4 Measurement of National Income and Product

In the preceding chapter, it was discussed that national income or product of a country has immense significance both in the fields of economic analysis and policy. In view of it, the most relevant question is related to the exact and reliable estimation of national product and income. In the present chapter, a study is attempted of the different methods through which gross national product, income and expenditure can be measured.

1. PRODUCTION METHOD

In this method, the basic aggregate of gross domestic product (GDP) or gross national product (GNP) is computed by aggregating the market values of final commodities and services produced in a given country during a particular year. The quantities produced of final goods and services are multiplied by their respective average prices and the sum total provides a magnitude of the GDP. GDP is the sum total of all the market values of the final products and services produced in the domestic territory of a country during a particular year.

If quantities produced of n final products and services during a year are $Q_1, Q_2, Q_3, ..., Q_n$ and their respective average prices are $P_1, P_2, P_3, ..., P_n$, then GDP at Market Prices $= P_1Q_1 + P_2Q_2 + P_3Q_3 + ... + P_nQ_n$

$$GDP = P_1Q_1 + P_2Q_2 + P_3Q_3 + ... + P_nQ_n$$

or $GDP = \Sigma P_i Q_i$

where Σ stands for summation.

A part of the product domestically produced is exported abroad in every year and at the same time some measure of goods and services are imported from abroad. If the value of exports (X) in aggregated with GDP and value of imports (M) is subracted from

it, we get the measure of gross national product (GNP) at market prices of the countries.

or GNP at Market Prices
    = GDP at Market Prices + (X – M)

or GNP at Market Prices
    = GDP at Market Prices + Net Exports

Net exports (X – M) in a given year may be positive or negative.

A series of sub–aggregates of GNP or GNP can be derived from them.

This method has certain *limitations* :

(*i*) It requires a detailed census of production. If the relaible estimates of production in all sectors or industries are not available in a specified year, this method can not be applied.

(*ii*) In this method, a choice has to be made whether a given product is a final or intermediate product. Sometime, such a choice is very difficult.

(*iii*) There are certain sectors in the economy such as trade, transport, communications, banking, insurance and others in which no products are generated. There is rather generation of incomes. The product method can not be applied in those sectors or activities.

(*iv*) This method can not apply to such transactions as do not take place in the market through money.

(*v*) The estimates of GDP or GNP through this method are greatly affected by fluctuations in prices.

2. VALUE ADDED METHOD

The value added method for computing GNP or national income is a variant of the product method.

In this method, the value of primary products derived from cultivation, mining, forestry, dairy farming, animal husbandry and imports are taken into account. As the primary products pass through different stages of production, there is some addition to their values on account of payments to the factor inputs. Inclusion of all these values added to the values of the products can give us the gross value added at market prices of the GNP. This may be explained through Table 1.

In this example the total value of transactions is Rs. 300 lakhs but this aggregate involves multiple counting because the same product in different forms appears more than once. In the value added method, the value of primary product, which in this example are steel and plastic granules are respectively Rs. 60 lakhs and Rs. 20 lakhs. As the processing occurs, steel is converted into plastic machinery and granules into toys, there are additions to values. The sum of these additions to values with primary products, determines the gross values added at market prices for the toy industry. Similarly the gross values added for all the products in the country during a given year can give the measure of GDP. The value of the final product is only Rs. 136 lakhs and not Rs. 300 lakhs.

Gross Value Added   =   Values of Primary
or   GDP at   Products + Addition
Market Prices   to Values

Alternatively Gross Value Added on GNP at market prices can be computed as

Gross Value Added   =   Aggregate Sales –
or   GDP at Market   Intermediate
Prices   Purchases

Intermediate purchases are the purchases made by firms from all other firms.

GNP at Market Prices = GDP at Market Prices + Net Exports.

This method can avoid the multiple counting. It has an added advantage over the product method that there is no problem of making a choice whether a product is final or intermediate product.

This method, however, involves some problems: (i) It requires detailed data related to production, sales and purchases. Such statistics are not easily available in less developed countries. (ii) In several irrigation and power projects, it is difficult to measure exactly the value added. (iii) It is not easy to have exact measurement of value added in several public services like education, health, police, defence services and administrative services. (iv) Many industries turn out more than one product. The exact estimation of value added in their case is also very difficult.

3. INCOMES METHOD

As an income aggregate, GNP is equivalent to the total income created by the current productive activity and the allocations of this income among the various economic groups in the community such as workers, land owners, capitalists and organisers in the form of wages, rents, interests and profits. The sum of these factor incomes generated within the demestic territory of the country is termed as domestic factor income.

