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Unit 8: National Income Accounting

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### **Some Basic Concepts of Macro Economics**

One of the pioneers of the subject we call economics today, Adam Smith, named his most influential work – An Enquiry into the Nature and Cause of the Wealth of Nations. It is not that countries which are endowed with a bounty of natural wealth – minerals or forests or the most fertile lands – are naturally the richest countries. In fact, the resource rich Africa and Latin America have some of the poorest countries in the world, whereas many prosperous countries have scarcely any natural wealth. There was a time when possession of natural resources was the most important consideration but even then, the resource had to be transformed through a production process.

In our modern economic setting this flow of production arises out of production of commodities – goods and services by millions of enterprises large and small. These enterprises range from giant corporations employing many people to single entrepreneur enterprises. So, from the smallest items like pins or buttons to the largest ones like aeroplanes, automobiles, giant machinery or any saleable service like that of the doctor, the lawyer or the financial consultant – the goods and services produced are to be sold to the consumers. The consumer may, in turn, be an individual or an enterprise and the good or service purchased by that entity might be for final use or for use in further production.

A farmer producing cotton sells it to a spinning mill where the raw cotton undergoes transformation to yarn; the yarn is, in turn, sold to a textile mill where, through the productive process, it is transformed into cloth; the cloth is, in turn, transformed through another productive process into an article of clothing which is then ready to be sold finally to the consumers for final use. Such an item that is meant for final use and will not pass through any more stages of production or transformations is called a final good.

Of the final goods, we can distinguish between consumption goods and capital goods. Goods like food and clothing, and services like recreation that are consumed when purchased by their ultimate consumers are called consumption goods or consumer goods. (This also includes services which are consumed but for convenience we may refer to them as consumer goods.)

We may note here that some commodities like television sets, automobiles or home computers, although they are for ultimate consumption. They also undergo wear and tear with gradual use and often need repairs and replacements of parts, i.e., like machines they also need to be preserved, maintained and renewed. That is why we call these goods consumer durables.

Of the total production taking place in the economy a large number of products don't end up in final consumption and are not capital goods either. Such goods may be used by other producers as material inputs. Examples are steel sheets used for making automobiles and copper used for making utensils. These are intermediate goods, mostly used as raw material or inputs for production of other commodities. These are not final goods.

At this stage it is important to introduce the concepts of stocks and flows. Often we hear statements like the average salary of someone is Rs 10,000 or the output of the steel industry is so many tons or so many rupees in value. But these are incomplete statements because it is not clear whether the income which is being referred to is yearly or monthly or daily income and surely that makes a huge difference.

Sometimes, when the context is familiar, we assume that the time is known and therefore do not mention it. But inherent in all such statements is a definite period. Otherwise such statements are meaningless.

Thus income, or output, or profits are concepts that make sense only when a period is specified. These are called flows because they occur in a period. Therefore, we need to delineate a time period to get a quantitative measure of these. Since a lot of accounting is done annually in an economy, many of these are expressed annually like annual profits or production. Flows are defined over a period.

In contrast, capital goods or consumer durables once produced do not wear out or get consumed in a delineated period. In fact, capital goods continue to serve us through different cycles of production. The buildings or machines in a factory are there irrespective of the specific period. There can be addition to, or deduction from, these if a new machine is added or a machine falls in disuse and is not replaced. These are called stocks. Stocks are defined at a point of time.

However, we can measure a change in stock over a specific period like how many machines were added this year. Such changes in stocks are thus flows, which can be measured over specific time periods. A machine can be part of the capital stock for many years (unless it wears out); but that machine can be part of the flow of new machines added to the capital stock only for a single year.

That part of our final output that comprises of capital goods constitutes gross investment of an economy. These may be machines, tools and implements; buildings, office spaces, storehouses or infrastructure like roads, bridges, airports.

A part of the capital goods produced this year goes for replacement of existing capital goods and is not an addition to the stock of capital goods already existing and its value needs to be subtracted from gross investment for arriving at the measure for net investment. This deletion, which is made from the value of gross investment in order to accommodate regular wear and tear of capital, is called depreciation.

So new addition to capital stock in an economy is measured by net investment or new capital formation, which is expressed as

Net Investment = Gross investment – Depreciation

Let us examine this concept called depreciation a little more in detail. Let us consider a new machine that a firm invests in. This machine may be in service for the next twenty years after which it falls into disrepair and needs to be replaced. We can now imagine as if the machine is being gradually used up in each year's production process and each year one twentieth of its original value is getting depreciated.

