

4

NATIONAL INCOME

MAIN POINTS

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Concept of National Income 2. Uses of National Income 3. Estimation Methods of National Income 4. Estimators of India's National Income 5. Limitations of India's National Income Estimates <ul style="list-style-type: none"> • Income Distribution 6. Introduction | <ol style="list-style-type: none"> 7. Pareto's Curve <ol style="list-style-type: none"> 7.1 Derivation 7.2 Applications of Pareto's Law of Income Distribution 8. Lorenz Curve <ol style="list-style-type: none"> 8.1 Concept 8.2 Derivations 8.3 Application of Lorenz Curve <ul style="list-style-type: none"> • Exercises |
|--|--|

Weightage 20%

1. CONCEPT OF NATIONAL INCOME

The income that a person receives from his services, business, agriculture, property, etc. is considered to be the total income of that person. The income received after deducting the expenses incurred to obtain the total income can be considered his net income. The income of a person gives an idea of his financial status and the extent to which that person can enjoy comforts and conveniences is largely dependent on his income. From the information about the income of a person for a certain year, it can be known in which direction the person has made economic progress. The respect of a person in society and his position in comparison to other people also depend to some extent on his income. In short, a person's income is a gauge that measures his financial status.

National income is the sum of the net income of the citizens of a country. The simplest definition of national income can be given as follows: For a certain period of time, usually a period of one year, the

net value of all the products and services produced in the country in all sectors such as agriculture, industry, etc. that can be used by the country and increase the wealth of the country can be called national income. In other words, the total monetary net value of the products and services produced by the citizens living in the country, the institutions of the country and the commercial companies, etc. that are available to the country is called national income.

In the various types of economic activities in which individuals are active, goods and services are produced. Here, only those products that add to the original product or wealth of the nation are to be counted. The activity that results in production or increases the value of the product produced in terms of consumption or otherwise is called the place of origin or origin of production. Four main units can be considered for production : (1) land, (2) labour, (3) capital, (4) trade or administration. Administration increases the value of the product produced. Or it creates its value, just as the goods produced in one place increase their value and consumption by sending them to the place of consumption and therefore, contribute to the national income.

If we take any production center, it produces different goods from raw materials with the help of appropriate units from these four units: land, capital, labour or administration; for example, by using land in agriculture, grains, cotton etc. are produced and cloth is produced from cotton. In this way, the value obtained by converting raw materials into consumer goods, after deducting the cost of raw materials, labour, interest on invested capital, annual depreciation etc. from the total cost of the finished goods, is called net profit or value added by manufacture. In this increase, the share of each production unit is considered to the extent that it has contributed to it and the contribution of that production unit to the national income can be considered.

The limits of goods and services to be counted in the calculation of national income are as follows. Primary production such as production related to agriculture, forestry, hunting, fisheries, mining, etc. in its original form or transformed form and all other products that are in their original form or transformed form are included in the total production. In addition, the total primary production of industries that are internationally certified is also included. Products produced in other industries should not

be included in the production because they are counted in primary production. The products that farmers produce in agriculture and some of them, such as grains, are to be counted at their market value.

In calculating national income, it is difficult to calculate the indirect income that is generated due to geographical conditions. Such as rivers, mountains, waterfalls, natural beauty, archaeological sites, etc. Different people come from abroad to see all these places and thus increase the national income. In addition, trade can increase from ports and electricity can be generated from waterfalls. And as a result, national income increases. Natural beauty, such as scenic places like Kashmir, gives people pleasure and attracts foreigners. It is difficult to find the measure of income generated from all this.

We can divide national income into two parts : (1) Income from production, (2) Income from services or labour. Some economists exclude services from national income, such as Dadabhai Naoroji, William Digby, Shah and Khambata etc. in calculating the national income of India. The work done by Shah and Khambata in calculating the national income of India can be considered good for the time. Their opinions were as follows:

1. If we count the services of lawyers, doctors, government officials, civil servants, etc. in the national income, it is not right to exclude the services of wives, mothers, etc.
2. It is difficult to estimate the expenditure incurred on private servants, cooks, secretaries, etc. in the home. It is difficult to estimate how much this service increases the national income.
3. Certain services such as advice, guidance, knowledge, joy, relief from pain, protection, courage, etc. cannot be measured and hence it is impossible to find the value of these services in monetary units, and hence, such services should be excluded from national income.

Considering the above points, the services of wives and mothers are not included in the national income of any country. There is a difference between the services of a nanny and those of a mother. A nanny serves for a salary, while a mother serves out of love and there is no salary for that. For this reason, the services of mothers are not included in the national income, yet both services increase the population of the nation. Similarly, many services are unpaid due to emotions, customs and religion.

These types of services are not included in the calculation of national income at present, but it would not be surprising if they are included in the future. Another thing to note is that a rich person pays more money than a poor person for the same type of service. In short, we should include only those services for which we have to pay a price in money in the national income.

How many items should be included in the national income is an important and difficult question. Generally, the monetary values of all the items produced in each sector should be counted and summed up. There are some limitations to this. First, the prices paid for each service and item depend on the income of the individual. That is, not every rupee or dollar of national income has the same purchasing power, just as in a country like India, the services that can be obtained in a village for one rupee cannot be obtained in the city. In addition, when comparing the national income of the same country for different periods, it should be done at the same purchasing power of the currency, because the purchasing power of the currency at different times is different.

To calculate national income, net income has to be obtained from each unit. Simply put, the amount obtained after deducting the cost of raw materials and the cost of manufacturing the product, interest on capital, depreciation of machines, etc. from the total cost of finished goods can be considered as net income. The services of a person are used to earn this income. But the expenses incurred by a person to become capable of providing that service are not taken into account. For example, the expenses and energy consumed in becoming an engineer or a doctor are not taken into account. There is also no proper method used to calculate the depreciation of machines. Even the owners of production centers do not hire specially trained people to measure the depreciation of the machines in their factories. Generally, the amount of depreciation allowed by the income tax account is deducted as depreciation. In an agricultural country like India, a large part of the national income comes from agriculture. It does not keep a proper account of the expenditure incurred for agriculture. It also does not keep a proper record of the men of the farmer's household working for a certain period (during spare time). National income is calculated for a year. The financial year is calculated from 1st April to 31st March, which is different from the (calendar) year.

If any mechanical machinery needs to be repaired in the current year, its cost is deducted from the income of the current year, whereas in reality, the machinery needs to be repaired in the current year due to its use in the previous year. Similarly, pension is received for services rendered in the past, yet its income is considered in the year in which it is given.

When comparing the national income of two countries, it is not appropriate to compare them by exchange rate, because the purchasing power of services with the currency of each country within the country is different; for example, in a country like India, labour rates are lower than in a country like America. In addition, since the living standards of each country are different, the consumption of the same item gives different levels of satisfaction. It is also important to note which types of services are included in the calculation of national income in each country. Items that are excluded in the calculation of national income of a single country should be excluded every time.

Since the income of each unit has to be counted in the national income, there is a possibility of a small amount of error in it. The error in collecting information related to national income is more or less for every country. National income is calculated by calculating the price of every item in the country in monetary terms only, so the use of national income in a country where the price of most items is not available in monetary terms remains limited. The important purpose of national income is to know how much progress the country has made in the economic sector. In this matter too, great care needs to be taken because with the passage of time, people's tastes, habits, etc. change. Apart from that, the importance of things also changes with time. Despite all these limitations, the importance of national income cannot be ignored. The extent to which the people of the country can enjoy comforts and conveniences depends on the national income of the country. To some extent, the economic progress of different countries can be compared with national income. Keeping in mind the figures of national income, the government can take some important decisions in the economic sector, such as how much tax can be levied in the country, how much money can be allocated for different sectors in the plan for the progress of the country, etc. Since national income includes the income generated in each state and each

region, it can be known which state and which region contribute more or less to the national income and accordingly, appropriate decisions and plans can be implemented state-wise and region-wise to increase production. In a country like India, the direct measure of the progress of various schemes implemented is national income. The increase in national income indicates the progress of the plan. In short, national income is the yardstick that measures the economic progress of the country.