GNP at Market Prices = All wages, salaries and supplementary incomes (excluding transfer payments) + All rents including imputed rents on self-occupied

Table 1. Value Added (In Lakhs of Rs.)

Product	Buyer	Seller	Values of Transaction	Value Added
1. Steel	Plastic machinery industry	Steel industry	60	60
2. Plastic machinery	Plastic industry	Plastic machinery industry	74	14
3. Plastic granules	Plastic industry	Plastic granules making industry	20	20
4. Plastic toys	Wholesalers industry	Plastic	38	18
5. Plastic toys	Retailers	Wholesaler	48	12
6. Plastic toys	Consumers	Retailers	60	12
		Total	300	136

properties + All interests + All profits + Net income from abroad – Transfer Payments + Indirect Taxes – Subsidies + Depreciation

GDP at market prices can be computed by deducting net factor income from abroad out of the above aggregate

GDP at Market Prices = Domestic Factor Income – Transfer Payments + Indirect Taxes – Subsidies + Depreciation.

This method involves some *difficulties* which are as : (*i*) A part of production is retained by the producer for the consumption by his family. It is not brought into the market for sale. It does not generate money income. This creates problem in exact estimation of incomes of the producers. (*ii*) Incomes of self-employed people include the elements of wages, rents, interests, profits etc. Such incomes are called mixed incomes. Sometime it is quite difficult to make correct estimates of such incomes. (*iii*) If a part of wages is paid out to the workers in kind, the exact measurement of wages and salaries becomes difficult. (*iv*) In the case of self-occupied properties by the owners, no direct rental payments take place. That creates problem in the estimation of total rents. (*v*) Some activities do not directly generate income, they rather create products. In such a situation, this method is difficult to be applied. (*vi*) Some people donot disclose their whole income for tax purposes. That results in the under-estimation of GNP.

The alternative approaches in the measurement of GNP lead to identical conclusion. The aggregate expenditure by the community in a particular year is incurred on the purchase of goods and services. Therefore, the aggregate expenditure for all practical purposes may be equal to the value of the final products. Further aggregate expenditure remains identically equal to the aggregate income.

GNP = Sum of the value of final products

GNP = Sum of all expenditures

GNP = Sum of all values added

GNP = Sum of all factor incomes

GNP = Aggregate value of final products

    = Aggregate of all values added

    = Aggregate of all expenditures

    = Aggregate of all factor incomes

In fact no single method for the measurement of national income and product is sufficient. The product method is applicable to those sectors alone which turn out products. Income and expenditure methods similarly are deficient because of widespread tendencies among the people to understate their incomes or exaggerate their spending. In countries like India, the statistical gaps too limit the use of these methods for the measurement of national income and product. To overcome these practical difficulties and to verify the accuracy of estimates, *two or more of these methods are combined* to have an accurate estimate of national income and product.

4. EXPENDITURE METHOD

As an expenditure aggregate, GNP represents the aggregate purchases of final commodities and services by the consumers and the government *plus* gross private domestic investment *plus* net foreign investment.

$$GNP = C + G + I + (X - M) + D = GNE$$

Here C is consumer purchases or consumption expenditure, G is government expenditure, I is net private domestic investment, (X – M) is net foreign investment and D is depreciation. The sum of I and D measures gross private domestic investment. GNE is the gross national expenditure which is identically equal to GNP.

GDP can be computed through the expenditure approach by deducting (X–M) out of the GNP

$$GDP = GNP - (X-M)$$

$$GDP = C + I + G + D$$

This method for estimating the GNP involves some serious *difficulties* :

(*i*) Accurate statistics related to consumption expenditure are often not available. (*ii*) The exact data concerning investment, depreciation etc. are not available in poor countries. (*iii*) People generally tend to overstate their expenditure. It results in exaggeration of gross national income over its true level. (*iv*) Some services of government assist production. Some other services are meant for peace and security. In this respect, it is difficult to make a clear distinction which of them should be included in national income and which should remain excluded from it. (*v*) The problem is created by the transfer

payments made by the government such as pensions, unemployment allowances etc. (*vi*) In the case of durable consumer goods like house, TV set, car, furniture etc., expenditure is incurred once but their use is extended over series of periods. This also creates complication in the measurement of domestic and national product.

5. MIXED METHOD

The National Income Committee (NIC) in India makes use of the combination of product and income approaches. In the revised series related to national income accounting in India published by the Central Statistical Organisation (C.S.O) in September 1999, the whole economy has been divided into 14 sectors. The product method is used in agriculture, forestry, logging, fishing, mining and quarrying and registered manufacturing sectors. Income method is used in unregistered manufacturing, electricity, gas and water supply, transport and communications, trade, storage, hotels and restaurants, banking and insurance, real estates and ownership of dwellings, public administration and defence and other services. In the construction sector, commodity flow method is used in urban area and expenditure method in rural areas.

