CHAPTER 4
Research Design of the Study
Industrial sector is very crucial for the economic development of any country as the development of industrial sector is considered as the barometer of economic progress of any nation. As such, the collection of statistical data on various activities and parameters such as income, investment, output, employment, capital formation, foreign exchange earnings of Industrial sector assume greater significance both from the point of view of policy making and research.

4.1 RATIONALE AND JUSTIFICATION

Considering the significance of small scale sector in the hill economy of the State of Himachal Pradesh, it is necessary to analyse various aspects underlying the growth of small scale industry, its contribution to the diversification of industrial set-up, growth of industrial output and generation of employment over the years, so that a better perspective of the sector could be evolved. Further, the analysis of comparative progress made by the small scale sector in the State during pre and post reform period may be quite useful for planners, policy makers, administrators, stake-holders etc. for evolving suitable policy interventions. While studies on growth and productivity of small scale industries have been conducted at the national level, no such detailed study has so far been conducted for the State of Himachal Pradesh.

4.2 OBJECTIVES

The specific objectives of the present study are:

1. To review the Industrial Policy of the Government.
2. To study the growth of small scale industries in the State of Himachal Pradesh during the pre and post reform period.
3. To analyse the changes in the structure of small scale industries in the State of Himachal Pradesh during pre and post reform period.

4. To work out the factor productivity of small scale industries in the State of Himachal Pradesh during pre and post reform period.

5. To suggest measures for the improvement of small scale industries in the State of Himachal Pradesh.

4.3 DATA SOURCE FOR THE STUDY

Three data sources are mainly available for the purpose of analysis of performance of small scale sector, that is:

(a) Data regarding registration of small scale industries collected by the Directorate of Industries of the State of Himachal Pradesh, through Districts Industries Centres (DICs) and also maintained in the form of the State profiles of small scale industries for the different years prepared by the Micro, Small and Medium Enterprises Development Institute (the erstwhile Small Industries Service Institute), Solan, Himachal Pradesh. However, industrial group-wise continuous data since 1972 is not available.

(b) Comprehensive Survey of small scale units conducted by the Development Commissioner, Small Scale Industries/Micro, Small and Medium Enterprises (SSI/MSME), in the form of All India Survey of Small Scale Industries/Micro, Small and Medium Enterprises. Till date, four All India Surveys have been conducted by the Development Commissioner, SSI/MSME – First in 1972-73, Second in 1987-88, Third in 2000-01 and the Fourth in 2006-07; and

(c) Annual Survey of Industries (ASI), which is conducted regularly on sample basis by Central Statistical Office, Ministry of Statistics and Programme Implementation, is also used for the purpose of
studying productivity of industries at the National and State levels. The Annual Survey Industries data is available on continuous and more or less yearly basis as per National Industrial Classification (NIC) which was prevalent at the time of survey.

The data (on the basis of registration of Small Scale Industries, done by District Industries Centres) and maintained by Small Scale Service Institute/Micro, Small and Medium Enterprises Development Institute, is not available in a continuous manner for the State of Himachal Pradesh. Moreover, the aforesaid database does not provide the information relating to the output produced by the broad groups of small scale industrial units in the State. As such, this data cannot be used for productivity analysis in an appropriate manner. Further, the data of Census of Small Scale Industries, which has been conducted only four times since 1972-73 may also not be suitable for measuring growth and productivity over a period of time due to lack of availability of continuous data.

On the other hand, the data collected from the Annual Survey of Industries is available more or less on continuous basis and thus useful for analysis of growth and structure as well as measurement of productivity. Considering the predominance of the small scale industries in the industrial spectrum of Himachal Pradesh, the data of Annual Survey of Industries is quite representative and would definitely be useful for analyzing growth, structure and productivity of small scale units. The most of productivity studies too uses Annual Survey of Industries.

In India, at the Central level, the Central Statistical Organisation (CSO) in the Ministry of Statistics & Programme Implementation is the nodal agency for the collection and coordination of statistical activities. At the State level, the State Directorates of Economics & Statistics are responsible for coordination of statistical activities in the States.
In pre-independence India, Industrial Statistics were collected under the Industrial Statistics Act 1942. A Directorate of Industrial Statistics was established in 1945 in order to administer the Act. The data on several aspects of manufacturing industries was provided by the Census of Manufacturing Industries (CMI) which was initiated in 1946. Besides, the Sample Survey of Manufacturing Industries (SSMI), at the later stage, provided estimates of some significant variables of manufacturing units. The Census of Manufacturing Industries and Sample Survey of Manufacturing Industries were replaced by Annual Survey of Industries (ASI) in 1959, which has now been the main source of data pertaining to the organized sector in India. The survey is conducted under the Collection of Statistics Act 1959 for the entire country, except the State of Jammu & Kashmir.

