CHAPTER - II

CONCEPTUAL FRAME-WORK OF PRODUCTIVITY :
A SURVEY OF LITERATURE

The foregoing Chapter-I has analysed the development of Public Sector Enterprises in India to highlight their role in the development of socialistic democratic society and to provide infrastructure for further industrial growth of the economy. To attain this objective, huge investments have been made in the Public Sector. Though resources have been mobilised in different forms to finance the Public Sector projects, the future development of Public Sector Enterprises is subject to the surpluses to be generated by them from efficient operation.

The present chapter is devoted to the survey of literature so that a frame-work for the study of productivity of Public Sector Enterprises is prepared with a view to examine the extent to which the factor inputs are deployed efficiently in Public Enterprises.

A SURVEY OF DEFINITION

Productivity is a lever for economic development. Higher productivity means higher standard of living to the people and status to the nation. The desire for rapid economic
development calls for proper understanding of productivity both in the context of national economy and unit level economy.

Productivity has been defined in different ways. Some of them are elaborated below:-

1. Productivity is defined as the ratio between output and input.

2. Productivity is also taken to mean efficiency in all activities.

3. Productivity also involves elimination of wagtage in all its forms.

4. Productivity is the function of providing more and more of everything for more and more people with less consumption of way of resources.

Productivity reflects attitude of mind towards progress. It involves improvement of that which exists. There has to be constant and continuous adjustment of economic and social life to changing condition. Productivity is the process of continuous effects to apply new technique and new methods. Productivity is, therefore, human effort to attain qualitative and quantitative improvement in products without extra expenditure of resources. The cost is the same in terms of land material machine time and labour.
Essentially importance of productivity is based on human concern for the following :-

1. Higher production.
2. Better quality.
3. Less consumption of resources.
4. Benefit for both Industry and Community.
5. Attitude towards constant improvement and progress.

The factors determining productivity fall into the following seven categories :-

1. Technical Factors.
2. Management Factors.
3. Financial Factors.
4. Labour Factors.
5. Government Factors.
7. Natural Factors.

Technical Factors are concerned with the ingenuity of engineers in devising tools, productive methods and systems and other materials.

The management factors consist of attitudes and behaviours of management in respect of competitive spirit, willingness to assume to risk, efficient scheduling of work,
aggressive expansion of market, efficient handling of labour relation, involvement research for new and better method and standardization of products.

Financial factors and productivity are interdependent. The capital will have to be available for financing innovations in existing industries and development of new ones.

The labour force must possess a degree of skill, general education and training, health and moral. There must be regulated hours of work and wages, adoptability and willingness to accept innovations and they must assume right attitudes towards works and responsibility.

Nothing can be achieved if Government policies are conducive to dealings with labour, trade and commerce. The taxation policy must have an incentive for attainment of higher productivity. There must be a policy for industrial and agricultural expansion and tariff and financial assistance to the industry.

Labour productivity cannot be defined from personal factors, envision mental factors and social factors. Education, training motivation and health make up the personal factors of an individual which account for difference in productivity of labour. Works methods and materials types
of tools and equipment are also responsible for productivity of the labour. The productivity of labour will also be affected by physical factors such as lighting, ventilation, noise, temperature etc. Nature of leadership social climate in shop, attitude towards production and group formation among the workers and social and psychological factors which bears on the productivity of labour.

Organisation factors also determine the labour productivity. The labour productivity will be affected if there is not an efficient communication pattern, organisational control, a system of decision making, reward and punishment.

Natural factors are also responsible for productivity of labour. They consist of weather presence or otherwise of minerals and other resources and also condition of soil.

There is no denying the fact that productivity has to be measured for the sake of monitoring the progress of any industry of any enterprise, productivity affects cost, profit, output, employment and investment.

There is controversy even today as to a suitable concept of productivity. The conservative school is in favour of internal rate of return as a measurement of productivity.
which is challenged by the proponents of public sector as a narrow concept. They advocate for the value of output and services rendered by public investment as the appropriate guide.

The concept of productivity signifies increases in output which are not accountable by increase in the quantity of inputs. The productivity concept is, therefore, based on the assumption of relationship between inputs and outputs.

"Increase in production must be accompanied by a reduction in the cost of production of every additional unit. This means securing higher productivity."

Even Changne says — "Productivity is an overall efficiency with which our industries perform."