2. USES OF NATIONAL INCOME

Estimates of national income as well as the data collected during the process of this estimation can both be very useful in studying the performance of various sectors of the economy, structural changes taking place in the economy, the growth of the economy and the changes in the standards of living of the people. Such studies also help in formulating economic policies and plans for the future. Some of the important uses of national income data are as follows:

1. National income as a measure of economic growth :

Estimates of national income at constant prices indicate economic growth of a country. The rate of economic growth of a country is measured by the rate of growth of national income at constant prices. For example, the rate of economic growth in India during the year 1993-94 was 4.4 per cent. It means that national income at constant prices was higher by 4.4 percent in 1993-94 as compared to the national income at constant prices in 1992-93. Economic growth is broadly speaking an indicator of increase in the level of physical production of goods and services in the economy.

2. National income as an indicator of success or failure of planning :

India has adopted planning as a means of economic growth. In a planned economy targets of outputs and rate of economic growth are fixed and resources are allocated accordingly. Whether these targets are achieved or not is indicated by the rate of growth of outputs of industrial sectors and that of national income at constant prices. In this way national income data can help in assessing the achievements of planning. If the targets are not achieved the government can review the situation and take steps to correct the same.

3. **Useful in estimating per capita income :**

Per capita income is obtained by dividing national income by the total population of the country. It indicates the average availability of goods and services to the people during a year. Higher the per capita income higher the availability of goods and services on an average to the people and so higher the average standard of living.

4. **Useful in assessing the performance of different production sectors :**

Production units of a country are broadly classified into primary, secondary and tertiary sectors. Primary sector includes production units engaged in exploiting natural resources like agriculture, fishing, mining etc. The secondary sector is engaged in manufacturing goods. The tertiary sector produces services like that of transport, banking, insurance, government etc. These sectors generate factor incomes. The data on factor incomes generated by these sectors can be used to measure their relative contributions to national income.

5. **Useful in measuring inequalities in the distribution of income :**

All individuals do not have the same income. Some earn more than the others. In other words some are rich and some are poor. It means national income is unequally distributed among people. Some degree of inequality in the distribution of income is bound to exist because individuals differ in age, sex, qualifications, experience of job, physical strength, willingness to take up risky jobs and so on. But when the degree of inequality is very high and not explained by the natural factors it becomes undesirable. The extent of inequality in a country can be measured from the national income data collected through the income distribution method. For example, from the data we can know the relative share of the working class (i.e wages etc.) and that of property class (i.e. rent, interest, etc.). If the government finds that the level of inequality is high it can take corrective measures to reduce the same. The data about the distribution of income can also be used to assess the effectiveness of the measures taken by the government in this regard.

6. **Useful in measuring standard of living :**

The standard of living of the people of a country is determined by what people spend on consumer goods and services like on food, clothing,

housing, education and other necessities, comforts and luxuries. Higher the expenditure on consumption higher is the standard of living of the people. National income data, when estimated through the expenditure method, reveals consumption expenditure and investment expenditure. If the total consumption expenditure is divided by total population we get per capita consumption expenditure. This per capita consumption expenditure indicates the average standard of living of the people of the country. If this is rising over the years the general standard of living of the people can also be said to be rising. However, this is to be remembered that this expenditure should be estimated at constant prices.

7. Useful in measuring the level and pattern of investment :

The expenditure method of estimating national income also measures investment expenditure. It gives us information about the total amount of fresh investment made in the country during the year. Investment determines production capacity which in turn influences the rate of growth of the economy. For example, fresh investments made in India during the year 1994-95 were about 25 per cent of the gross domestic product. By comparing such figures over the years we can know whether the level of investment in the country is rising or not and also the rate of change. We can also know the pattern of investment in the country. We can know how much is invested in agriculture, manufacturing and services, etc. In the year 1993-94, in India, out of about total investment of Rs. 1,60,000 crores 16% was in agriculture, 35% in manufacturing, 23% in transport and 2% in construction. The government can draw many useful conclusions from such data.

8. Makes international comparisons possible :

We can compare the economies of any two countries on the basis of their national income data. We can know whether a country is rich or poor. We can know how important agriculture or any other occupation is in a country as compared to other countries. We can also compare the level and patterns of consumption and investment in different countries. We can also compare the standards of living on the basis of the per capita incomes. We can also know the rates of growth of different countries and draw useful conclusions.

3. ESTIMATION METHODS OF NATIONAL INCOME

National income can be primarily estimated (or calculated) in three ways :

- (1) Income method
- (2) Net product method
- (3) Social accounts method

(1) Income method :

According to this method, national income is obtained by summing up the income of every citizen in the country for the year for which the national income is to be estimated. This income includes the total amount paid by every production unit in the form of wages, salaries, interest, rent, profit, and so on. The salaried class earns income in the form of salaries; industrial units earn income in the form of profits; landowners earn income in the form of rent or net agricultural output; and capitalists earn income from the interest on their capital, etc. Income generated without any productive activity, such as gifts, donations, or grants, is not included in this calculation. This method can utilize income tax returns. However, in a country like India, where the majority of people do not file income tax and agricultural income is not taxable, this method is not very useful. Nonetheless, this method can be used by collecting the income of every individual during a census or through professional sample surveys. This method is more useful for developed countries because, in such nations, records of all types of income, production, and other data are maintained with greater accuracy.

(2) Net product method :

First, let us see what is Net Production. Suppose that for a bakery that makes bread, the total cost of the bread it makes is not its income or Net Production. The cost of the items used for making bread, such as flour, sugar, ghee, fuel, labour, etc., is subtracted from the total cost of the bread, and the value added by manufacture is called Net Production. Similarly, in a textile mill and other industrial units, the cost of the items produced after deducting the related expenses, cost of raw materials, depreciation of machines, interest on invested money, etc., is called Net Production. In short, Net Production, i.e. the net increase in the price due to the

conversion of raw materials by the manufacturing unit, is also called Net Production. These figures are easily available for every industrial unit.

National income can be obtained by summing up the Net Production figures from all sectors of the economy, including services, and adding the net income received from abroad. There is no possibility of any amount being doubled in this. For example, if a motor manufacturing company buys tires and some finished parts etc. from another industrial unit, the cost of tires and other parts is deducted from the total cost for Net Production, so the Net Production of the company manufacturing tires etc. is not included in this.

The total cost of production can be easily obtained by multiplying the total production by its appropriate price.

But it is more difficult to find the costs that have to be deducted from the total cost of production to find the net cost of production or the net increase in the cost of the product from the producing unit. Since there is often no exact information about the costs related to production in each producing unit, these costs are estimated. For example, farmers do not keep accurate records of the costs incurred in farming to calculate the income from farming. It is also difficult to estimate the services of their family members who also work in it. Because the members of the farmer's family help in farming in their free time from their regular duties. In addition, there is no exact information about the cost of seeds and fertilizers used for farming. All this information is estimated roughly. In the industrial sector, the cost of raw materials, labour costs, fuel costs, etc. can be obtained, but it is difficult to find an estimate of mechanical depreciation. Generally, the same amount is calculated for depreciation as is the case in income tax. That amount is often not correct. The production calculated by this method should be the result of investment and hard work of the citizens of the country only. If the cost of each item of production is calculated according to the market price, then it is called national income at market price. But if the cost of each item is calculated according to the price received by the producer unit, then it is called national income at factor cost.

This method is mostly used in developed countries. However, the national income obtained by this method cannot be considered highly

reliable. In short, there is a greater possibility of error in the national income estimated by this method.