The entire industrial activity in the manufacturing industries is divided into two sectors, viz., ‘factory’ and ‘non-factory’ sectors, on the basis of size of employment therein. The units registered under the Section 2(m)(i) and 2(m)(ii) the Factory Act 1948 are covered under the Factory Act 1948, i.e., those factories employing 10 or more workers using power and those employing 20 or more workers without using power. The non-factory sector covers the remaining manufacturing units. The data on the organized sector, i.e. factory sector, are collected under Annual Survey of Industries, whereas data on unorganized sector are collected through periodic sample survey conducted by National Sample Survey Office (NSSO) as well as through follow-up surveys on economic activities.

The sampling design of Annual Survey of Industries from 1987-88 to 1996-97 was complete enumeration of industry group (3 digit level of National Industrial Classification 1987) where number of units is 20 or less, a fixed sample of 20 units in groups having units between 21 and 60 and a sampling of one to three in respect of the groups having 61 or
more units. Sampling design was reduced from about 60000 units upto 1997-98 to about 30000 units. The State-wise allocations were made proportional to the number of factories in a State. 4 digit level of National Industrial Classification 1998 is used from 1998-99 in making allotments. If the total number of factories in a State at 4 digit level is less than or equal to 8 then complete numeration is done otherwise a minimum value of 4 of sample size is maintained.

The present study used the data from Annual Survey of Industries which has almost been continuous source of data since 1959. The sample design of Annual Survey Industries classified factories into (i) Census Sector and (ii) Sample Sector. All units with 50 or more workers operating with power, and units having 100 or more workers operating without power were covered under the Census sector. Industrially backward States, including Himachal Pradesh, were covered under the Census Sector. In the present study, only the registered manufacturing small scale industrial units have been taken up for the study in terms with the Annual Survey of Industries.

In the present study, gross output at constant prices has been used as a measure of output, whereas the total number of employees (including workers and persons other than workers) is considered as labour input, and the value of capital and material consumed at constant prices have been used as a measure for capital and raw material inputs. The values of output and capital have been deflated by taking 1993-94 as a base year in order to reduce the impact of price rise. The year 1993-94 has been selected as a base year due to the fact that the earlier base year of 1980-81 may not appropriately take care of the price variations, considering the long period of study which has been divided in two sub-periods of pre and post reform period. The Annual Survey of India data on the output were deflated by the price index of manufacture items, with base year as 1993-94, as price index of the
manufacturing items would be the best way to neutralize the price variations in respect of output of manufacturing items. The capital and value of material consumed have been deflated by the wholesale price index having base year as 1993-94.

Considering the industrial activities in the State of Himachal Pradesh and the availability of the continuous Annual Survey of India data to facilitate comparison between pre and post reform periods, the following nine (9) industrial activities have been selected for the purpose of productivity study:

(i) Production, processing and preservation of fruits and vegetables.
(ii) Manufacture of beverages – distilling.
(iii) Printing and allied activities.
(iv) Manufacture of plastic products.
(v) Manufacture of non-metallic mineral products, such as glass and glass products, ceramic ware, bricks, tiles, articles of concrete, cements and lime, cutting, shaping and finishing of stones, etc.
(vii) Manufacture of special purpose machinery, such as agricultural and forestry machinery, machine tools etc.
(viii) Manufacture of watches and clocks.
(ix) Manufacture of furniture and fixtures.

4.4 PERIOD OF STUDY

For the purpose of the study, the total period has been covered from 1972 to 2013. The period is divided into pre reform (1972-73 to 1990-91) and post reform (1991-92 to 2012-13) periods for the purpose of analysis, as per Annual Survey of Industries data. The Annual Survey of Industries data was not available for some of the periods in respect of certain industrial activities, either because the survey was not
conducted or that data were not available in a sufficient manner at a
disaggregated state/industrial level.