Russel W. Fensake defines the terms productivity in five ways. They are:

1. Productivity is a form of efficiency;
2. Productivity is the utilisation of resources or effectiveness of utilisation of resources;

3. Productivity is a ratio (rather than a phenomenon);
4. Productivity is a measure of some kind (rather than a variable requiring) measurement;
5. It is a rate of return (Primarily in monetary terms) D.J.M.S. Risk defines productivity as a physical ration, it relates to the quality of goods produced or services given in comparison with the quantity of resources consumed. 4

PRODUCTIVITY ANALYSIS OF PUBLIC SECTOR ENTERPRISES-FRAMEWORK OF THE STUDY

In the present chapter an attempt is made to formulate conceptual framework of productivity in Public Enterprises. The subject has assumed growing importance with expansion of Public Sector at a phenomenal rate. The importance of the Public Sector is evident from its rising share in net domestic product, net capital formation and total employment in the organised sector of the economy. It is natural to undertake enquiry into the efficiency and productivity of factors production employed in the Public Enterprises. Several studies have evaluated the efficiency in terms of financial performance of Public Enterprises. The findings of those studies reveal unsatisfactory performance in terms of

profitability. This had led to several severe criticism of Public Enterprises and the basic policies of promoting the Public Sector in general. Actually the whole question of the proper criteria for assessment of these enterprises has to be examined from objective and academic points of view.

The appropriateness of the criteria for examining the performance of Public Enterprises, stems from the approach for assessing the performance itself. In my opinion, profitability is not a suitable criterion for assessing the performance of Public Enterprises (PES), which are primarily wedded to the philosophy of socialistic pattern of society. The profitability is the criterion which may be considered appropriate for commercial purposes. It fails to give an insight into the social contribution by these enterprises to the net domestic product, net capital formation and total employment in the organised sector of the economy. The total benefit to the economy as a whole from an introduction process comprises the sum of factor income by the sum of rent, wages, salary, interest and profit. The profitability criterion totally disregards rent, wages and salaries and also interest because these items represent costs rather than benefit. The total gains received by the economy from a production activity must include all types of income flows.
It is inevitable to evaluate the performance of an enterprise by drawing a line of demarcation between direct contribution and indirect contribution to the National Economy. The direct contributions are the sum of goods and services rendered by an enterprise in the economy. The indirect contribution is the impact of production activity of an enterprise through its backward and forward linkage on general level of economic activity in the country. The capital investment in Public Enterprises mainly provide basic infrastructure whose benefits are received by economy as a whole in the form of higher level of economic activity. Profitability, therefore, is not a suitable criterion of assessment of the efficiency of Public Enterprises.

The relative efficiency of Public Sector Enterprises can be evaluated at a given point of time and over a period of time. The profitability is the consideration of performance at a given point of time and its relative trends are assessed over a period of time productivity on the other hand, represents the efficient use of scarce resources at a given point of time and productivity trends indicate change over a period of time.

The productivity can be measured either for specific factor of production or with respect to all factors of productions. The formal method consists of labour productivity measured as net output per person employed and capital productivity measured as net output of capital employed.
To measure the labour productivity of Public Sector Enterprises, I have estimated total employment in Public Sector vide table - 3.1 and 3.2. These estimated help me to find out the growth rates and trends in employment of Public Sector Enterprises. To find out the weightage of labour input in the production activity of Public Enterprises I have also estimated trends in average earnings of labour originating in Public Sector Enterprises. The trend in labour productivity, as discussed earlier is assessed as net output per man employed in Public Sector Enterprises vide Table-5.

Measurement of capital and its growth during the given period is the first task in productivity trends. Capital is a major factor input which consists of a multiplicity of physical objects already produced by the economy and, in turn, used for the current production of other commodities. Viewed from this angle, the problem of measurement of real capital resolves itself into the identification, valuation at some base year prices, and aggregation of the values so obtained of a large number of physical objects which enter as inputs in the current output of final goods and services in the economy.
The measurement and comparison of the stock of real capital existing at two distinct points of time become difficult because (a) the capital goods, which constitute the aggregate capital stock, generally show a great deal of heterogeneity, and (b) the form that different types of capital goods take keeps on changing with the passage of time largely on account of the continuous process of technological change. The question that arises, therefore, is: how are the capital goods built at different times, at different costs, and with different performance characteristics, to be equated in the construction of a time series showing the aggregate value of capital stock measured at some constant prices? The Economists have provided the following answer to this intricate question: The value, in base period prices, of the stock of durable capital goods (before allowance for capital consumption) measures the amount it would have cost in the base period to produce the actual stock of capital goods existing in the given year (not its equivalent in ability to contribute to production). Similarly, gross additions to the capital stock and capital consumption are valued in terms of base year costs for the particular types of capital goods added or consumed. This must be modified immediately in the case of durable capital
goods not actually produced in the base year, to substitute
the amount it would have cost to produce them if they had been
known and actually produced. But a similar modification is
required in all index number problems.