6. SOLVED ILLUSTRATIONS

I. Product Method

Example 1. From the data given below related to final products A, B, C, D, E compute GDP at market price.

Solution :

Product	Q_i Quantities (in units)	P_i Price (in Rs.)	P_iQ_i
A	200	.12	2,400
B	150	10	1,500
C	125	8	1,000
D	320	5	1,600
E	155	4	620
			7120

$$\text{GDP at Market Prices} = \sum_{i=0}^{n} P_iQ_i = 7120$$

Example 2. Given the total market value of final products in a country as Rs. 980 crore and exports and imports as Rs. 96 crore and Rs. 80 crore respectively. Calculate the GNP at market prices.

Solution :

GDP at Market Price = Rs. 980 Crore
Exports (X) = Rs. 96 Crore
and Imports (M) = Rs. 80 Crore

$$\text{GNP at Market Prices} = \sum_{r=0}^{n} P_iQ_i+(X-M)$$

$$= 980 + 96 - 80$$
$$= \text{Rs. 996 Crore}$$

VALUE ADDED METHOD

Example 3. There are three firms A, B and C. The transactions related to them are as under. Compute GDP through the value added method.

Solution :

Firm	Value of Product (in units)	Transactions	Value Added (in Rs.)
A	40	A sells produce worth Rs. 25 to B and worth Rs. 15 to C	40
B	35	B sells goods worth Rs. 5 to C	35 – 25 = 10
C	30	C sells goods worth Rs. 30 to transactions	Rs.30 – (15 + 5) = 10
Total	105		60

GDP = Gross Value Added

= Values of Output – Intermediate Consumption

= Rs. 60

Example 4. Calculate GDP at market prices, GNP at market prices, NNP at market prices, and NNP at factor costs through the product method (Value Added Method from the following data).

Items	(In Crore Rs.)
1. Value of output of	
(*i*) Primary Sector	1,200
(*ii*) Secondary Sector	800
(*iii*) Tertiary Sector	900
2. International Consumption of	
(*i*) Primary Sector	600
(*ii*) Secondary Sector	500
(*iii*) Tertiary Sector	650

3. Net exports	150
4. Depreciation (Consumption of Fixed Capital)	60
5. Indirect Taxes	120
6. Subsidies	80

Solution :

(i) GDP at Market Prices

   = Value of Output of Primary, Secondary and Tertiary Sectors – Intermediate Consumption of Primary, Seconday and Tertiary Sectors

   = (1,200 + 800 + 900)–(600 + 500 + 650)

   = 2,900 – 1,750 = Rs. 1150 Crore

(ii) GNP at Market Prices

   = GDP at Market Prices + Net Exports

   = 1,150 + 150 = Rs. 1,300 Crore

(iii) NNP at Market Prices

   = GNP at Market Prices – Depreciation

   = 1,300 – 60 = Rs. 1,240 Crore

(iv) NNP at Factor Costs or National Income

   = NNP at Market Prices – Net Indirect Taxes

   = NNP at Market Prices – Indirect Taxes – Subsidies

   = 1,240 – (120 – 80) = Rs. 1,200 Crore

Example 5. From the data given below, compute national income, private income, personal income and disposable income.

Items	(In Crore Rs.)
(1) Gross Value Added by Primary Sector at Market Prices	1,500
(2) Gross Value Added by Secondary Sector at Market Prices	2,000
(3) Gross Value Added byTertiary Sector at Market Prices	2,400
(4) Capital Consumption (Depreciation)	500
(5) Net Indirect Taxes	300
(6) Net Factor Income from Abroad	25
(7) Transfer Payments from the Government	180
(8) Net Current Transfer Payments from Abroad	20
(9) Interest on National Debt	1,300
(10) Gifts	5
(11) Windfall Gains	30
(12) Property and Entrepreneurial Income of the Government	400
(13) Savings of Non-departmental Undertakings	135
(14) Social Insurance Contributions of the Employees	800
(15) Corporate Profits Tax Liability	160
(16) Undistributed Corporate Profits	440
(17) Direct Personal Taxes	250

Solution :

(i) National Income or NNP at Factor Costs

   = Gross Value Added by Primary, Secondary and Tertiary Sectors – Capital Consumption + Net Factor Income from Abroad – Net Factor Income form Abroad – Net Indirect Taxes

   = (1,500 + 2,000 + 2,400) – 500 + 25 – 300

   = 5,900 + 25 – 800

   = 5,925 – 800 = **Rs. 5,125 Crore**

(ii) Private Income

   = National Income + Transfer Payments from the Government + Net Current Transfer from Abroad + Interest on National Debt + Gifts + Windfall Gains – Property and Entrepreneurial Income of the Government–Savings of Non-departmental Undertakings–Social Insurance Contributions of the employees.