(3) Social accounts method :

A profit and loss account is kept for every business, this account is called a ledger, the information in the ledger can be used to decide what kind of decisions to take in the business. This information is different for every different type of business. Similarly, the account that is kept by covering all the income and expenditure records of the entire economy of the country is called the National Accounts (Social Accounts or National Accounts). For this account, the entire economy of the country is divided into different sections, and by collecting information by section, the income of the entire country can be found. Each section has two aspects, income and expenditure. The amount spent in each section is recorded in the expenditure, for example, if a salary is paid in an industrial unit, that amount is recorded as an expenditure in that section, while in the civil section, since that amount is received as salary, it is recorded in the income. Thus, each amount is recorded in both the income and expenditure aspects, from this type of account, it can also be known how the different sections of the entire economy are related to each other. For the purpose of calculating national income, the entire economy is divided into four sectors as follows :

(1) Citizens, (2) Producing Units, (3) Government, (4) Foreign trade. Citizens provide their services to other units such as industries and government and they buy goods from industrial units and industrial units pay compensation, salary etc. for the services of citizens, while citizens buy the produced goods and pay in cash. The goods of one industrial unit are also used in another industrial unit and the goods of another industrial unit are also used in the industrial unit where they have utility. Thus, there is an interaction of goods in the industrial unit. The goods of the industrial unit are exported to the government as well as to the foreign country, the government pays wages, salaries etc. for the services of citizens, the government collects taxes from industrial units and citizens. In foreign trade, foreign countries import our goods, in this way the entire economy is interconnected. We can present this in the National Accounting System as follows :

National Accounting System

Income	Expenditure
1. Citizens	
(1) Income from Producing Units [11]	(4) Consumption [7]
(2) Income from Government	(5) Taxes to Government [16]
(3) Transferred Assets/Property from Government [21]	(6) Saving
2. Producing Units	
(7) Goods sold that are essential to citizens [4]	(11) Wages, salaries, etc. to citizens [1]
(8) Goods given to the government [19]	(12) Taxes to the government [17]
(9) Finished goods given to another unit [13]	(13) Finished goods purchased from another unit [9]
(10) Export [22]	(14) Import [23]
	(15) Undistributed profit
3. Government	
(16) Taxation by citizens [5]	(19) Purchased goods [8]
(17) Tax received from the manufacturing unit [12]	(20) Wages, salaries, etc. to citizens [2]
(18) Deficit	(21) Property etc. given to citizens [3]
3. Government	
(22) Import [10]	(23) Export [14]
(24) Balance	

The figures in brackets [] in the income and expenditure in the above table indicate the corresponding income or expenditure recorded in another section. In this way the concept of the entire economy can be very clearly understood and the national income can be calculated as follows:

According to the cost of production unit

$$\begin{aligned} \text{National Income} &= (1) + (2) + (15) \\ &= (11) + (20) + (15) \end{aligned}$$

This method is used in developed countries like America. In India, there is no precise record of income and expenditure of each individual, production unit, organization, etc. Often the economy is divided into more detailed sections than the tables mentioned above.

The data for the above accounts are obtained as follows :

1. Consumer goods etc. of citizens are obtained from retail trade data.
2. Information on taxes, services, wages, purchased goods, etc. is available from the government budget.
3. Commercial data provide information on sales, profits, losses, wages paid to citizens, etc.
4. Imports and exports are determined from the government's foreign trade data.

4. ESTIMATORS OF INDIA'S NATIONAL INCOME

In India, since 1867, various individuals have tried to estimate the national income. The first person to start in this field was Dadabhai Naoroji. He tried to obtain the national income and per capita income of India for the year 1867-68. To obtain the income of the agricultural sector, he multiplied the total area of land by the average crop per acre and multiplied it by the average price. Services were excluded from his calculations. Since the information on the area of land, crop per acre, its price, etc. was not very precise, the figures he obtained were not reliable.

In 1900, Lord Curzon tried again in this direction. He estimated industrial income as half of agricultural income, which was an incorrect estimate. For agricultural income, he assumed that there was a direct relationship between land revenue and agricultural output; that is, as land revenue increases, agricultural income increases. In this way, he derived agricultural income figures from revenue income. He also excluded services.

In 1911, Findlay Shirras estimated the national income of India. He also adopted the same methods adopted by Dadabhai Naoroji, Barber and Karzan. One or two crops were selected to obtain the production of the entire agricultural sector. To find out the non-agricultural income, he assumed that the income from each sector is in proportion to the amount of effort or labour used in the agricultural sector as well as in the non-

agricultural sector. He estimated the national income of India for the years 1922 and 1927. In these estimates, he gave more importance to the non-agricultural product or its income.

Wadia and Joshi in their book 'Wealth of India' have given the figures of national income for the year 1913-14. They have also used the same method as Frindle Shires. They have deducted 20 per cent of the total income from agriculture and the industrial sector for depreciation on labour. Their method also cannot be said to be without flaws.

In addition, Shah and Khambhat calculated the national income for both the period before and after World War I. They calculated the average income of people engaged in different sectors. They also excluded services from this calculation, so their figures are also not considered correct.

Bouley-Robertson Committee :

As mentioned above, various people tried to calculate the national income of India, but their methods were very flawed. Moreover, accurate and systematic statistical data were not available, so the Government of India (then the British Government) in November 1933 invited Dr. A. L. Bowle of the London School of Economics and Mr. D. H. Robertson of the University of Cambridge to calculate the national income of India and to give suitable advice for the same. They submitted their report in 1934. In their report, they stated that the data relating to every industrial unit and agriculture in India are very flawed and many are not even available. They made the following recommendations for estimating the national income :

He has suggested using both methods - income method and production method - for estimating national income. Income of rural and urban areas should be calculated differently. For rural areas, a random sample of villages should be selected and information on production and all kinds of services in the sampled villages should be obtained. Only specially trained persons should be used to obtain all this information. These persons should stay in the same village for a year and collect information on agricultural income as well as all kinds of services. High-level officials should also be appointed to supervise all this.

For the urban areas, taxable incomes should be obtained from Income Tax returns, and for non-taxable and other income, a purposeful sample

survey should be conducted. This survey should normally be carried out through universities. Income of industrial units or factories using electricity etc. should be obtained in the form of production. In addition, it was also suggested to conduct an interim census for income of urban areas. Although the method suggested by these expert economists was very comprehensive and beneficial, the government could not implement it and then it could not be implemented due to the Second World War.

Dr. V. K. R. V. Rao's National Income Estimates :

Dr. V. K. R. V. Rao has obtained estimates of the national income of India from 1925-26 to 1929-30 and for the year 1931-32. Due to the accuracy of his method and data collection, the figures obtained by him can also be put for international comparison. Dr. Rao first calculated the national income for the year 1925-29 and from experience he felt that it is better to choose the census year for calculating the national income in a general way and to obtain as much additional information as possible regarding national income. Therefore, he again calculated the national income for the year 1931-32. According to Dr. Rao's calculations, the national income of India for the year 1931-32 is 1689.1 crore rupees. There is a possibility of ± 6 per cent error in this figure. The annual per capita income is Rs. 62 with an error of ± 6 per cent. No increase has been made in these calculations for under-assessment in agriculture and income tax. The increase is likely to be 10% on checking the data for agriculture and it is unlikely that the tax evaders for income tax will be less than 5%. Accordingly, the national income including an error of 6%, increasing the national income, becomes Rs. 1766.4 crores and the per capita income becomes Rs. 65 (with an error of $\pm 6\%$). However, for comparison with other past estimates, it is necessary to calculate the first mentioned estimate because in the past also, the income has not been increased for under-assessment, on the basis of the national income figures of 1931-32, he calculated the national income for the year 1942-43. In this estimate, the increase in production and its price compared to the production and price of 1931-32 was assumed as follows :

- (1) Excluding Burma income.
- (2) Production other than agriculture and industry has increased by 20 per cent compared to the production of 1931-32 and its value has increased by 30 per cent.

- (3) Non-agricultural production has increased by 11.1 per cent and its value by 80.8 per cent.
- (4) The production of industries other than organized industries has increased by 50 per cent and its value by 60 per cent.
- (5) The production of organized industries has increased by 90 percent and its value by 77.7 per cent.