Notice here that depreciation is an accounting concept. No real expenditure may have actually been incurred each year yet depreciation is annually accounted for. The act of production makes this consumption feasible in two ways – by producing these consumption goods and simultaneously generating the income for those who are involved in the production process. The entrepreneur buys machines and employs people to make this production feasible. The objective of the entrepreneur is to sell the commodities produced and earn profits. The act of employment, in turn, generates income for those who are employed. The income that the employed earn and the profit that the entrepreneur earns become the basis for purchase of consumption goods that are being produced for sale.

Total output of final goods and services produced in an economy in a year has two different parts – the consumer goods and services, and the capital goods. The consumer goods and services sustain the consumption of the total population of the economy.

From the population of the economy is derived its workforce, people who contribute to production either by providing their labour and skill or by supplying their capital or entrepreneurship. Such human effort is combined with existing stock of capital goods – tools, machines, infrastructure etc. to form the basis for production of output.

Since we are dealing with all goods and services that are produced for the market, i.e. to be sold, the crucial factor enabling such sale is demand for such products backed by purchasing power. One must have the necessary ability to purchase commodities. Otherwise one's need for commodities does not get recognised by the market.

### **Circular Flow Of Income And Methods Of Calculating National Income**

The description of the economy in the previous section enables us to have an estimate of how a simple economy – without a government, external trade or any savings – may function. The households receive their payments from the firms for productive activities they perform for the latter. As we have mentioned before, there may fundamentally be four kinds of contributions that can be made during the production of goods and services

- (a) Contribution made by human labor, remuneration for which is called wage
- (b) Contribution made by capital, remuneration for which is called interest
- (c) Contribution made by entrepreneurship, remuneration of which is profit
- (d) Contribution made by fixed natural resources (called 'land'), remuneration for which is called rent.

In this simplified economy, there is only one way in which the households may dispose of their earnings – by spending their entire income on the goods and services produced by the domestic firms. The other channels of disposing their income are closed: we have assumed that the households do not save, they do not pay taxes to the government – since there is no government, and neither do they buy imported goods since there is no external trade in this simple economy

The aggregate consumption by the households of the economy is equal to the aggregate expenditure on goods and services produced by the firms in the economy. The entire income of the economy, therefore, comes back to the producers in the form of sales revenue. There is no leakage from the system – there is no difference between the amount that the firms had distributed in the form of factor payments (which is the sum total of remunerations earned by the four factors of production) and the aggregate consumption expenditure that they receive as sales revenue.

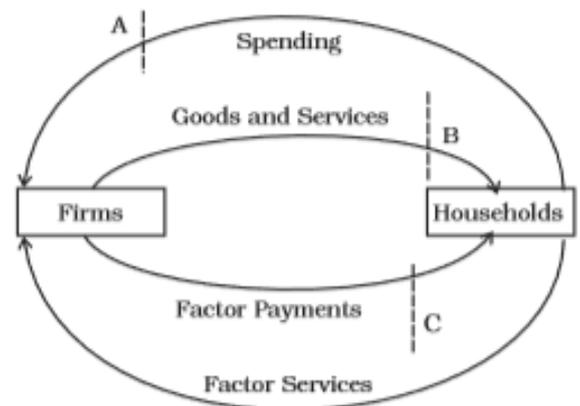
The uppermost arrow, going from the households to the firms, represents the spending the households undertake to buy goods and services produced by the firms.

The second arrow going from the firms to the households is the counterpart of the arrow above. It stands for the goods and services which are flowing from the firms to the households.

In other words, this flow is what the households are getting from the firms, for which they are making the expenditures. In short, the two arrows on the top represent the goods and services market – the arrow above represents the flow of payments for the goods and services, the arrow below represents the flow of goods and services.

The two arrows at the bottom of the diagram similarly represent the factors of production market. The lower most arrow going from the households to the firms symbolizes the services that the households are rendering to the firms. Using these services, the firms are manufacturing the output.

The arrow above this, going from the firms to the households, represents the payments made by the firms to the households for the services provided by the latter.