   = 5,125 + 180 + 20 + 1,300 + 5 + 30 – 400 – 135 – 800

   = 6,660 – 1,335 = **Rs. 5,325 Crore**

(iii) Personal Income

   = National Income – (Social Insurance Contributions + Corporate Profit Tax Liability + Undistributed Profits) + Transfer Payments

   = 5,125 – (800 + 160 + 440) + 180

   = 5,305 – 1,400 = **Rs. 3,905 Crore**

(iv) Disposable Income

   = Personal Income – Direct Personal Taxes

   = 3,905 – 250 = **Rs. 3,655 Crore**

II. Income Method

Example 1. Calculate Compensation of Employees from the data given below :

Items	(In Crore Rs.)
1. Wages and Salaries	428
2. Wages in Kind	12
3. Employers' Contributions to Social Security	45

Solution : Compensation of Employees

= Wages and Salaries + Wages in Kind + Employers' Contribution to Social Security

= 428 + 12 + 45 = **Rs. 485 Crore**

Example 2. Compute operating surplus from the following information :

Items	(In Crore Rs.)
1. Rents and Royalties	116
2. Interests	14
3. Profits	30

Solution : Operating Surplus

= Rents and Royalties + Interests + Profits

= 116 + 14 + 30 = **Rs. 160 Crore**

Example 3. Calculate domestic factor income from the following data :

Items	(In Crore Rs.)
1. Compensation of Employees	188
2. Income from Property and Entrepre-neurship (Rents + Interests + Profits)	218
3. Mixed Incomes	15

Solution : Domestic Factor Income

= Compensation of Employees + Income from Property and Entrepreneurship + Mixed Incomes

= 188 + 218 + 15 = 421

= **Rs. 421 Crore**

Example 4. Calculate NNP at factor costs from the following information :

Items	(In Crore Rs.)
1. Wages and Salaries	435
2. Rents	116
3. Interests	84
4. Profits	125
5. Mixed Incomes	105
6. Net Factor Income from Abroad	70

Solution : NNP at Factor Costs on National Income

= Wages and Salaries + Rents + Interests + Profits + Mixed Incomes + Net Factor Income from Abroad

= 435 + 116 + 84 + 125 + 105 + 70

= **Rs. 935 Crore**

Example 5. Calculate GDP at market prices and GNP at market prices through income method.

Items	(In Crore Rs.)
1. Income From Work	819
2. Income From Property and Entrepreneurship	433
3. Mixed Incomes	182
4. Net Factor Income from Abroad	46
5. Indirect Taxes	118
6. Subsidies	105
7. Consumption of Fixed Capital (Depreciation)	106

Solution : NDP at Factor Costs

= Income from Work + Income from Property and Entrepreneurship + Mixed Incomes

= 819 + 433 + 182

= Rs. 1434 Crore

GDP at Factor Costs

= NDP at Factor Costs + Consumption of Fixed Capital

= 1434 + 106 = Rs. 1540 Crore

GDP at Market Prices

= GDP at Factor Costs + Indirect Taxes – Subsidies

= 1540 + 118 – 105

= 1540 + 13

= **Rs. 1553 Crore**

GNP at Market Prices

= GDP at Market Prices + Net Factor Income from Abroad

= 1553 + 46

= **Rs. 1599 Crore**

Example 6. Find out Personal Income and Disposable Income through incomes method from the data given below :

Items	(In Crore Rs.)
1. NNP at Market Prices	1680
2. Net Indirect Taxes	240
3. Social Insurance Contributions	115
4. Undistributed Corporate Profits	265
5. Corporate Profits Tax Liability	334

6. Transfer Payments 106

7. Direct Personal Taxes 125

Solution : National Income

= NNP at Market Prices – Net Indirect Taxes

= 1680 – 240 = Rs. 1440 Crore

Personal Income

= National Income – (Social Insurance Contribution + Corporate Profits Tax Liability + Undistributed Corporate Profits) + Transfer Payments

= 1440 – (115 + 334 + 265) + 106

= 1546 – 714 = Rs. 832 Crore

Disposable Income

= Personal Income – Direct Personal Taxes

= 832 – 125 = **Rs. 707 Crore**

III. Expenditure Method

Example 1. Calculate GNP at market prices through expenditure method from the data given below :