According to this assumption, the national income at the price earned by the productive unit for the year 1942-43 was estimated at Rs. 3423 crores and the per capita income was Rs. 114.

Dr. V. K. R. V. Rao's Method :

Dr. Rao used both the income method and the production method. He used the net production method for the national income of the year 1925-29 for (1) agriculture and forestry, (2) mining, (3) industries, (4) handlooms, (5) shipping and transport. While for the national income of the year 1931-32 he used the net production method only for (1) agriculture and forestry, and (2) mining. In addition, using the 1931-32 census, he obtained the total number of earning persons in the country and found out whose income was included in the national income. The total persons were divided into two parts according to the persons whose income was to be found in the production method and whose income was to be found in the income method. The first section included agriculture, forestry, mining, fisheries, etc.; The second section included industry, trade, transport, services, administrative sector, arts etc. For the second section, as much information as possible was obtained using income tax returns and the missing information was obtained by making necessary sample checks. In addition, income from immovable and movable property etc. which was not included above was added. The national income was calculated by deducting the amount of production and expenditure incurred on income from the total income and adding the fluctuation of income and expenditure with foreign countries. According to the situation of that time, Dr. Rao's method can be considered very good and the estimate he obtained can be considered much better than the previous estimates.

Estimates of national income earned by different individuals for different periods are given in Table 1 below.

Table 1 : Estimates of India's National Income

Sr. No.	Author	Area	In which year did they try ?	For which year	Estimates in crores of rupees	Per capita income in Rs.
1.	Dadabhai Naoroji	British India	1876	1868	340	20
2.	Barring and Barber	British India	1882	1882	525	27
3.	Lord Curzon	British India		1897-98	675	30
4.	William Digby	British India	1901 1901	1899	390	17
5.	F. J. Atkinson	British India	1908	1875	574	31
6.	P. N. Sharma	British India		1911	-	50
7.	Findlay Shirras	British India	1921 1922	1911 1921	1942 2598	80 107
8.	Shah and Khambhata	All India	1924	1900-14 1921-22	1106 2364	36 74
9.	Wadia and Joshi	All India	1925	1913-14	1087	44
10.	Vakil and Moorjan	All India	1926	1891-94 1911-15	1138 1774	42 59
11.	Dr. V. K. R. V. Rao	British India	1934	1925-29 1931-32 1942-43	2301 1766 3423	78 65 114
12.	National Income Committee	Independent India	1943 1951 (First report)	1948-49	8710	255
			1954 (Second report)	1948-49	8650	257

13.	Central Statistical Organization (CSO)	India	report) 1956	1950-51 1955-56	9,531 10,698	265 273
14.	Central Statistical Organization (CSO)	India	1967	1960-61	15,593	359
15.	Central Statistical Organization (CSO)	India	1999	1998-99	15,22,238	15,690
16.	National Statistical Organization (NSO)	India	2019	2014-15	1,11,17,615	87,748
17.	National Statistical Organization (NSO)	India	2024	2023-24	3,02,40,248	2,13,853

Per Capita Income :

Per capita income is obtained by dividing the National Income by the country's total population. The per capita income can also give an idea of the country's economic progress. If the country's national income has increased, but the population has also increased in the same proportion, then there will be no increase in the per capita income. Moreover, if the price level has risen, and due to that, the national income is calculated at current prices, an increase will be observed, but this cannot be considered a real increase. If the national income of different years is to be compared, it should be obtained and compared at a single price (purchasing power), i.e., at a constant price. The figures of Dr. V.K.R.V. Rao and the National Income Committee in Table 1, shown above, can be considered reliable. According to Dr. Rao, the per capita income for 1931-32 was ₹ 78 and in 1943 was ₹ 114; however, if we consider the Wholesale Price Index, this increase is not a true increase, because the price level in 1942-43 was much higher than in 1931-32. All the estimators before Dr. Rao cannot

be considered very reliable. For example, both Lord Curzon and William Digby obtained national income estimators for the year 1901, yet there is a significant difference between their two figures. The main reason for this difference could be that the method they used to calculate the national income was different, and additionally, the data obtained from various sectors may not have been reliable. Table 1 provides the national income estimators and per capita income figures obtained by various authors.

National Income Committee :

After India's independence in 1947, due to the lack of proper and reliable data on the importance of national income, the Government of India constituted the National Income Committee on 4th August 1949. This committee consisted of Prof. P. C. Mahalanobis, Chairman; Dr. D. R. Gadgil and Dr. V. K. R. V. Rao as members. The main work of this committee was to improve the quality of information available for different fields, to find national income and to suggest how to increase research in the field of national income. As per the recommendation of the National Income Committee, the National Sample Survey was started in 1950. Through this sample survey, the information required for national income and state income is also collected in different surveys, due to which the statistical information at the state level and the central level improved more and more. This committee has issued two reports, the first in 1951 and the second in 1954, which have described the sources of information related to national income, and the methods adopted for national income.

This committee also used the production method and the income method like Dr. Rao's method. The production method was used in agriculture, forestry, animal husbandry, fisheries, mining, hunting etc. industries. While the income method was used in the transport, trade, service, administrative sector, business arts sector, social service etc. sectors. In urban areas, income from immovable property like houses etc. was accepted from the municipal register, while in rural areas, income was estimated from the value of houses etc. After getting income from different sectors, the national income figure was obtained by adding the net income from abroad. Dr. Rao's method and the method of the National Income Committee are similar to some extent, but there are some changes in some

places; like, Dr. Rao has given 1, $\frac{1}{4}$ and $\frac{1}{8}$ weightage to labourers, dependent labourers and minor labourers respectively. While the National Income Committee has excluded the services of minor labourers. Dr. Rao has derived income from industrial units through the income method, while the committee has derived income from the production method. The reason for this may also be that according to the Industrial Act, every industrial producer unit is required to keep a systematic account of its production, expenditure, etc. and those figures are published through the government. The National Income Committee also faced many difficulties in finding income information from the agricultural sector and the industrial sector. Since the expenditure data could not be found in the agricultural sector, it was assumed that 21 per cent of the total cost of production was deducted as cost. Accordingly, the net income figures were obtained by making different assumptions in home industries. Due to these assumptions, the margin of error in the calculation of national income is likely to increase. In addition, since it is difficult to find the wages of workers engaged in different types of business industries, there is a possibility of error in the income of that sector. It is natural that the method of national income changes as the statistical information improves with the passage of time. Accordingly, the National Income Committee made some changes.

The work that was started by the National Income Committee was taken over after 1951 by the Central Statistical Organisation (CSO), which was established by the Government of India. Under the auspices of this organization, the National Income Unit was created. The main functions of this unit are as follows :

- (1) Calculation of national income
- (2) Improving the methods for calculating national income
- (3) Obtaining state-wise income figures
- (4) Taking appropriate steps to make useful information on national income more reliable
- (5) Initiating research work in the field of national income.

Since the formation of the National Income Unit, seminars and conferences have been organized to improve the research and methodology

of national income and national income is calculated accordingly, taking the advice of renowned economists from the country and abroad. As a result and due to the efforts of this unit, the "Indian Association for Research in National Income and Wealth" was established. As a result, there has been a lot of improvement in the estimates of national income. Table 2 gives the national income obtained by the National Income Unit (NIU) departmentally; so that it can be understood how much national income is obtained from each department.