The concept of Capital implicit in the above mentioned
measure of real capital stock is most appropriate in the
analysis of productivity. According to professor Joan
Robinson, it corresponds to the essential nature of capital
as a factor of production.

The method which is generally followed in preparing
the time series of real capital stock is known as the Perpet­
ual Inventory Method. This method was pioneered by Dr.
Goldsmith while preparing the time series of national wealths
in the United States.¹ The method, as it was originally
devised by Goldsmith, consists in taking a fairly long time
series of gross capital formation, correcting it for price
changes, and then accumulating the figures so obtained year
by year after making suitable deductions for capital
consumption.

¹. Goldsmith, R: "A Perpetual Inventory of National Wealth",
In practice, however, a slightly modified variant of this method is often used especially in the case where a sufficiently long time series of capital formation is not available. The modified variant of this method requires: (i) an independently derived estimate of the net capital stock relating to a given benchmark year in the period under consideration; (valued at constant base period prices; (ii) the estimates of gross capital formation at constant base period prices for each year in the period under consideration; and (iii) the estimates of the actual capital consumption of the effective depreciation of capital consumption or the effective depreciation of capital stock for each year in the specified period. Given these estimates; the required time series of real capital stock can be obtained carrying the given benchmark estimate of net capital stock forward (or backward) with the help of the estimated real net capital formation.

In what follows, this variant of the perpetual inventory method is followed to derive the estimates of real capital stock in public enterprises for the period 1960-61 to 1985-86.

(i) Bench-Mark estimates of Net Capital Stock:

The value of net capital stock at any given point of time is, as already discussed above, obtained by measuring the aggregate amount it would have cost in the specified base
period to produce the actual stock of various types of
capital goods existing at a given point of time. However,
the figures relating to the value of fixed capital assets
which are generally reported in the Annual Reports of Public
Enterprises, and even in the sources like the Annual Survey
of Industries, do not even approximately correspond to the
above concept of capital and hence fail to provide the
required measure of capital input.

The main difficulty with the reported figures is that
they invariably indicate what is called 'depreciated book
value of capital assets', which is nothing but the accumu-
lated annual aggregate expenditure on all types of capital
assets, expressed in the respective current money terms,
adjusted for the corresponding annual depreciation charges.
It is evident, therefore, that the reported figures of the
aggregate value of capital assets represent a total mis-
leading and distorted measure of the required economic
aggregate, viz; real value of net capital stock, mainly
because they represent a simple aggregation of the actual
money values of annual additions to capital stock over a
period of time without making any adjustment for annual price
changes during the period. This procedure yields a measure
in which each annual addition to the stock of capital goods
gets evaluated at different prices (i.e. at the price
prevailing in the corresponding year) with the result that their simple aggregation by itself does not yield any meaningful aggregate that can be directly used for economic analysis.

To estimate the required value of net capital stock for any specified bench-mark year, what needs to be done, therefore, is to deflate the estimate annual additions to each of the various types of capital assets, for each of the years proceeding the given bench-mark year, with the help of suitable price deflators for various types of assets. The preparation of this type of estimates of net capital stock in Public Enterprises in India has so far remained a rather neglected field of study. It has, however, not altogether been an unexplored field, since a study published by the Reserve Bank of India in 1972 has made an attempt to estimate the aggregate value of net capital stock in the Public Sector as a whole for the bench-mark year 1960-61 at current prices. But the RBI estimates have not provided any information on the departmental or sectoral break-up of the estimated aggregate value of capital stock in the Public Sector, perhaps because the estimate relating to the Public Sector was derived essentially as a part of the Wider Study relating to the estimation of
total value of tangible wealth in Indian Economy. Moreover, in the light of additional information which is now available, the aggregate estimated by the RBI itself requires some revision. In view of this, an attempt is made to prepare the required estimate of new capital stock in Public Enterprises by Sectoral categories for the bench-mark year 1960-61 valued at current prices (i.e. 1960-61) prices.

