DATABASE AND METHODOLOGY

This chapter delineates the database of the present study along with concepts, terms and various econometric as well as statistical techniques used to achieve the desired objectives of the study. The present study entitled “Management of Social Sector in India: An Evaluation” is primarily based on secondary data. Initially, a list of all possible indicators relating to social sector and its key areas- education and health at national and state levels has been prepared. An attempt has been made in this study to collect data regarding the maximum possible number of indicators for maximum number of states in India. The study analyses the patterns of public expenditure on social sector at national and state levels as well as examines the impact of social spending on social attainments in India. For this purpose, the cross-section and time series i.e., panel database of 30 states (including Delhi and Puducherry, the two union territories with special legislature) for the period 1988 to 2013 has been covered in the study. While examining the patterns of public expenditure on social sector including education and health at state level, in addition to analysis of all states, a separate analysis has also been undertaken for 15 major states in India namely, Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal. These 15 major states account for more than 90 per cent of the total population of the country. A total of 73 variables have been used to achieve the specific objectives of the study. The ultimate sample size depends upon the availability of data for the relevant variables.

The data for the selected variables have been collected from various published reports and documents such as Combined Finance and Revenue Accounts of Union and State Governments; Handbook of Statistics on Indian Economy; Economic Survey; World Economic Outlook Database; EPW Research Foundation; Data for use of Deputy Chairman, Planning Commission; Selected Educational Statistics; Statistics of School Education; Education in India; Trends of Drop-out Rates for Years 1980-81 to 1993-94; Health Information of India; Compendium of India’s Fertility and Mortality Indicators (1971-2007); India: A Pocket Book of Data Series 2010-11; India Human Development Report 2011; Maternal Mortality
Due to non-availability of data relating to private expenditure on social sector, the present study has been restricted to the analysis of public expenditure on social sector (especially education and health sectors) and its impact on social attainments. The GDP deflator and the GSDP deflator have been used in the study for deflating the time series on expenditures. The GDP deflator (base year 2004-05) has been used for deflating the expenditure series of the centre and all states whereas the respective GSDP deflators (base year 2004-05) have been used to deflate the expenditure series for individual states.