**Table 2 : National Income as Estimated by the
National Income Committee
(in crores of rupees, at current prices)**

Source	2022-23	2023-24	2024-25
1. Primary sector	49,60,015	54,10,210	59,26,078
1.1 Agriculture, cattle, forestry and fisheries	44,49,332	48,77,867	53,85,291
1.2 Mining	5,10,682	5,32,343	5,40,788
2. Industry/secondary sector	63,15,335	70,89,650	76,03,402
2.1 Manufacturing	35,34,867	39,21,596	41,69,419
2.2 Electricity, gas, water supply and other services	6,09,068	7,66,435	8,06,974
2.3 Construction	21,71,401	24,01,618	26,27,009
3. Services/tertiary sector	1,33,71,348	1,49,13,028	1,64,92,552
3.1 Trade, hotels, transport, communication and broadcasting related services	44,12,008	48,28,505	52,57,396
3.2 Financial, real estate and professional services	56,00,439	62,44,153	68,81,866
3.3 Public administration, defence and other services	33,58,901	38,40,370	43,53,290
Gross value added at basic prices	2,46,46,698	2,74,12,888	3,00,22,033

Net taxes on production	+22,43,775	+27,10,068	+30,46,113
Gross domestic product	2,68,90,473	3,01,22,956	3,30,68,145
Net income from abroad	- 3,70,307	- 4,12,170	- 4,78,297
Gross national income	2,65,20,166	2,97,10,786	3,25,89,848

Source : Provisional Estimates of Annual Gross Domestic Product For 2024-25 (Published by NSO).

We can deduce the special characteristics of India's income from Table 2. Looking at the National Income figures across different sectors, we can see that the Services sector contributes approximately 55%, the Industry sector contributes 25%, and the Agriculture sector contributes 20% to the National Income.

Table 3 gives the national income and per capita income for different years:

Table 3 : National Income and per Capita Income for Different Years

Year	National income in billion rupees		Per capita income in Rs.	
	At current prices	At the same price as in 2011-12	At current prices	At the same price as in 2011-12
2011-12	86.05	86.05	64,316	64,316
2012-13	97.43	90.64	72,137	67,061
2013-14	109.11	95.83	79,933	70,053
2014-15	119.56	101.40	86,438	73,407
2015-16	129.89	109.30	94,732	79,521
2016-17	145.45	118.82	1,04,277	85,321
2017-18	159.27	125.68	1,14,923	90,634
2018-19	175.76	132.89	1,26,505	95,502
2019-20	185.39	136.01	1,35,468	98,421
2020-21	179.99	127.07	1,30,865	92,706
2021-22	212.18	138.83	1,51,012	99,155
2022-23	235.40	148.87	1,72,000	1,08,572

5. LIMITATIONS OF INDIA'S NATIONAL INCOME ESTIMATES

We will describe some of the difficulties in calculating national income in India. As a result of these difficulties, national income cannot be calculated with the desired accuracy.

1. The financial year for economic purposes is from 1st April to 31st March. This year is considered for all government budgets, economic development plans, etc. India is an agricultural country and its economy is agricultural. The year for agricultural income is generally considered from 1st July to 30th June. Apart from that, the financial year of banks, insurance etc. is also different. If the financial years of those entities are different, then it is difficult to get the income and expenditure accounts.
2. The main difficulty in calculating national income is statistical data. Since national income is the income covering the entire economy of the country, the data on which it is calculated must be very reliable and accurate. The statistical data collected in India are mainly used for different purposes. Therefore, if this data is used to prepare national income estimates, there are some limitations in using its estimates. For calculating national income, production, prices, cost of production, different types of services, wage rates - all these things are required. $\frac{1}{3}$ India's national income is calculated by the income method. This income mainly belongs to persons engaged in business activities and other services. Census data is used for this information.
3. Almost $\frac{2}{3}$ of the national income comes from different productive units. The agricultural sector is the main one. All the statistics of agricultural production and animal production are not obtained through a specific method like sample survey etc., besides, the production of animals like milk production, wool production etc. is not kept in a specific account. Because this production is mainly done in rural areas, where people do not keep accounts. Vegetables and fruits that are grown in places other than farms or fields like river banks, forests, roadsides, house yards, fences etc. are completely excluded. The forest department collects this information for forest

produce, but it gets the information for the department under its control, the information of the remaining departments like the departments under the Revenue Department and apart from that, the trees on other river banks and roadsides, village paddy fields etc. are not counted.

4. **Cost of Production :** Accurate figures on the costs incurred to obtain net output for national income are required. This information is not available, especially in the agricultural sector, livestock production costs and fisheries.
5. Income other than from production centers, which is derived from services like employment, business, etc., can be calculated using Income Tax returns. However, very few individuals in India pay income tax. Therefore, it is difficult to ascertain the income of the remaining individuals in these professions.
6. Information on immovable property such as houses etc. can be obtained in the year of the census, but it is difficult to assess the income from these properties for other years. In urban areas this income can be obtained by using municipal taxes but this is not possible for villages where there is no house tax.

The National Income Committee is continuously working to improve India's national income figures. As a result, national income estimates are gradually becoming more and more reliable.

State Income :

National income is the total net income generated by the citizens of the entire nation. Similarly, the income of the state cannot be defined. Because the movement of goods, labour and capital is free between states, while it is not possible between two countries. In a large country like India, the production and quantity of different units like agricultural production, industrial production are different in different states. There can be many reasons for this. Due to this inequality, the importance of different regions in the political, economic and social fields is different. For this, in the Third Five Year Plan, it was thought that each state should develop equally and related state-wise plans were formulated, so that the importance of the state's income figures increased.

Just as national income is the measure of the progress of the nation, state income shows how much progress has been made in the economic sector of the state. Different schemes can be implemented according to that progress. No matter how many shortcomings there are in obtaining state income, this is the only tool to compare the economic situation and progress of different states in the country. How much economic progress or income has increased at the state level due to different schemes. It can be measured by state income. Based on the state income, it can be decided how much different types of taxes should be levied in the state. Due to this importance of state income, a separate unit is kept in the state statistical bureau to obtain state income. These figures are used to make different decisions at the state level as well as at the national level.

There are some difficulties in obtaining the income of a state precisely. Just as foreign income can be found from import-export figures in the calculation of national income, income from other states cannot be found in the income of a state because there is a concession for import-export of certain items with each other. It is difficult to obtain these figures for border areas. In addition, if a person lives in one state and owns property in another state or has shares in an industry there, it is difficult to obtain his income. Therefore, it is not possible to calculate this income in the form of national income. For this reason, in calculating state income, the income coming from the state itself is considered. In short, the net product of the state is called state income. If a person of a state gets income from another state, that income is excluded from the state income.

In India, the first state income figures were published in the 'Madras Year Book' in the year 1923. Dr. Natarajan gave estimates of state income for the years 1938-39 and 1949-50. Among the state bureaus, the Bombay State Bureau was the first to systematically obtain state income in the year 1948-49. Now every state bureau regularly estimates state income. The contribution of the 'National Council of Applied Economic Research' is also important in improving this estimate. Under its initiative, state-wise state income figures were published for the year 1960-61.

To make the state's income figures more reliable, various conferences were organized by the Central and State Statisticians under the auspices of the CSO, in which the following recommendations were made :

- (1) Every State Bureau shall make it a priority to estimate the State income.
- (2) The CSO and the State Bureau shall endeavour to improve the estimates by mutual cooperation.
- (3) The State Bureau shall furnish the National Sample Survey (NSS) with the information it requires and the National Sample Survey shall make every effort to obtain that information.
- (4) The CSO shall indicate the methods for obtaining State-wise revenue from the Railways, Posts and Tarptal Departments.

In short, the CSO and the state bureau should try to improve these figures through continuous cooperation and efforts of each other. As a result, the state revenue figures are published regularly every year and they are becoming more reliable.

INCOME DISTRIBUTION

6. INTRODUCTION

How national income is distributed in any country is an important question. Generally, it is desirable from the point of view of social justice that income should be distributed equally, but it is not possible. From the point of view of economics, it is considered good to reduce income inequality as much as possible. The question of reducing income inequality is an important question for every country. This question is also puzzling leading countries like America and Europe. According to a report of a study by the United Nations Organization in 1970, in Western Europe, the richest 10 per cent of the people receive a third of the national income of the entire country. On the other hand, the poorest 10 per cent of the population receives a mere 2 per cent of the overall national income. That is, the richest 10 per cent of the people receive 33 per cent of the income while the poorest 10 per cent of the people receive only 2 per cent of the income. Countries that have suffered from such inequality include West Germany, France, Italy, England and a few other countries.

