cdot q$$

Let us first change the demand function

20

$$p = 20 - \frac{q}{20}$$

$$\text{Then } TR = (20 - \frac{q}{20}) q = 20q - \frac{q^2}{20}$$

(ii) In order to maximise the total revenue function, find the critical value(s) by setting the first derivative of TR function equal to zero

$$\frac{d(TR)}{dq} = 20 - \frac{q}{10} = 0$$

And we have  $q = 200$

At critical value the total revenue function is maximised provided the sufficient condition is satisfied

That is  $\frac{d^2(TR)}{dq^2} < 0$

$$\frac{d^2(TR)}{dq^2} = \frac{1}{10} < 0$$

Thus total revenue is maximised at  $q = 200$  and the maximum total revenue is

$$TR = 20q - \frac{q^2}{20} = 20(200) - \frac{(200)^2}{20} = 4000 - 2000 =$$

2000

(i) The profit function of the firm is

$$\pi = TR - TC = 15q - \frac{7q^2}{100}$$

In the above equation, the first term on the right side is the price or average revenue. the second term is the slope

$\frac{dp(Q)}{dq}$  of the demand curve \_\_\_\_\_ times the number of units sold. Under monopoly  $MR < P$  because \_\_\_\_\_ < 0 while under  $MR = P$  under perfect competition  $MR = P = AR$

The first order condition for profit maximisation is

$$\frac{d\pi}{dq} = \frac{d(TR)}{dq} - \frac{d(TC)}{dq} = 0$$

$$\begin{aligned}
 \frac{dq}{5} - \frac{dq}{q} - \frac{dq}{10} - \frac{dq}{25} &= 20 \\
 5 - \frac{1}{q} - \frac{1}{10} - \frac{1}{25} &= 0 \\
 \Rightarrow q &= 107 \text{ (Approximately)}
 \end{aligned}$$

Whether profit are maximised at  $q = 107$ , we need to ensure that the sufficient condition is satisfied

$$\begin{aligned}
 \text{That is } \frac{d\pi}{dq} &< 0 \\
 \frac{d^2\pi}{dq^2} &= -\frac{1}{q^2} \\
 R) &= -\frac{1}{107^2} \\
 ) &= -\frac{1}{11449} \\
 &= -0.0000867
 \end{aligned}$$

Thus profit are maximised at  $q = 107$  and the maximum profit are  $\pi = 803$

### 3.3.2. Short run production analysis

Short run is the production period in which the input  $L$  is allowed to vary by keeping  $K$  constant.

Thus the general format of the short run production function is written as  $Q = f(L, K)$ , where  $K$

denotes the constant amount of the capital. The short run production function in its cubic form is drawn in the fig 2.10 (a) and the corresponding marginal and average productivities are shown in 2.10 (b). the Marginal product curve cuts the average product curve at its maximum. We can show this result mathematically.

$$\text{Let } Q = f(L, K)$$

The average product for labour would be (keeping capital  $K$  constant)

$$\begin{aligned}
 Q &= f(L, K) \\
 &= \frac{f(L, K)}{L}
 \end{aligned}$$

The first order maximisation condition for the average product of  $L$  is,

$$\frac{d(\frac{Q}{L})}{dL} = \frac{L f'(L, K) - f(L, K)}{L^2} = 0 \quad \dots \quad (i)$$