3.1 Variables of the Study

1. Social Sector Expenditure (SSE) at 2004-05 Prices at National Level;
2. Year-on-Year Growth in SSE;
3. Percentage Share of SSE by Revenue and Capital Account at National Level;
4. SSE as a Per cent of GDP;
5. SSE as a Per cent of Aggregate Public Expenditure;
6. Real Per Capita SSE at 2004-05 Prices;
7. Combined SSE under Major Heads as a Per cent of GDP;
8. Combined SSE under Major Heads as a Per cent of Aggregate Public Expenditure;
9. Percentage Share of Major Heads in Combined SSE;
10. Centre’s SSE under Major Heads as a Per cent of GDP;
11. Centre’s SSE under Major Heads as a Per cent of Aggregate Public Expenditure;
12. Percentage Share of Major Heads in Centre’s SSE;
13. States’ SSE under Major Heads as a Per cent of GDP;
14. States’ SSE under Major Heads as a Per cent of Aggregate Public Expenditure;
15. Percentage Share of Major Heads in States’ SSE;
16. State-wise SSE as a Per cent of GSDP;
17. State-wise SSE as a Per cent of Aggregate Public Expenditure;
18. State-wise Real Per Capita SSE at 2004-05 Prices;
19. Public Expenditure on Education at National Level at 2004-05 Prices;
20. Year-on-Year Growth in Public Expenditure on Education;
21. Percentage Share of Public Expenditure on Education by Revenue and Capital Account at National Level;
22. Public Expenditure on Education as a Per cent of GDP;
23. Public Expenditure on Education as a Per cent of Aggregate Public Expenditure;
24. Public Expenditure on Education as a Per cent of SSE;
25. Real Per Capita Public Expenditure on Education at 2004-05 Prices;
26. Combined Educational Expenditure under Major Heads as a Per cent of GDP;
27. Combined Educational Expenditure under Major Heads as a Per cent of Aggregate Public Expenditure;
28. Percentage Share of Major Heads in Combined Educational Expenditure;
29. Centre’s Educational Expenditure under Major Heads as a Per cent of GDP;
30. Centre’s Educational Expenditure under Major Heads as a Per cent of Aggregate Public Expenditure
31. Percentage Share of Major Heads in Centre’s Educational Expenditure;
32. States’ Educational Expenditure under Major Heads as a Per cent of GDP;
33. States’ Educational Expenditure under Major Heads as a Per cent of Aggregate Public Expenditure;
34. Percentage Share of Major Heads in States’ Educational Expenditure;
35. State-wise Public Expenditure on Education as a Per cent of GSDP;
36. State-wise Public Expenditure on Education as a Per cent of Aggregate Public Expenditure;
37. State-wise Public Expenditure on Education as a Per cent of SSE;
38. State-wise Real Per Capita Public Expenditure on Education at 2004-05 Prices;
39. Gross Enrolment Ratio at Primary Level;
40. Gross Enrolment Ratio at Upper-Primary Level;
41. Drop-out Rate at Primary Level;
42. Drop-out Rate at Elementary Level;
43. Pupil-Teacher Ratio at Primary Level;
44. Pupil-Teacher Ratio at Upper-Primary Level;
45. Public Expenditure on Health at National Level at 2004-05 Prices;
46. Year-on-Year Growth in Public Expenditure on Health;
47. Percentage Share of Public Expenditure on Health by Revenue and Capital Account at National Level;
48. Public Expenditure on Health as a Per cent of GDP;
49. Public Expenditure on Health as a Per cent of Aggregate Public Expenditure;
50. Public Expenditure on Health as a Per cent of SSE;
51. Real Per Capita Public Expenditure on Health at 2004-05 Prices;
52. Combined Health Expenditure under Major Heads as a Per cent of GDP;
53. Combined Health Expenditure under Major Heads as a Per cent of Aggregate Public Expenditure;
54. Percentage Share of Major Heads in Combined Health Expenditure;
55. Centre’s Health Expenditure under Major Heads as a Per cent of GDP;
56. Centre’s Health Expenditure under Major Heads as a Per cent of Aggregate Public Expenditure;
57. Percentage Share of Major Heads in Centre’s Health Expenditure;
58. States’ Health Expenditure under Major Heads as a Per cent of GDP;
59. States’ Health Expenditure under Major Heads as a Per cent of Aggregate Public Expenditure;
60. Percentage Share of Major Heads in States’ Health Expenditure;
61. State-wise Public Expenditure on Health as a Per cent of GSDP;
62. State-wise Public Expenditure on Health as a Per cent of Aggregate Public Expenditure;
63. State-wise Public Expenditure on Health as a Per cent of SSE;
64. State-wise Real Per Capita Public Expenditure on Health at 2004-05 Prices;
65. Infant Mortality Rate per Thousand Live Births;
66. Life Expectancy at Birth in Years;
67. Maternal Mortality Ratio per Lakh Live Births;
68. Total Fertility Rate i.e., Children per Woman;
69. Real Per Capita GSDP at 2004-05 Prices;
70. Number of Schools per Lakh Population at Primary Level;
71. Number of Girls per Hundred Boys Enrolled at Primary Level;
72. Female Literacy Rate in Percent;
73. Number of Allopathic Doctors per Lakh Population.

3.2 Concepts and Terms used in the Study

1. Public Expenditure

The term ‘public expenditure’ means the expenditure incurred by the public sector at the level of the central and state governments and the local governmental authorities.

2. Social Sector Expenditure

‘Social sector expenditure’ includes expenditure on ‘social services’, ‘rural development’, and ‘food storage & warehousing’ under revenue expenditure, capital outlay and loans & advances by the central and state governments. ‘Social sector expenditure’ in India broadly covers the expenditure incurred under ten major heads within the social sector. The first eight heads namely, ‘education, sports, art and
culture’, ‘health and family welfare’, ‘water supply, sanitation, housing and urban development’, ‘information and broadcasting’, ‘welfare of SCs, STs and OBCs’, ‘labour and labour welfare’, ‘social welfare and nutrition’, and ‘others’ have been covered under main budgetary head ‘Social Services’ while the remaining two major heads such as ‘rural development’, and ‘food, storage and warehousing’ have been covered under main budgetary head ‘Economic Services’. The expenditure under the heading ‘rural development’ relates mostly to anti-poverty programmes while the expenditure on food policy/subsidy is covered under the heading ‘food storage & warehousing’.

3. Educational Expenditure

‘Educational expenditure’ refers to the expenditure incurred by the central and state governments under the four major heads within the education sector namely, ‘general education’, ‘technical education’, ‘sports & youth services’, and ‘art and culture’. The major head ‘general education’ within the education sector includes six minor heads such as ‘elementary education’, ‘secondary education’, university and higher education’, adult education’, language development’, and ‘general’.