West Germany and Japan have achieved very rapid economic growth in the post-war years. In West Germany, just 5% of the upper class earn 37% of the national income, while in the West 70% of the population live on the same share of income. The unequal distribution of income has led

to a rising standard of living. Another reason for rising inflation is that when a few people have more income, they spend more than they need and buy things at higher prices. In short, as economic inequality increases, inflation increases.

According to the laws of economics, rich people can increase their incomes to a greater extent than poor people, so income inequality cannot be reduced completely, but it can be reduced gradually. It is difficult to measure economic inequality precisely, but some efforts have been made to measure it.

7. PARETO'S CURVE

In 1897, the Italian economist Vilfredo Pareto wrote an article about this curve in his country's economics journal "Cours d'Economie Lausanne, 1897, Vol, 2, Part 1". According to Pareto, the distribution of income in every country and at every time follows a certain curve. Later, he found that the income distribution curve may not be the same for every country and every income level, so he said that this rule is true for some income levels. He tried to approximate the income of countries beyond this curve. He drew some economic and social conclusions from this rule. He also obtained the cumulative distribution from the income distribution of countries and drew different curves for each country, placing the cumulative distribution on the y-axis and income on the x-axis. From this curve, he concluded that the curves of this distribution for different times have some kind of trend. From this, he discovered this curve. The definition of Pareto's curve can be given as follows :

If the number of people with annual income x or more is N , then the Pareto curve can be represented as :

$$N = Ax^{-\alpha} \quad \dots \dots \dots (1)$$

Where A and α both are constant, and their values are to be found by fitting the income data to this curve. Typically the value of α is around 1.5. Taking the logarithm of (1),

$$\log N = \log A - \alpha \log x \quad \dots \dots \dots (2)$$

That is, if we take the logarithm of the number of people with income x or more and plot it against the logarithm of income x , the points on the graph will form a line. The slope of this line will be $-\alpha$. By using a double

logarithmic scale, the number of people with both small and large incomes can be included on the graph. In Figure 4.1, the vertical axis shows the logarithm of the lower limits of income in the income distribution, and the horizontal axis shows the logarithm of people with that income.

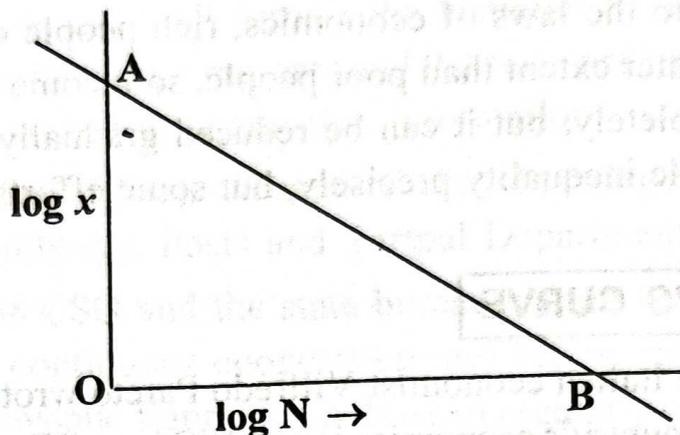


Fig. : 4.1

The line AB is tangent α to the angle OAB made with the vertical axis. Pareto's first income information curve was given as follows :

$$N = Ae^{-\beta x} (x - c)^{-\alpha} \dots \dots \dots (3)$$

Taking the logarithm of which,

$$\log N = \log A - \alpha \log (x - c) - \beta x \dots \dots \dots (4)$$

Where the constant is also to be determined from the income data for each period and period. c is the smallest value of income from which the curve starts. Pareto himself ignored this curve because its value was too small to fit the income data. For example, in 1890 in the Grand-Duche Do den burg the constants of curve (3) were $c = 220$, $\beta = 0.00006$, $\log A = 8.72204$ and $\alpha = 1.465$ while the constants of curve (2) were

$$\log A = 8.3324, \alpha = 1.6655$$

Curve (2) was fitted only to the income data of the upper class. Since the value of in curve (3) was very small, it was modified to show that the curve in (2) was suitable for income data. He initially believed to some extent that his curve could be fitted to the data relating to the entire income range for every country and at every time. But this belief is not correct. According to the theory of this curve, there should be an infinite number of people with income slightly above zero, which is not possible in practice. As income increases, the number of people with that income decreases. Therefore, this curve is not very suitable for fitting into the

lower incomes which are not subject to income tax. Pareto himself later realized this fact. His curve is better suited to fitting to the upper incomes than to the lower incomes.

7.1 Derivation

Pareto drew two conclusions based on his curve :

- (1) The shape of the income distribution curve on a double logarithmic scale is not only the same for the upper income but is the same for all income ranges.
- (2) From this distribution trend, it can be said that the only way to increase economic prosperity is to increase national production, because the contribution of the poor to the national income cannot be increased without this. According to Pareto's opinion, if the income of any country is to be increased or economic inequality is to be removed, the proportion of national income should increase more than the proportion of population. In this way, the lower income class can come to the upper class and as a result, the inequality of income decreases, in short, it is not possible to increase the income of the poor without increasing the income of all the people.

Pareto fitted his curve to the incomes of several countries and the slope of the line shown in Figure 4.1 did not vary by more than 3 or 4 degrees from 56 degrees; that is, the value of α came to about 1.5.

Then Sir Josiah Stamp worked in this field in 1935 and in his case the value of α came to 1.6 to 1.7. In short, the value of α came to around 1.5. If this rule is correct, then it can be concluded that the higher the value of α , the greater the degree of inequality and the lower the value of α , the less the degree of inequality. From this, the value of α can be considered as a measure of income inequality.

We have seen in Figure 4.1 that this curve becomes a straight line on a double logarithmic scale. Parameter α Shows the slope of the trend line and is the elasticity of the income distribution function because

$$\eta = \frac{x}{N} \cdot \frac{dN}{dx} = \alpha \quad \dots \dots \dots (5)$$

α is called the value of N individuals earning x or more in relation to the lower limit of the income class x. It can be interpreted as follows. For example, $\alpha = 1.5$. The lower limit of some income class is Rs. 1,000.

Now, if that income is increased by 10%, i.e., the value of individuals earning Rs. 1,100 or more should be 15% less than that of individuals earning Rs. 1,000.

Because $\alpha = 1.5$. Parameter α is the rate of decline in the number of people with income as the income class increases. Normally, the value of α is greater than 1.0, so as income x increases, the number of people with that income decreases.

Now, let us interpret the curve in (1) in another way. Differentiating the income distribution $N = Ax^{-\alpha}$ with respect to x ,

$$\frac{dN}{dx} = -A\alpha x^{-\alpha-1} \dots \dots \dots (6)$$

That is,

$$dN = -A\alpha x^{-\alpha-1} dx$$

occurs. Therefore, the relative decrease in the number of individuals N "

$$\begin{aligned} \frac{dN}{N} &= \frac{-A\alpha x^{-\alpha-1}}{Ax^{-\alpha}} dx \\ &= -\frac{\alpha}{x} dx \dots \dots \dots (7) \end{aligned}$$

Now, let us interpret (7). Suppose the lower limit of the income class increases by $dx = 100$, i.e. the lower limit of income increases from Rs. 1,000 to Rs. 1,100, then the relative decrease in the number of persons N is

$$\frac{dN}{N} = -\frac{\alpha}{1000} \times 100 = -\frac{\alpha}{10} \dots \dots \dots (8)$$

It occurs. Now, upon increasing the lower limit again by $dx = 100$, the relative decrease in the number of individuals N is approximately.

$$\frac{dN}{N} = -\frac{\alpha}{1100} \times 100 = -\frac{\alpha}{11} \dots \dots \dots (9)$$

Which is less than (8). That is, this decrease is less than the decrease in the number of individuals when the lower limit of the income class is increased from Rs. 1,000 to 1,100, so we can say that as income increases, the relative decrease in the number of individuals having that income

becomes smaller and smaller and that decrease occurs in the proportion mentioned in (7).