Since the same amount of money, representing the aggregate value of goods and services, is moving in a circular way, if we want to estimate the aggregate value of goods and services produced during a year we can measure the annual value of the flows at any of the dotted lines indicated in the diagram. We can measure the uppermost flow (at point A) by measuring the aggregate value of spending that the firms receive for the final goods and services which they produce.

This method will be called the expenditure method. If we measure the flow at B by measuring the aggregate value of final goods and services produced by all the firms, it will be called product method. At C, measuring the total of all factor payments will be called income method. Observe that the aggregate spending of the economy must be equal to the aggregate income earned by the factors of production (the flows are equal at A and C).

Such a story which describes the functioning of an imaginary economy is called a macroeconomic model. A model does not describe an actual economy in detail. For example, our model assumes that households do not save, there is no government, no trade with other countries. However, models do not want to capture an economy in its every minute detail – their purpose is to highlight some essential features of the functioning of an economic system. But one must be cautious not to simplify the matters in such a way that misrepresents the essential nature of the economy.

## **The Product or Value Added Method**

Suppose that there are only two kinds of producers in the economy. They are the wheat producers (or the farmers) and the bread makers (the bakers). The wheat producers grow wheat and they do not need any input other than human labor. They sell a part of the wheat to the bakers. The bakers do not need any other raw materials besides wheat to produce bread.

Suppose that in a year the total value of wheat that the farmers have produced is Rs 100. Out of this they have sold Rs 50 worth of wheat to the bakers. The bakers have used this amount of wheat completely during the year and have produced Rs 200 worth of bread. If we follow the simple way of aggregating the values of production of the sectors, we would add Rs 200 (value of production of the bakers) to Rs 100 (value of production of farmers). The result will be Rs 300.

A little reflection will tell us that the value of aggregate production is not Rs 300. The farmers had produced Rs 100 worth of wheat for which it did not need assistance of any inputs. Therefore the entire Rs 100 is rightfully the contribution of the farmers. But the same is not true for the bakers. The bakers had to buy Rs 50 worth of wheat to produce their bread. The Rs 200 worth of bread that they have produced is not entirely their own contribution. To calculate the net contribution of the bakers, we need to subtract the value of the wheat that they have bought from the farmers. This is because Rs 50 worth of wheat will be counted twice. First it will be counted as part of the output produced by the farmers. Second time, it will be counted as the imputed value of wheat in the bread produced by the bakers. Therefore, the net contribution made by the bakers is,  $\text{Rs } 200 - \text{Rs } 50 = \text{Rs } 150$ . Hence, aggregate value of goods produced by this simple economy is  $\text{Rs } 100$  (net contribution by the farmers) +  $\text{Rs } 150$  (net contribution by the bakers) =  $\text{Rs } 250$ .

The term that is used to denote the net contribution made by a firm is called its value added. We have seen that the raw materials that a firm buys from another firm which are completely used up in the process of production are called 'intermediate goods'. Therefore, the value added of a firm is, value of production of the firm – value of intermediate goods used by the firm. The value added of a firm is distributed among its four factors of production, namely, labor, capital, entrepreneurship, and land. Therefore wages, interest, profits, and rents paid out by the firm must add up to the value added of the firm. Value added is a flow variable.

Inventories are treated as capital. Addition to the stock of capital of a firm is known as investment. Therefore, change in the inventory of a firm is treated as investment. There can be three major categories of investment. First is the rise in the value of inventories of a firm over a year which is treated as investment expenditure undertaken by the firm.

The second category of investment is the fixed business investment, which is defined as the addition to the machinery, factory buildings, and equipment employed by the firms. The last category of investment is the residential investment, which refers to the addition of housing facilities.

Change in inventories may be planned or unplanned. In case of an unexpected fall in sales, the firm will have unsold stock of goods which it had not anticipated. Hence there will be unplanned accumulation of inventories. In the opposite case where there is unexpected rise in the sales there will be unplanned decumulation of inventories.

Suppose the firm wants to raise the inventories from 100 shirts to 200 shirts during the year. Expecting sales of 1,000 shirts during the year (as before), the firm produces  $1000 + 100 = 1,100$  shirts. If the sales are 1,000 shirts, then the firm indeed ends up with a rise of inventories. The new stock of inventories is 200 shirts, which was indeed planned by the firm. This rise is an example of planned accumulation of inventories.