4.5 RESEARCH METHODOLOGY

4.5.1 Growth

The growth performance of small scale industries is examined by
recording changes in the some selected growth indicators, such as
number of units, capital investment, production and employment
generated.

Further, the growth in number of small units without the
commensurate growth in the other indicators is not a sufficient indicator
of growth performance. As such, the changes in the average size of
units are studied and analyzed. Besides, the structural ratios such as
per unit fixed investment, per unit investment in the original value of
plant and machinery, per unit output, per unit employment, etc. are also
worked out in order to have better understanding of the growth
performance of small units.

4.5.2 Structural Changes

The structural changes were studied by examining the pattern of
the spread of different industries, shifts in broad groups of industry,
changes in their share to total output and employment, over a period of
time. In the nutshell, the growth & structure of small scale sector in the
State of Himachal Pradesh were studied with reference to the following
indicators:

(i) Absolute indicators
    (a) No. of units established
    (b) Capital investment made
    (c) Production
    (d) Employment
(ii) **Important Structural Ratios**

(a) Production per industrial unit  
(b) Investment per industrial unit  
(c) Employment per industrial unit  
(d) Capital output ratio  
(e) Capital labour ratio  

(iii) **Compound Annual Growth rate**

4.6 **PRODUCTIVITY**

In a general sense, productivity is the volume of output produced by a given quantity of factor(s) of production. It is a measure of efficiency of production. "Productivity is about how efficiently a firm or any other organisation can turn its inputs, such as labour and capital, into outputs in the form of goods and services. Producing more goods and services with the same inputs or producing the same quantity of goods and services with less input is an improvement in productivity."^3

Productivity is the ratio of production of a given quantity of commodity to a given quantity of input required to produce it. In other words, productivity is the rate at which the output is produced with the help of a unit of input, say labour. For instance, the productivity of a food processing industry is the volume of output produced by it per unit of labour or capital or any other factor or combination of factors of production. It indicates the degree of efficiency of an activity or an organization.

4.6.1 **Different Concepts of Productivity**

Production is a function of single or multiple factors of productions. When there is only one input in the production of a good, the productivity of that single factor of production is called 'simple productivity'. Generally, there are more than one factor of productions in a production process. However, the productivity is measured in terms of
a single factor of production, which implies that the output is related to any one of the factors of production, such as, Labour Productivity or Capital Productivity or Raw Material Productivity. As a simplest measure of productivity, partial factor productivity is the ratio of a factor of production to the output or per unit output of a factor of production.

Generally, the partial factor productivity is calculated in terms of labour productivity and capital productivity. The trends in the capital-labour ratio dominate the productivity analysis.

The Labour Productivity (LP) is the ratio of Gross Value Added (GVA) to the number of workers.

\[
LP = \frac{\text{Gross Value Added at Constant Prices}}{\text{Total Employees}}
\]

Labour productivity represents the volume of output which is produced by employing a certain amount of labour. Increase in labour productivity implies increase in the efficiency of workers as well as rise in their income and living standards.4

The Capital Productivity (CP) is measured as a ratio of Gross Value Added (GVA) to the number of workers.

\[
CP = \frac{\text{Total Product (or GVA)}}{\text{Value of Gross Fixed Capital Stock}}
\]

One of the limitations of partial factor productivity analysis is that the changes in the productivity of one factor of production could also be, at least to some extent, due to the other factors of production. For instance, the changes in labour productivity may not be due to the changes in the efficiency of the labour alone, but may be due to the changes in the technology or by employing additional capital in the production process. Hence, the concept of Total Factor Productivity (TFP) comes into productivity analysis.
Total Factor Productivity analysis takes into account labour and capital inputs as well as other inputs and is an indicator of changes in the efficiency of production process in use of factors of production. It is the part of growth of output which is not due to the growth of labour or capital inputs but the factors such as innovations and technical advancement. An increase in Total Factor Productivity means that the more output can be produced with the same quantity of labour and capital.

4.6.2 Measurement of Productivity Growth

There are various approaches, viz., Index Number Approach, Production Function Approach (Parametric approach) and Direct Estimation of Cost Function Approach (Non-parametric approach), whereby the total factor productivity of a production process can be measured.

In the present study, the Cobb-Douglas specification of the production function had been used for measuring the total factor productivity. In the production function approach, a shift in the production function over a period of time is attributed to the technological progress.