4. Health Expenditure

‘Health expenditure’ includes expenditure of the central and state governments under two major heads within the health sector namely, ‘medical and public health’, and ‘family welfare’. The expenditure under the major head ‘medical and public health’ consists of the expenditure incurred on medical relief or curative care in hospitals and dispensaries, medical education and research, government insurance schemes, communicable disease control programmes, primary healthcare etc. The expenditure under the major head ‘family welfare’ mainly includes expenditure incurred on family planning, maternal and child health, immunisation etc.

5. Centre

‘Centre’ means the central government and the governments of those union territories which do not have legislatures.
6. State

‘State’ means the state governments and the governments of those union territories which have special legislatures. Delhi, earlier a part of the centre, has been included in the states since 1993-94. As new states namely, Chhattisgarh, Jharkhand and Uttarakhand have been formed in November 2000, so the data regarding social sector expenditure relating to these states have been available from 2000-01. These new states have been carved out of the existing states of Madhya Pradesh, Bihar and Uttar Pradesh respectively; therefore, data prior to 2000-01 have been included in their respective parent states.

7. Gross Enrolment Ratio

‘Gross Enrolment Ratio’ (GER) is defined as “the percentage of enrolment in grades I-V and VI-VIII to the estimated child population in the age group of 6 to below 11 years, and 11 to below 14 years respectively”.

8. Drop-out Rate

‘Drop-out rate’ (DOR) is defined as “the percentage of pupil who drop-out from a given period or cycle or level of education in a given cycle or school years”.

9. Pupil-Teacher Ratio

‘Pupil-teacher ratio’ (PTR) is defined as “the average number of students per teacher at a specific level of education in a given school year. It compares the number of students to the number of teachers at a given level of education”.

10. Infant Mortality Rate

‘Infant Mortality Rate’ (IMR) refers to “the number of deaths per thousand live births in the first year of a child’s life. It reflects the probability of a child dying before attaining the age of one year”.

11. Life Expectancy at Birth

‘Life Expectancy at birth’ (LEB) refers to “the number of years the person is expected to live, given the prevailing age-specific mortality rates of the population to which the person belongs”.

59
12. Maternal Mortality Ratio

‘Maternal Mortality Ratio’ (MMR) is defined as “the number of women who die from any cause related to or aggravated by pregnancy or its management (excluding accidental or incidental causes) during pregnancy and childbirth or within 42 days of termination of pregnancy, irrespective of the duration and site of pregnancy, per one lakh live births”.

13. Total Fertility Rate

‘Total fertility rate’ (TFR) in a specific year is defined as “the total number of children born to each woman if she were to live through her reproductive years (age 15-49 years) and bear children in accordance with the prevailing age-specific fertility rates. Therefore, TFR has been measured in terms of number of children per woman”.

14. Female Literacy Rate

‘Female literacy rate’ (FLR) is defined as “the percentage of females of an area at a particular time aged 15 years or above who can read and write with understanding a short simple statement about their everyday life”.

3.3 Methodology

The various econometric and statistical techniques have been applied to achieve the specific objectives of the study. These techniques are discussed below:

3.3.1 Panel Data Regression Models

Panel data refers to a dataset in which the behaviour of entities has been observed over time. These entities may be individuals, states, countries, companies etc. As panel data is a combination of both cross-sectional and time-series, therefore, it is also known as cross-sectional time-series data or longitudinal data. The regression models based on panel data sets are called panel data regression models.

In the present study, panel data regression model has been used to examine the impact of social sector expenditure on social attainments in India using ‘STATA12’ econometric software. For this purpose, the impact of educational spending on educational status in terms of GER at primary level as well as the
impact of health spending on health status in terms of IMR has been assessed separately using panel data regression models.

In order to study the impact of educational spending on educational status in India, educational status of a particular state is captured by gross enrolment ratio at primary level of education whereas the educational spending by a particular state is measured in terms of real per capita public spending on education. A set of state level control variables that are known to affect the educational status, like per capita income, number of primary schools, share of girls in primary enrolment, and pupil-teacher ratio have been introduced in the panel data regression model along with public spending on education.

In order to examine the impact of health spending on health status in India, health status is measured in terms of infant mortality rate of a particular state, whereas health spending is captured by real per capita public spending on health by a particular state in India. Like in case of education regression model, a set of state level control variables that are known to affect the relationship among public spending on health and health status, such as per capita income, female literacy rate, number of allopathic doctors, and total fertility rate have been introduced in the health regression model along with public spending on health.