For the purpose of estimation, the aggregate stock in Public Enterprises is regarded as a total of the capital stock employed in non-departmental enterprises in twelve industrial categories, for which estimates of net product are already available. To estimate the net capital stock in Public Enterprises in the manufacturing and tertiary Sectors, I have used the data available from the Annual Reports on the working of Central Government Undertakings and the reports published by the Bureau of Public Enterprises. From the figures relating to the value of capital stock employed in Central Government Undertakings in the manufacturing sector excluding The Steel Authority of India Limited (formerly, the Hindustan Steel Limited) for the year 1960-61, and the previous years, I have estimated the time profile of the annual additions to capital stock. Then adjustments are made in the same for price changes, and by aggregating the figures so obtained I have arrived at corresponding estimates.
of net capital stock in 1960-61 values at prices prevailing in 1960-61. This estimate of capital output ratio in public enterprises (excluding public steel mills) yields an average capital output ratio of 5.88. Since the total value added in Public Enterprises in the manufacturing Sector (excluding the steel plants) works out at Rs. 73 crore for the year 1960-61, I arrive at an estimate of Rs. 429 crore as the corresponding value of net capital stock.

I have estimated the value of net capital stock in the public steel enterprises separately for the benchmark year 1960-61 by using the same method that I have followed in the case of other Public Enterprises. The main reason in separating the Public Steel Plants from other Central Government manufacturing concerns for the purpose of estimating capital stock is that the former is far more capital intensive and shows a considerably different time profile of annual additions to capital stock as compared to the latter. The estimated capital stock in the Steel Authority of India (formerly, the Hindustan Steel Limited) works out at Rs. 643 crore in 1960-61 valued at the prices prevailing in 1960-61. This gives us an estimate of Rs. 1,063 crore as the value of net capital stock in Public Enterprises in the manufacturing sector for the benchmark year 1960-61.
Estimates of Real Not Capital Formation:

The official estimates of gross capital formation in Public Enterprises by type of assets and departmental categories along with the corresponding estimates of depreciation allowances are available from the National Accounts Statistics issued by the C.S.O.

Since the estimates of net capital formation valued at constant base year prices is required, it is necessary to deflate these estimates with the help of suitable price indices for different types of assets. I have derived price indices for (a) Buildings and Construction, (b) Machinery and equipment and (c) depreciation allowance from the official estimates of gross capital formation for the economy as a whole at current and constant 1960-61 prices. The price index for the remaining component of net capital formation, viz; change in inventories; is obtained by computing the implicit price index for net product originating in various types of enterprises separately.

To obtain the broad sectoral break-up of the estimated real net capital formation in Public Enterprises, I have used the estimates of net capital formation in Public Sector
Enterprises by industry of use at current prices prepared by C.S.O. The estimates at current prices relating to the six industrial categories which constitute the commodity producing sector, viz; agriculture, forestry, mining and quarraying, manufacturing construction, and electricity, gas and water supply. The corresponding price indices for net capital formation in these sectors are derived from the official estimates of net capital formation by industry of use for the economy as a whole at current as well as constant 1960-61 prices available for the period 1960-61 to 1985-86.

By deflating the estimates of net capital formation in Public Enterprises in the commodity producing sectors at current prices with the help of the above mentioned price indices, I have obtained the corresponding estimates at constant 1960-61 prices. Having derived the estimates of aggregate net capital formation in Public Enterprises at 1960-61 prices and the corresponding estimates of the net capital formation in the commodity producing sector I have obtained the estimates of net capital formation in Public Sector Enterprises in the tertiary sector as the difference between the former and the latter. The capital productivity is measured by me in Table-6.3 as net output per unit of
capital employed in Public Sector Enterprises. Separate estimates of capital intensity is given in Table - 6.2 to show that the Public Enterprises are capital intensive.

frame

The broad/work which the present study has adopted for analysing the productivity may be expressed in the form of the following equation :-

\[ P = f (G_K, G_L, G_A) \]

where, \( P \), \( G_K \), \( G_L \), \( G_A \) denote the productivity annual growth of capital input, Labour input and the overall efficiency of factor inputs respectively over a given period of time.