There are a variety of functional forms that can be used to describe production relationship between input and output. However, the Cobb-Douglas production function is widely used to represent the relationship of an output to the inputs used in producing it. This production function was initially conceived by Knut Wicksell and later tested statistically by the Statisticians, Charles Cobb and Paul Douglas. The Cobb-Douglas production function has been widely used in the productivity studies.
The production function, as a general expression, can take the following form –

\[ Q = f(K, L, M) \]

Where, \( Q \) = output, \( K \) = capital, \( L \) = labour and \( M \) = Material used

The Cobb-Douglas specification of the production function can be written as –

\[ V = A_0 L^{\alpha} K^{\beta} M^{\gamma} \] \hspace{1cm} \ldots (I)

where, \( V \), \( L \), \( K \) and \( M \) refer to output, labour, capital and material consumed. \( \alpha \), \( \beta \) and \( \gamma \) give factor shares of labour, capital and material consumed respectively. \( A_0 \) the efficiency parameter and describes initial conditions. The elasticity of substitution between labour and capital is assumed to be one.

However, after introducing the time trend, the Cobb Douglas production function takes the form as under –

\[ V = A_0 e^{\lambda t} L^{\alpha} K^{\beta} M^{\gamma} \] \hspace{1cm} \ldots (II)

\( e \) is the error (or disturbance term) which capture the effects of exogenous and endogenous variables. \( t \) refers to the time period. Technological changes take place at a constant rate of \( \lambda \).

The Cobb-Douglas production function, being a non-linear relationship, could not be estimated directly by regression technique. The equation must be in a linear form in order to estimate its various parameters through ordinary least square regression method of estimation. As such, the equation can be linearized by taking the logarithm of each term.

The Log-linear form of above CD function is derived as under:

\[ \log V = A + \alpha \log L + \beta \log K + \gamma \log M + \lambda t \] \hspace{1cm} \ldots (III)
The Ordinary Least Square estimation of this equation yields the estimation of $\alpha$, $\beta$, $\gamma$ and $\lambda$. The estimated value of $\lambda$ provides the measure of technological progress, which is identified with the growth of total factor productivity. The R-squared measurement would provide variation in the output due to the combined variation in capital, labour and material consumed.

The sum of the estimates of $\alpha$, $\beta$ and $\gamma$ is a measure of the degree of homogeneity of the production function. Thus, the sum of the constants $(\alpha + \beta + \gamma)$ determines the return to scale. That is,

$$(\alpha + \beta + \gamma) > 1 \text{ implies increasing return to scale.}$$

$$(\alpha + \beta + \gamma) = 1 \text{ implies constant return to scale.}$$

$$(\alpha + \beta + \gamma) < 1 \text{ implies decreasing return to scale.}$$

### 4.7 DEFINITION OF VARIABLES USED IN ANNUAL SURVEY OF INDUSTRIES

**Fixed Capital:**

Fixed capital is the depreciated value of fixed assets, including land, building, plant and machinery, furniture and fixtures, transport, equipment, etc. owned by the factory or taken on hire-purchase (excluding interest), which have normal productive life of more than one year. However, the intangible assets and those being used for post-manufacturing activities, such as sale, storage, distribution, are excluded from it.

**Employees:**

Employees are all persons, including all administrative, technical and clerical staff as also labour engaged by the factory whether for wages or not, in work connected directly or indirectly with the manufacturing process. The persons holding position of supervision or management as well as all working proprietors and their paid or unpaid
members of family or cooperative societies who are actively engaged in the work of the factory are also included in the definition of employees.

**Gross Output:**

Gross output include the ex-factory value of products and by-products manufactured as well as net value of semi-finished foods, work-in-progress, the receipts for industrial and non-industrial services rendered to others, value of semi-finished goods of last year sold in the current year and sale value of goods sold in the same condition as purchased during the accounting year. The taxes and duties etc. on sale are excluded and subsidies are included in the value of gross output.

**4.8 SCOPE OF STUDY**

The scope of the study is to measure the growth, structure and productivity of selected industrial activities in the State of Himachal Pradesh. The study entails looking at the major policy measures taken by the Government with a view to understand their distinctiveness on two set of periods, viz., pre and post reform periods, in India. The growth and structure of the selected industrial activities in Himachal Pradesh have been studied in terms of number of units, capital investment, manpower employed and the output produced as well as changes in the structural ratios. The variations in the productivity are studied through Cobb Douglas Production Function.
REFERENCES