**Education Regression**

The following education regression equation based on panel database of 27 Indian states (all states excluding Chhattisgarh, Jharkhand and Uttarakhand) over the period 1993-94 to 2010-11 (collected annually) has been estimated:

\[
\ln(\text{GER}_{it}) = \beta_0 + \beta_1 \ln(\text{PCEE}_{it}) + \beta_2 \ln(\text{PCGSDP}_{it}) + \beta_3 \ln(\text{SCLS}_{it}) + \beta_4 \ln(\text{GLS}_{it}) + \beta_5 \ln(\text{PTR}_{it}) + \epsilon_{it}
\]

\[ \text{........................... (1)} \]

Where ‘i’ = number of states in the sample

‘t’ = number of years in the sample

‘GER’ = gross enrolment ratio at primary level of education in a particular state

‘PCEE’ = real per capita public spending on education of a particular state

‘PCGSDP’ = real per capita income of a particular state
‘SCLS’ = number of primary schools per one lakh population in a particular state
‘GLS’ = number of girls per hundred boys enrolled at primary level in a particular state
‘PTR’ = pupil-teacher ratio at primary level in a particular state
‘ε’ = error term

Health Regression

The following health regression equation based on panel database of 15 major Indian states over the period 1990-91 to 2010-11 (collected at five points of time 1990-91, 1995-96, 2000-01, 2005-06 and 2010-11 depending upon the availability of data) has been estimated:

$$\ln(IMR_{it}) = \alpha_0 + \alpha_1 \ln(PCHE_{it}) + \alpha_2 \ln(PCGSDP_{it}) + \alpha_3 \ln(FLR_{it}) + \alpha_4 \ln(AD_{it}) + \alpha_5 \ln(TFR_{it}) + \varepsilon_{it}$$

Where ‘i’ = number of states in the sample
‘t’ = number of years in the sample
‘IMR’ = infant mortality rate of a particular state
‘PCHE’ = real per capita public spending on health of a particular state
‘PCGSDP’ = real per capita income of a particular state
‘FLR’ = female literacy rate of a particular state
‘AD’ = number of allopathic doctors per one lakh population in a particular state
‘TFR’ = total fertility rate of a particular state
‘ε’ = error term

According to Park (2011), “panel data models examine cross-sectional (group), time-series (time) effects or both in order to deal with heterogeneity or individual effect which may or may not be observed. These effects may be fixed or random. A fixed effect model examines if intercepts vary across group or time period, while a random effect model explores differences in error variance components across individual or time period. The ‘one-way model’ includes only
one set of dummy variables whereas the ‘two-way model involves two sets of dummy variables. The basic difference among fixed and random effect models depends upon the role of dummy variables. A parameter estimate of a dummy variable is a part of the intercept in a fixed effect model and an error component in a random effect model. Slopes remain the same across group or time period in either fixed or random effects model. The fixed effect model is estimated by least squares dummy variable (LSDV) regression (OLS with a set of dummies) and within effect estimation methods, while random effect model is estimated by generalized least squares (GLS) and feasible generalized least squares (FGLS) or estimated generalized least squares (EGLS) method”.

In order to find out the appropriate panel data regression model, tests like ‘F-test, Breush and Pagan Langrangian multiplier (LM) test and Hausman specification test’ are applied. ‘F-test’ checks the consistency of ‘fixed effect model’ while ‘Breush and Pagan Langrangian multiplier (LM)’ examines the consistency of ‘random effect model’. If both the models are found consistent based on these results, then ‘Hausman specification test (5 per cent significance level)’ is applied to choose among ‘fixed effect model and random effect model’. If ‘Hausman specification test’ statistic turns out to be significant then ‘fixed effect model’ is appropriate, and if the statistic turns out to be insignificant then ‘random effect model’ is appropriate. If both the models are found inconsistent, then pooled OLS model is considered as most appropriate (Park, 2011).

3.3.2 Tabular Analysis

Tabular analysis technique has been applied in the study to work out ratios, percentages and averages etc.

3.3.3. Coefficient of Variation

In order to determine about the nature of change in the degree of inequality in various social attainment indicators, coefficient of variation technique has been applied to find out the converging or diverging trend across states in India in terms of social attainment indicators. Coefficient of variation is measured in terms of percentage.
\[ Coefficient \ of \ Variation \ = \ \frac{\sigma}{\bar{X}} \times 100 \]

where \( \sigma \) and \( \bar{X} \) represent standard deviation and mean respectively of a given variable.

3.3.4 Scattered and Bar Charts

Scattered charts have been used to present the relationship between public spending on social sector and social attainments as well as to examine the relationship between per capita income and social attainments. Bar charts have been used to depict the ranking of major states according to social attainment indicators as well as to show the composition of social sector expenditure at national and state levels in India.