On the other hand, if the firm had wanted to reduce the inventories from 100 to 25 (say), then it would produce  $1000 - 75 = 925$  shirts. This is because it plans to sell 75 shirts out of the inventory of 100 shirts it started with (so that the inventory at the end of the year becomes  $100 - 75 = 25$  shirts, which the firm wants). If the sales indeed turn out to be 1000 as expected by the firm, the firm will be left with the planned, reduced inventory of 25 shirts.

Taking cognizance of change of inventories we may write Gross value added of firm,

$i(GVA_i) = \text{Gross value of the output produced by the firm } i(Q_i) - \text{Value of intermediate goods used by the firm } (Z_i)$

$GVA_i = \text{Value of sales by the firm } (V_i) + \text{Value of change in inventories } (A_i) - \text{Value of intermediate goods used by the firm } (Z_i)$

$\text{Change in inventories of a firm during a year} = \text{Production of the firm during the year} - \text{Sale of the firm during the year.}$

It is worth noting that the sales by the firm includes sales not only to domestic buyers but also to buyers abroad (the latter is termed as exports). It is also to be noted that all the above-mentioned variables are flow variables. Generally, these are measured on an annual basis. Hence they measure value of the flows per year.

$\text{Net value added of the firm } i = GVA_i - \text{Depreciation of the firm } i(D_i)$

If we sum the gross value added of all the firms of the economy in a year, we get a measure of the value of aggregate amount of goods and services produced by the economy in a year (just as we had done in the wheat-bread example). Such an estimate is called Gross Domestic Product (GDP). Thus  $\text{GDP} = \text{Sum total of gross value added of all the firms in the economy.}$

If there are  $N$  firms in the economy, each assigned with a serial number from 1 to  $N$ , then  $\text{GDP} = \text{Sum total of the gross value added of all the firms in the economy}$

$$= GVA_1 + GVA_2 + \dots + GVA_N$$

Therefore

$$GDP = \sum_{i=1}^N GVA_i$$

$$NVA_i = GVA_i - D_i$$

Therefore,  $GVA_i = NVA_i + D_i$

This is for the  $i$ -th firm. There are  $N$  such firms. Therefore, the GDP of the entire economy, which is the sum total of the value added of all the  $N$  firms, will be the sum total of the net value added and depreciation of the  $N$  firms.

$$GDP = \sum_{i=1}^N NVA_i + \sum_{i=1}^N D_i$$

## Expenditure Method

Final expenditure is that part of expenditure which is undertaken not for intermediate purposes. The Rs 50 worth of wheat which the bakers buy from the farmers counts as intermediate goods, hence it does not fall under the category of final expenditure. Therefore the aggregate value of output of the economy is Rs 200 (final expenditure received by the baker) + Rs 50 (final expenditure received by the farmer) = Rs 250 per year. Firm can make the final expenditure on the following accounts

- (a) The final consumption expenditure on the goods and services produced by the firm. We shall denote this by  $C_i$ . We may note that mostly it is the households which undertake consumption expenditure. There may be exceptions when the firms buy consumables to treat their guests or for their employees
- (b) The final investment expenditure,  $I_i$ , incurred by other firms on the capital goods produced by firm  $i$ . Observe that unlike the expenditure on intermediate goods which is not included in the calculation of GDP, expenditure on investments is included. The reason is that investment goods remain with the firm, whereas intermediate goods are consumed in the process of production
- (c) The expenditure that the government makes on the final goods and services produced by firm  $i$ . We shall denote this by  $G_i$ . We may point out that the final expenditure incurred by the government includes both the consumption and investment expenditure
- (d) The export revenues that firm  $i$  earns by selling its goods and services abroad. This will be denoted by  $X_i$ .

$$= C_i + I_i + G_i + X_i$$

$$\sum_{i=1}^N RV_i = \text{Sum total of final consumption, investment, government and exports expenditures by the firm } i$$

$$= \sum_{i=1}^N C_i + \sum_{i=1}^N I_i + \sum_{i=1}^N G_i + \sum_{i=1}^N X_i$$

## Income Method

This follows from the simple idea that the revenues earned by all the firms put together must be distributed among the factors of production as salaries, wages, profits, interest earnings and rents. Let there be  $M$  number of households in the economy.