Items	(In Crore Rs.)
1. Private Final Consumption Expenditure	3,584
2. Government Final Consumption Expenditure	1,019
3. Net Exports	25
4. Net Factor Income from Abroad	18
5. Consumption of Fixed Capital	40
6. Net Domestic Investment	220

Solution : GNP at Market Parices or GNE

= Private Final Consumption Expenditure + Government Final Consumption Expenditure + Net Domestic Investment + Consumption of Fixed Capital + Net Exports + Net Factor Income from Abroad

= 3,584 + 1,019 + 220 + 40 + 25 + 18

= 4,906 = **Rs. 4,906 Crores**

Example 2. Compute GNP at Market Prices, GDP at Market Prices, NNP at Market Prices, NNP at Factor Costs or National Income from the following information through Expenditure Method :

Items	(In Crore Rs.)
1. Private Final Consumption Expenditure	140,375
2. Government Final Consumption Expenditure	68,215
3. Net Domestic Capital Formation	15,610
4. Net Foreign Investment	8,420
5. Depreciation	3,170
6. Net Indirect Taxes	850

Solution :

(i) GNP at Market Prices or GNE

= Private Final Consumption Expenditure + Government Final Consumption Expenditure + Net Domestic Capital Formation + Net Foreign Investment + Depreciation

= 1,40,375 + 68,215 + 15,610 + 8,420 + 3,170

= 2,35,790 = **Rs. 2,35,790 Crore**

(ii) GDP at Market Prices

= GNP at Market Prices – Net Foreign Investment

= 2,35,790 – 8,420 = 2,27,370

= **Rs. 2,27,370 Crore**

(iii) NNP at Market Prices

= GNP at Market Prices – Depreciation

= 2,35,790 – 3,170

= 2,32,620 = **Rs. 2,32,620 Crore**

(iv) NNP at Factor Costs or National Income

= NNP at Market Prices–Net Indirect Taxes

= 2,32,620 – 850

= 2,31,770

= **Rs. 2,31,770**

Example 3. Calculate GNP at market prices through Expenditure Method and through Income Method. Show that these estimates are identical.

Items	(In Crore Rs.)
1. Private Final Consumption Expenditure	1,240
2. Government Final Consumption Expenditure	750
3. Net Factor Income from Abroad	140
4. Net Domestic Investment	250
5. Capital Consumption	120
6. Exports	75
7. Imports	60
8. Operating Surplus	460

9. Compensation of Employees $\qquad$ 1,730

10. Net Indirect Taxes $\qquad$ 65

$= 2,500 + 15 = $ **Rs. 2,515 Crore**

Income Method :

Solution : Expenditure Method

GNP at Market Prices

= Private Final Consumption Expenditure + Government Final Consumption Expenditure + Net Domestic Investment + (Exports – Imports) + Capital Consumption + Net Factor Income from Abroad

= $1,240 + 750 + 250 + (75 - 60) + 120 + 140$

GNP at Market Prices

= Compensation of Employees + Operati Surplus + Net Factor Income From Abroad Capital Consumption + Net Indirect Taxes

= $1,730 + 460 + 140 + 120 + 65$

= $2,515 = $ **Rs. 2,515 Crore**

The two methods give identical measure of GNP Market Prices.

Questions

Multiple Choice Questions

1. The difference between GDP and GNP at market price is due to

   (a) Exports   (b) Imports   (c) Net exports

2. GNP computed through product, income and expenditure should be

   (a) Identically equal   (b) Different   (c) Neither of them

3. The Value added method overcomes the problems of

   (a) Multiple counting   (b) Choice of products   (c) Both of them

4. GNP is the sum of expenditures on

   (a) Consumer purchases

   (b) Purchases of investment goods

   (c) Govt. purchases

   (d) Net purchases from abroad

   (e) All the above

Answers : 1. (c), 2. (a), 3. (c), 4. (e).

Very Short Answer Type Questions

1. What is multiple counting ?

2. Explain with an illustration the value-added technique for measuring national income.

3. What are the constituents of compensation of employees ?

4. What are the components of operating surplus ?

5. Distinguish between income from work and income from property and entrepreneurship.

Short Answer Type Questions

1. What is national income ? How can it be measured ?

2. How can the GDP be measured through the product method ?

3. Explain the valued-added measure for removing the problem of multiple counting.

4. What are the problems involved in the incomes method ?

5. What are the shortcomings in the expenditure method for estimating the national product ?