From this we can conclude that it is easier for individuals whose income is above a certain limit to increase their income than for individuals whose income is below this limit.

We saw above that the value of the valuer for a Pareto curve is α , and the value of α is typically around 1.5. This is another property of the Pareto curve. The relative increase in income is proportional to the relative decrease in the number of people with income because

$$\frac{dN}{N} = -\alpha \frac{dx}{x} \quad \dots \dots \dots (10)$$

The conclusions of the Pareto curve are consistent with the principles of economics.

From this curve given by Pareto, he tried to derive a general social law and that is that no matter how many steps are taken to remove economic inequality, that inequality cannot be removed because the natural law for the distribution of income applies in every situation. The distribution of income remains largely according to the curve given to him. To put this in Pareto's own words, "The trend of the distribution of income in the entire country takes a certain shape. If there is a change in one part of the curve, it affects the other part of the curve and finally the whole change results in the original form". Pareto himself was a staunch economist with a very old-fashioned mindset. And he was opposed to social changes. His law about income distribution is a general law of nature. He believed that. In support of this, he states that he has derived this law by obtaining income information for different countries at different times. He adapted this curve for this rule by obtaining information on the income of countries such as Britain, Prussia, Saxony, Florence, Basel, Peru, etc. Social customs are different in every country, but the distribution of income remains the same.

7.2 Applications of Pareto's Law of Income Distribution

The Pareto's Law of Income Distribution states that in any economy, a large portion of wealth or income is controlled by a small fraction of the population. Vilfredo Pareto, after studying European economies in the late 19th century, observed that approximately 20% of the population

controlled about 80% of total income. This 80/20 principle has since become a universal rule of imbalance, applicable in economics, business, and management.

1. Economic and Social Inequality Analysis :

Pareto's law helps in analyzing how income or wealth is distributed among people in an economy. Economists use the Pareto distribution to measure inequality and visualize it through curves such as the Lorenz Curve and Gini Coefficient. The steeper the Pareto curve, the higher the inequality - indicating that a small percentage of people control a large share of total income. Governments and researchers study income patterns to monitor how wealth is concentrated. Economists can identify whether economic reforms or policies have increased or decreased inequality over time. It supports the design of poverty reduction programs by identifying income groups that need attention. **Example** : If in a country, 10% of people earn 70% of total national income, Pareto's law helps policymakers recognize a high level of inequality and take corrective actions.

2. Taxation and Fiscal Policy :

In fiscal policy, Pareto's principle is crucial for designing progressive taxation systems. Since a small fraction of citizens holds most of the wealth, targeting this group through higher tax rates can help generate substantial revenue without overburdening the lower-income population. Designing progressive tax brackets (where the tax rate increases with income). Estimating optimal tax rates for high-income groups. Allocating resources for social welfare schemes like education, healthcare, and subsidies. **Example** : If 20% of citizens contribute 80% of tax revenue, the government can focus audits and policy adjustments on this segment to ensure compliance and efficiency.

3. Business and Marketing Decision-Making :

In business, the Pareto principle reveals that 80% of profits come from 20% of customers or products. Companies can use this insight to focus efforts on the most profitable segments rather than spreading resources evenly. **Customer Relationship Management (CRM)** : Identify and retain top 20% of customers who generate maximum sales. **Inventory Control** : Focus on 20% of products that account for 80% of turnover. **Sales Strategy** : Allocate marketing budgets to key customer groups.

Example : In retail, a company might find that 200 of its 1,000 products generate 80% of total revenue. Focusing on these products increases profit efficiency.

4. **Financial and Investment Planning :**

Investors and financial analysts apply Pareto's principle to identify high-performing assets or investments that yield maximum returns. The idea is to focus on the minority of investments responsible for the majority of profits. **Portfolio Management :** Diversify but prioritize top-performing stocks. **Risk Management :** Identify few investments that contribute most to overall portfolio risk. **Corporate Finance :** Recognize projects or business units driving most revenue. **Example:** If 20% of investments in a mutual fund contribute 80% of the total returns, fund managers can increase allocation toward those top assets.

5. **Resource Allocation and Productivity :**

Organizations use Pareto's law to improve productivity by identifying the critical few activities that generate most results. It helps in time management and efficiency improvement. Prioritizing important tasks in project management. Identifying 20% of processes causing 80% of production delays or defects. Streamlining resources to high-impact areas. **Example :** In a manufacturing unit, 20% of machine breakdowns might cause 80% of downtime. Fixing those key issues can drastically improve productivity.

6. **Risk and Insurance Analysis :**

Insurance companies observe that a small portion of policyholders file most claims. Pareto's law helps insurers predict risk concentration and set premiums accordingly. Assessing risk exposure across customer groups. Designing premium structures based on claim frequency. Detecting fraudulent claims by analyzing outliers. **Example :** If 10% of policyholders file 80% of claims, insurance firms focus on this high-risk group for detailed risk assessment.

7. **Development Economics :**

In development studies, Pareto's law helps compare income distributions between countries and track economic progress. It reflects whether growth benefits are reaching all social groups or concentrated in a few. Classifying nations as developed, developing, or underdeveloped

based on income inequality. Evaluating economic reforms or globalization impacts on income spread. Measuring poverty reduction effectiveness. **Example :** When comparing countries, if one shows a flatter Pareto curve (more equal distribution), it indicates better social equity compared to a country with a steep curve.

8. Policy Evaluation and Public Administration :

Governments use Pareto analysis to evaluate which programmes, departments, or policies deliver the greatest benefits to citizens. This ensures efficient allocation of public funds and improved governance outcomes. Identifying welfare schemes that help the largest number of citizens.

Measuring performance of ministries or departments. Optimizing budgetary spending to achieve maximum public benefit. **Example :** If 20% of welfare programs account for 80% of positive social impact, future funding can prioritize these programs.

Pareto's Law of Income Distribution extends far beyond income or wealth. It offers a universal framework to identify the "vital few" that drive most outcomes, whether in economics, business, or public policy. By applying this principle, decision-makers can optimize efficiency, improve equity, and focus on high-impact areas to achieve sustainable progress.

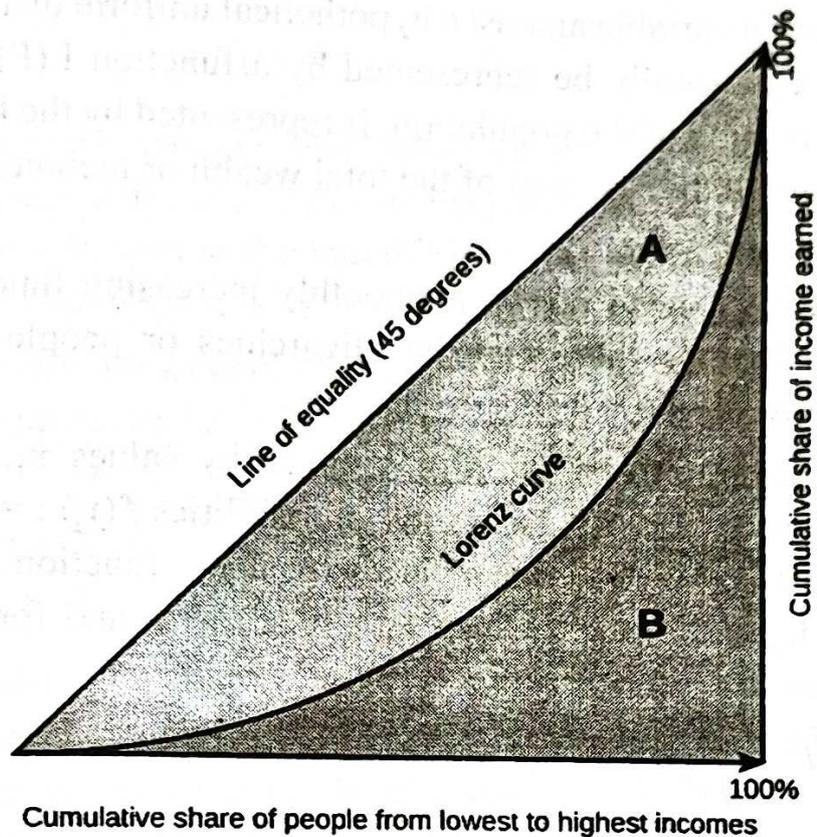
8. LORENZ CURVE

.8.1 Concept

In economics, the Lorenz curve is a graphical representation of the distribution of income or of wealth. It was developed by Max O. Lorenz in 1905 for representing inequality of the wealth distribution.