Let  $W_i$  be the wages and salaries received by the  $i$ -th household in a year. Similarly,  $P_i$ ,  $I_n$ ,  $R_i$  be the gross profits, interest payments and rents received by the  $i$ -th household in a year. Therefore, GDP is given by

$$GDP = \sum_{i=1}^N GVA_i = C + I + G + X - M = W + In + R$$

It may be worth examining how the households dispose off their earnings. There are three major ways in which they may do so. Either they consume it, or they save it, or pay taxes with it (if no aid or donation, 'transfer payment' in general, is being sent abroad, which is another way to spend their incomes). Let S stand for the aggregate savings made by them and T be the sum of taxes paid by them. Therefore

$$GDP = C + S + T$$

$$C + I + G + X = C + S + T$$

$$I + G + X - M = S + T$$

$$(I - S) + (G - T) = M - X$$

$G - T$  measures by what amount the government expenditure exceeds the tax revenue earned by it. This is referred to as budget deficit.  $M - X$  is known as the trade deficit – it measures the excess of import expenditure over the export revenue earned by the economy ( $M$  is the outflow from the country,  $X$  is the inflow into the country). If there is no government, no foreign trade then

$$I = S$$

### **Some Macro Economic Identities**

Gross Domestic Product measures the aggregate production of final goods and services taking place within the domestic economy during a year.

The macroeconomic variable which considers such additions and subtractions is known as Gross National Product (GNP). It is, therefore, defined as follows

$GNP = GDP +$  Factor income earned by the domestic factors of production employed in the rest of the world – Factor income earned by the factors of production of the rest of the world employed in the domestic economy Hence,  $GNP = GDP +$  Net factor income from abroad

A part of the capital gets consumed during the year due to wear and tear. This wear and tear is called depreciation. Naturally, depreciation does not become part of anybody's income. If we deduct depreciation from GNP the measure of aggregate income that we obtain is called Net National Product (NNP). Thus

$NNP = GNP -$  Depreciation It is to be noted that all these variables are evaluated at market prices. Through the expression given above, we get the value of NNP evaluated at market prices. But market price includes indirect taxes.

When indirect taxes are imposed on goods and services, their prices go up. Indirect taxes accrue to the government. We must deduct them from NNP evaluated at market prices to calculate that part of NNP which accrues to the factors of production.

Similarly, there may be subsidies granted by the government on the prices of some commodities (in India petrol is heavily taxed by the government, whereas cooking gas is subsidised). So we need to add subsidies to the NNP evaluated at market prices. The measure that we obtain by doing so is called Net National Product at factor cost or National Income.

Thus,  $NNP$  at factor cost = National Income (NI) =  $NNP$  at market prices – (Indirect taxes – Subsidies) =  $NNP$  at market prices – Net indirect taxes (Net indirect taxes = Indirect taxes – Subsidies)

The part of NI which is received by households is called this Personal Income (PI). First, let us note that out of NI, which is earned by the firms and government enterprises, a part of profit is not distributed among the factors of production. This is called Undistributed Profits (UP).

Thus, Personal income (PI) = NI – Undistributed profits – Net interest payments made by households – Corporate tax + Transfer payments to the households from the government and firms.

Personal Disposable Income (PDI) = PI – Personal tax payments – Non-tax payments.  
Personal Disposable Income is the part of the aggregate income which belongs to the households

National Disposable Income = Net National Product at market prices + Other current transfers from the rest of the world. The idea behind National Disposable Income is that it gives an idea of what is the maximum amount of goods and services the domestic economy has at its disposal. Current transfers from the rest of the world include items such as gifts, aids, etc.

Private Income = Factor income from net domestic product accruing to the private sector + National debt interest + Net factor income from abroad + Current transfers from government + Other net transfers from the rest of the world

## **Goods and Prices**

To compare the GDP figures (and other macroeconomic variables) of different countries or to compare the GDP figures of the same country at different points of time, we cannot rely on GDPs evaluated at current market prices.

For comparison we take the help of real GDP. Real GDP is calculated in a way such that the goods and services are evaluated at some constant set of prices (or constant prices). Since these prices remain fixed, if the Real GDP changes we can be sure that it is the volume of production which is undergoing changes.

Nominal GDP, on the other hand, is simply the value of GDP at the current prevailing prices. For example, suppose a country only produces bread. In the year 2000 it had produced 100 units of bread, price was Rs 10 per bread. GDP at current price was Rs 1,000. In 2001 the same country produced 110 units of bread at price Rs 15 per bread. Therefore, nominal GDP in 2001 was Rs 1,650 (=110 × Rs 15). Real GDP in 2001 calculated at the price of the year 2000 (2000 will be called the base year) will be 110 × Rs 10 = Rs 1,100.