$$\frac{d^2(Q)}{dL^2} < 0$$

Provided  $\frac{f'(L, K)}{f(L, K)} = \frac{f'_L}{f_L}$

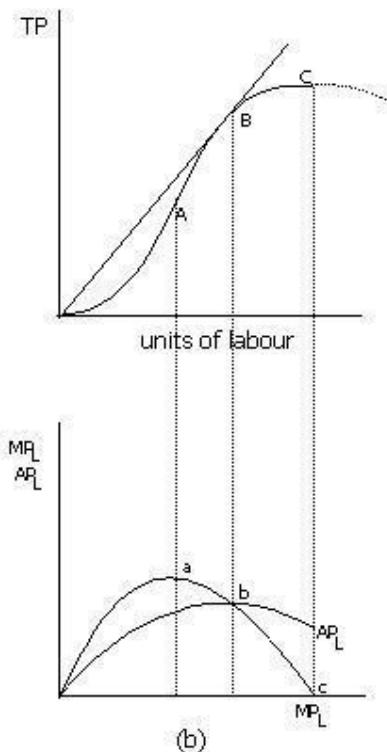
From (i) we have

$$\frac{f'_L(L, K)}{f(L, K)} = \frac{AP_L}{MP_L}$$

Or  $MP_L = \frac{AP_L}{f(L, K)}$

From above it is obvious that marginal product curve hits average product curve when average product is at its maximum. One more point which is significant in the figure 2.10 (b) is that marginal product reaches maximum at a smaller input of labour.

Fig.2.10 (a)



**Example 7.** Consider a production function given by the sixth degree equation

$$Q = AL^2K^2 - BL^3K^3 \text{ where } A, B > 0 \text{ find}$$

- (a) Average product of labour
- (b) Marginal product of labour
- (c) Show that  $AP_L = MP_L$  at the maximum of  $AP_L$
- (d) Show that  $MP_L$  reaches maximum at lower input level than  $AP_L$

Solution:

Letting  $AK^2 = X_1$  and  $BK^3 = X_2$  so that the production function is now given as

$$Q = X_1 L^2 - X_2 L^3$$

Now by definition

$$AP_L = X_1 L - X_2 L^2 \text{ and } MP_L = 2X_1 L - 3X_2 L^2$$

Now for the maximisation of the  $AP_L$ , set the first derivative of  $AP_L = 0$

$$\begin{aligned} i.e. AP_L' &= X_1 - 2X_2 L = 0 \\ &\Rightarrow L = \frac{X_1}{2X_2} \end{aligned}$$

the second order condition for the maximisation is  $AP_L'' < 0$

$$AP_L'' = -2X_2 < 0$$

Thus  $AP_L$  is maximised at  $L = \frac{X_1}{2X_2}$  and the maximum value is

$$\begin{aligned} (AP_L)_{L=\frac{X_1}{2X_2}} &= \frac{4X_1}{2X_2} \\ &= \frac{X_1}{X_2} \end{aligned}$$

At this point the  $MP_L$  value of  $MP_L$  is obtained simply by substituting the value  $L = \frac{X_1}{2X_2}$  in

function

$$\begin{aligned} (MP_L)_{L=\frac{X_1}{2X_2}} &= 2 \cdot \frac{X_1}{2X_2} - 3 \cdot \left(\frac{X_1}{2X_2}\right)^2 \\ &= \frac{4X_1}{2X_2} - \frac{3X_1^2}{4X_2^2} \\ &= \frac{4X_1}{2X_2} - \frac{X_1^2}{X_2^2} = (AP_L) \end{aligned}$$

Thus we see that  $AP_L = MP_L$  at the maximum of  $AP_L$

Now, for the maximisation of  $MP_L$  we follow the same procedure

Set the first derivative of the  $MP_L$  equal to zero

$$MP_L' = 2X_1 - 6X_2 L = 0 \Rightarrow L = \frac{X_1}{3X_2}$$

The second order condition for the maximisation is  $MP_L'' < 0$

$$MP_L'' = -6X_2 < 0$$

Thus  $MP_L$  is maximised at  $L = \frac{X_1}{3X_2}$  and the maximum value is

$$(MP_L)_{L=\frac{X_1}{3X_2}} = \frac{3}{3X_2} = X_{12}$$

AP reaches maximum at  $L = \frac{X_1}{2}$  and MP reaches maximum at  $L = \frac{X_1}{3}$ . Since  $X_1, X_2, L > 0$ , MP

$$\frac{2X}{2} > \frac{3X}{2}$$

reaches its maximum at a smaller input of labour than AP.

## Matrices

**Definition of matrix:** A matrix is a rectangular array of numbers, parameters or variables each of which has carefully ordered place within the matrix. The numbers are referred to as elements of the matrix. The numbers in the horizontal line are called rows; the numbers in the vertical line are called columns. The number of rows 'm' and columns 'n' defines the dimensions of the matrix ( $m \times n$ )