To neutralise the bias which may be the result of any assumption, I have divided the total period of 26 years under review into sub-periods (each of about eight years). The averages of each factor productivity is combined to derive the average for the whole period. The aim of this procedure is to eliminate the effect of short-run fluctuations in the estimates of productivity trends for the whole period. This method is used widely in empirical study dealing with quantitative aspect of productivity of economic sector. It yields results which bear reasonable approximation to the reality. The whole approach is based on the hypothesis that relative contribution by various sectors is basis of total productivity in Public Sector Enterprises in India.
The total factor productivity is appropriate for evaluating the overall performance of Public Sector Enterprises. This contention follows the fact that the index of total factor productivity (measured as output per unit of total input) is the most comprehensive indicator of the trends in the overall efficiency of scarce resources utilized by Public Sector Enterprises over the longer period under consideration. The index of total factor productivity is also termed as index of output per unit of total factor input. It is derived as a ratio of the index of net output to the index of total factor input. The index of net output is the indicator of the actual growth of net output, while the index of total input indicates the efficiency of all factors of production during the period under consideration. If the growth of total factor input during the period under review is less than the corresponding index of net output, it would imply higher productivity of factor input. Therefore, the index of total factor productivity is useful device to measure the extent of decrease and increase in overall efficiency of factor input in any production process. It is worth noting that profitability criterion is different from the productivity criterion of assessing the overall performance of economic units. The profitability criterion is static in its approach because it shows the
excess of the price charged by an enterprise to the consumer over the average cost of production contrary to this, the productivity approach is basically dynamic; it indicates the excess of actual growth of output over the growth of total factor input. It is an index of changing efficiency with which scales productive resources are used in the course of its expansion over a period of time.

PRODUCTIVITY ANALYSIS OF STEEL INDUSTRY
FRAMEWORK OF THE STUDY:

Steel industry is taken by me for an in-depth study of productivity. Though the industry was in existence even before independence, the productivity trend has been estimated for a period of 26 years from 1960-61 to 1985-86 in tune with the pattern adopted for productivity analysis of Public Enterprises as a whole. The exclusive study of this industry is due to vast investment of capital, total output which is the basic ingredient of economic development.

The analysis of the productivity trend in the steel industry has been divided into two sections. The first section deals with the steel group of Public Enterprises and the second section is concerned with the industry as a whole comprising with both the Public and Private Sectors steel mills.
The measurement of the productivity in Public Steel Plants is premised on the assumption that the growth of steel products is the function of capital, labour and their overall efficiency. I have estimated the growth of steel output, the growth of labour and the growth of capital output for partial and total productivity analysis.

The productivity trend of steel industry as a whole has been made more meaningful, and objective for academic purposes by sub-classifying the productivity measures in terms of income, value added and physical output ratios to capital and labour separately.

The productivity has been measured in terms of the following:

1. Income per unit of capital.
2. Value-added per unit of capital.
3. Capital requirement per tonne of ingot steel.

The capital intensity in steel industry has been estimated in Table-11. The capital intensity has been measured as a ratio of capital to workers. The capital intensity indicates the growth of capital with the expansion of steel plants employing more of the workers. Increase in capital intensity in steel industry does not imply
substitution of labour for capital. It is mainly due to establishment of new steel mills in Public Sector and large scale modernisation and expansion.

In Table - 12 the capital Productivity has been measured as average output per-unit of capital though marginal productivity of capital is usually eliminated for investment planning. For the present purpose, marginal productivity of capital is of little use. The average capital output ratio indicates the total stock of capital in steel industry in relation to the total output. The output measured in Table-12 does not imply return to the capital. It only shows addition to output with given stock of the capital. Average ratios of capital to total output of steel are rough approximation to marginal rations. For income per unit capital, I feel it unnecessary to compare the average ratio with the rate of interest because these ratios are not the return on capital in the sense of profitability.

The labour productivity has been estimated in Table-13. The weightage of the workers in income generated by Steel production process has been estimated both in terms of gross income per worker and net income per worker, on the basis or relative share of workers in total income. The contribution of the workers to total output indicates the labour
productivity. It is average output per worker. The labour productivity has been expressed both in financial and physical terms. The disparity between net income per worker and net value-added per worker is the measure of the impact of the pricing policy of the Government on the efficiency of labour in steel industry. The contradictions between the rate of growth per-worker and physical output per-worker indicates the utilisation of existing capacities at different points of time. The different products of steel also called for comparison between the growth rates of value-added and physical output, because mean hours are determined by the product composition. To find out as to whether the wage bill is linked to labour productivity, a separate table has been drawn up.