In the calculation of real and nominal GDP of the current year, the volume of production is fixed. Therefore, if these measures differ it is only due to change in the price level between the base year and the current year. The ratio of nominal to real GDP is a well-known index of prices. This is called GDP Deflator. Thus, if GDP stands for nominal GDP and gdp stands for real GDP then

$$GDP\ Deflator = \frac{GDP(Nominal)}{gdp(Real)}$$

There is another way to measure change of prices in an economy which is known as the Consumer Price Index (CPI). This is the index of prices of a given basket of commodities which are bought by the representative consumer. CPI is generally expressed in percentage terms. We have two years under consideration – one is the base year, the other is the current year. We calculate the cost of purchase of a given basket of commodities in the base year. We also calculate the cost of purchase of the same basket in the current year. Then we express the latter as a percentage of the former. This gives us the Consumer Price Index of the current year vis-à-vis the base year.

Let us take an economy which produces two goods, rice, and cloth. A representative consumer buys 90 kg of rice and 5 pieces of cloth in a year. Suppose in the year 2000 the price of a kg of rice was Rs 10 and a piece of cloth was Rs 100. So, the consumer had to spend a total sum of Rs  $10 \times 90 = \text{Rs } 900$  on rice in 2000. Similarly, she spent Rs  $100 \times 5 = \text{Rs } 500$  per year on cloth. Summation of the two items is, Rs  $900 + \text{Rs } 500 = \text{Rs } 1,400$ .

Suppose the prices of a kg of rice and a piece of cloth has gone up to Rs 15 and Rs 120 in the year 2005. To buy the same quantity of rice and clothes the representative will have to spend Rs 1,350 and Rs 600 respectively (calculated in a similar way as before). Their sum will be, Rs  $1,350 + \text{Rs } 600 = \text{Rs } 1,950$ . The CPI therefore will be  $1,950/1,400 \times 100 = 139.29$ .

It is worth noting that many commodities have two sets of prices. One is the retail price which the consumer pays. The other is the wholesale price, the price at which goods are traded in bulk. These two may differ in value because of the margin kept by traders. Goods which are traded in bulk (such as raw materials or semi-finished goods) are not purchased by ordinary consumers.

Like CPI, the index for wholesale prices is called Wholesale Price Index (WPI). In countries like USA it is referred to as Producer Price Index (PPI). Notice CPI (and analogously WPI) may differ from GDP deflator because

1. The goods purchased by consumers do not represent all the goods which are produced in a country. GDP deflator considers all such goods and services.
2. CPI includes prices of goods consumed by the representative consumer, hence it includes prices of imported goods. GDP deflator does not include prices of imported goods.
3. The weights are constant in CPI – but they differ according to production level of each good in GDP deflator.

## **GDP and Welfare**

If a person has more income he or she can buy more goods and services and his or her material well-being improves. So it may seem reasonable to treat his or her income level as his or her level of well-being. Higher level of GDP of a country as an index of greater well-being of the people of that country (to account for price changes, we may take the value of real GDP instead of nominal GDP). But there are at least three reasons why this may not be correct

1. Distribution of GDP – how uniform is it: If the GDP of the country is rising, the welfare may not rise. This is because the rise in GDP may be concentrated in the hands of very few individuals or firms. For the rest, the income may in fact have fallen. In such a case the welfare of the entire country cannot be said to have increased
2. Non-monetary exchanges: Many activities in an economy are not evaluated in monetary terms. For example, the domestic services women perform at home are not paid for. The exchanges which take place in the informal sector without the help of money are called barter exchanges. In barter exchanges goods (or services) are directly exchanged against each other. But since money is not being used here, these exchanges are not registered as part of economic activity
3. Externalities: Externalities refer to the benefits (or harms) a firm or an individual cause to another for which they are not paid (or penalised). Externalities do not have any market in which they can be bought and sold. For example, let us suppose there is an oil refinery which refines crude petroleum and sells it in the market. The output of the refinery is the amount of oil it refines. We can estimate the value added of the refinery by deducting the value of intermediate goods used by the refinery (crude oil in this case) from the value of its output.