The curve is a graph showing the proportion of overall income or wealth assumed by the bottom $x\%$ of the people, although this is not rigorously true for a finite population (see below). It is often used to represent income distribution, where it shows for the bottom $x\%$ of households, what percentage ($y\%$) of the total income they have. The percentage of households is plotted on the x-axis, the percentage of income on the y-axis. It can also be used to show distribution of assets. In such use, many economists consider it to be a measure of social inequality.

The concept is useful in describing inequality among the size of individuals in ecology and in studies of biodiversity, where the cumulative proportion of species is plotted against the cumulative proportion of individuals. It is also useful in business modeling : e.g., in consumer finance, to measure the actual percentage $y\%$ of delinquencies attributable to the $x\%$ of people with worst risk scores. Lorenz curves were also applied to epidemiology and public health, e.g., to measure pandemic inequality as the distribution of national cumulative incidence ($y\%$) generated by the population residing in areas ($x\%$) ranked with respect to their local epidemic attack rate.



Points on the Lorenz curve represent statements such as, “the bottom 20% of all households have 10% of the total income”.

A perfectly equal income distribution would be one in which every person has the same income. In this case, the bottom $N\%$ of society would always have $N\%$ of the income. This can be depicted by the straight line $y = x$; called the “line of perfect equality”.

By contrast, a perfectly unequal distribution would be one in which one person has all the income and everyone else has none. In that case, the curve would be at $y = 0\%$ for all $x < 100\%$, and $y = 100\%$ when $x = 100\%$. This curve is called the “line of perfect inequality”.

The Gini coefficient is the ratio of the area between the line of perfect equality and the observed Lorenz curve to the area between the line of perfect equality and the line of perfect inequality. The higher the coefficient, the more unequal the distribution is. In the diagram on the right, this is given by the ratio $\frac{A}{(A+B)}$, where A and B are the areas of regions as marked in the diagram.

8.2 Derivations

The Lorenz curve is a probability plot (a P-P plot) comparing the distribution of a variable against a hypothetical uniform distribution of that variable. It can usually be represented by a function $L(F)$, where F , the cumulative portion of the population, is represented by the horizontal axis, and L , the cumulative portion of the total wealth or income, is represented by the vertical axis.

The curve L need not be a smoothly increasing function of F . For wealth distributions there may be oligarchies or people with negative wealth for instance.

For a discrete distribution of Y given by values y_1, \dots, y_n in non-decreasing order ($y_i \leq y_{i+1}$) and their probabilities $f(y_j) := \Pr(Y = y_j)$ the Lorenz curve is the continuous piecewise linear function connecting the points (F_i, L_i) , $i = 0$ to n , where $F_0 = 0$, $L_0 = 0$, and for $i = 1$ to n :

$$F_i := \sum_{j=1}^i f(y_j)$$

$$S_i := \sum_{j=1}^i f(y_j) y_j$$

$$L_i := \frac{S_i}{S_n}$$

When all y_j are equally probable with probabilities $\frac{1}{n}$ this simplifies to

$$F_i = \frac{i}{n}$$

$$S_i = \frac{1}{n} \sum_{j=1}^i y_j$$

$$L_i = \frac{S_i}{S_n}$$

For a continuous distribution with the probability density function f and the cumulative distribution function F , the Lorenz curve L is given by :

$$L(F(x)) = \frac{\int_{-\infty}^x t f(t) dt}{\int_{-\infty}^{\infty} t f(t) dt} = \frac{\int_{-\infty}^x t f(t) dt}{\mu}$$

Where μ denotes the average. The Lorenz curve $L(F)$ may then be plotted as a function parametric in $x : L(x)$ vs. $F(x)$. In other contexts, the quantity computed here is known as the length biased (or size biased) distribution; it also has an important role in renewal theory.

Alternatively, for a cumulative distribution function $F(x)$ with inverse $x(F)$, the Lorenz curve $L(F)$ is directly given by :

$$L(F) = \frac{\int_0^F x(F_1) dF_1}{\int_0^1 x(F_1) dF_1}$$

The inverse $x(F)$ may not exist because the cumulative distribution function has intervals of constant values. However, the previous formula can still apply by generalizing the definition of $x(F)$:

$$x(F_1) = \inf\{y : f(y) \geq F_1\}$$

Where \inf is the infimum.

8.3 Application of Lorenz Curve

A graphic measure of dispersion in a statistical series is known as Lorenz Curve. It provides the user with an immediate glimpse of the degree of variation in the given statistical distribution from its mean value; hence, is a simple measure. Prof. Lorenz first used this measure of dispersion for the measurement of economic inequality related to the distribution of income and wealth across different nations or different time periods for the same nation. Since then, the application of the Lorenz Curve has spread

widely for the measurement of disparity of distribution related to various parameters distribution of wages and profits.

The parameters in which the Lorenz Curve is now applied for the measure of dispersion are as follows :

1. Distribution of Income :

Helps governments understand income gaps between rich and poor. Used to formulate taxation and welfare policies. Economists use it to compare countries or time periods. **Example :** If 20% of the population earns only 5% of income, and 80% of income goes to 20% of people, the Lorenz curve will show a steep bend, indicating high income inequality.

2. Distribution of Wages :

Helps policymakers design fair wage policies. Employers can analyze pay disparity within organizations. Used in labor economics to study wage structures by gender, education, or occupation. **Example :** If the top 10% of employees earn 40% of total wages, the Lorenz curve will be far below the equality line - showing unequal wage distribution.

3. Distribution of Wealth :

Helps in assessing economic inequality. Used in land reforms and wealth tax policy. Organizations like the World Bank and UNDP use it to measure global inequality. **Example :** If 10% of the population owns 70% of the wealth, the Lorenz Curve will show extreme inequality.

4. Distribution of Profits :

Important for market structure analysis - helps identify monopolies or oligopolies. Assists in taxation and competition policy formulation. Investors can use it to assess market concentration. **Example :** If only 5% of firms earn 60% of total profits, the Lorenz Curve shows high inequality in profit distribution - typical of industries with few dominant players (e.g., tech or telecom).

5. Distribution of Production :

Helps governments in industrial and regional planning. Identifies imbalances in production, guiding resource allocation. Useful in supply chain and market analysis.

Example : If 20% of factories produce 80% of goods (80/20 rule), the Lorenz Curve shows a skewed production distribution.

6. Distribution of Population :

Helps in urban planning and infrastructure development. Identifies overpopulated vs underpopulated areas. Supports resource distribution and migration studies. **Example :** If 50% of the population lives in only 10% of the land area, the Lorenz Curve will show high population concentration.

EXERCISES

1. Define National Income.
2. State the uses of National Income estimates for a country.
3. Explain the methods for the estimation of National Income.
4. Describe the principle of Pareto's Law of Income Distribution.
5. Write a short note on Lorenz Curve.
6. State the Applications of Lorenz Curve.
7. State the Applications of Pareto's Law of Income Distribution.

□ □ □