Apart from the major inputs of capital and labour materials also significantly contribute to overall efficiency of steel plants. Therefore, estimates of the work cost are presented separately. The analysis is helpful to measure the impact of materials on the total cost of production. It also facilitates the measurement of material efficiency in the process of production. The increase or decrease in the average rate of work cost would indicate the extent to which the productivity of steel plants has been affected. A comparison between the selling cost of steel and work cost would open a vistas of analysis of operations of steel
industry. If the X-work price received by the Industry is less than the average price of the steel products, the Industry would be adversely affected in terms of income, value-added, gross margin etc.

The estimated work cost per tonne of steel does not highlight the changes in steel output mix because it would have been difficult for Research Scholar to give precise measurement of the impact of each of the product-mix. I am fully aware of my limitations in estimating the total works cost of steel ingot produced by the Steel Industry, though the error has been minimised by studying a long period. I have studied major components of works-cost of finished product, consisting of raw material and semi-finished product besides fuel and electricity. The material efficiency in the use of production has been estimated to show the consumption of pig iron in the production of steel. The consumption of coal and electricity per-tonne of ingot steel has also been estimated to measure the efficiency of major material inputs.

The estimates of value-added signify the rate of growth of output (value). The growth of value-added is subject to output prices and the material cost. Therefore, estimates of gross value-added and gross income are made for
period under review. These estimates are indicators of distributable surplus of steel industry.

The total productivity trend has been evaluated separately in the form of total net-output index and total factor input index. It furnishes an insight into the changes taking place in the use of scarce resources by the steel industry during the period of its expansion and modernisation. The main conclusions are drawn from the findings of the analytical study of the productivity of steel industry.

**CONCLUSION**

The importance of productivity is essentially based on human concern for the attainment of higher production, better quality, less consumption of resources, benefit to the industries in particular and to the community in general. It is a manifestation of an attitude towards constant improvement. The factors determining productivity are technical, management, financial, labour, Government, environmental and natural factors. There is no gainsaying the fact that productivity has to be measured for the sake of monitoring the progress of an industry or an enterprise. Productivity in general, affects cost, profit output employment and investment.
There is controversy even today over a suitable concept of productivity. The conservative school advocates internal rate of return as a measure of productivity which is challenged by the proponents of Public Sector as a narrow concept. They favour the value of output and services rendered by public investment as the appropriate guide.

As a matter of fact, the concept of productivity signifies increase in output which are not accountable by increase in the quantity of inputs. Therefore, it is based on the assumption of relationship between inputs and output.

Present chapter is devoted to formulate a conceptual framework of productivity in Public Enterprises. The subject has assumed growing significance with expansion of Public Sector Enterprises at a phenomenal rate which is evident from its rising share in net domestic product, net capitals formation and total employment in the organised sector of the economy. Thus the probe into the efficiency and productivity of factors of production employed in the Public Sector Enterprises becomes inevitable.

Several studies have evaluated the efficiency in terms of financial performance of Public Sector Enterprises which have been open to several severe criticism as it goes against the basic policies of promoting the Public Sector in general.
The proper criterion for assessment of these enterprises has to be examined from objective and academic points of view. The Research Scholar feels that it is proper to evaluate the performance of Public Sector Enterprises by drawing a line of demarcation between direct contribution and indirect contribution. The direct contribution includes the sum of goods and services rendered by an enterprise in the economy, while indirect contribution implies the impact of production activity of an enterprise through its backward and forward linkages in general level of economic activity in the country. The capital investments in Public Sector Enterprises mainly provide basic infrastructures whose benefits are received by economy as a whole in the form of higher level of economic activity. Hence, financial return (profitability) is not a suitable criterion for assessment of the productivity of Public Sector Enterprises.

The following method has been adopted by the Research Scholar to analyse productivity trends in the Public Sector:

\[ P = f \left( G_K', G_L', G_A \right) \]

Where \( P \), \( G_K' \), \( G_L' \), \( G_A \) denote the productivity, annual growth of capital input, labour input and overall efficiency of factors inputs respectively over a given period of time.
Research Scholar has prepared index of total factor productivity to measure productivity after ascertaining changes in factor inputs.

Steel Industry has been taken up by the Research Scholar as a case study. A period of 26 years i.e. (1960-61 to 1985-86) has been covered to analyse productivity trends in conformity with the concept adopted for Public Enterprises. The Steel Industry as a whole, comprising Public and Private mills both has also been analysed by sub-classifying the concept of productivity measures in terms of income, value-added and physical output ratios to capital and labour, separately.