CHAPTER - II

METHODOLOGY

This chapter describes a) the main sources of data used for the analyses and b) methods and techniques used to assess social and demographic disparities in higher education and employment.

2.1 Sources of Data

For most part of the analysis, data have been used from NSSO 55th (1999-2000) and 62nd round (2005-06); from employment and unemployment surveys (EUS) including information on education. Schedule 10 from both the rounds ask questions to the head of the household on the highest level of education achieved by individual of the household. In addition, data from census of India (1991 and 2001) from socio-cultural tables of India are used. Table 2.1 provides chapter-wise data source used in the analysis.

In chapter 3, i.e. for analysis of inequalities in achievement of higher education by social groups, the NSSO 55th (1999-2000) and 62nd round (2005-06) data is used. Achievement in higher education includes individuals from higher secondary and above in the age group 18-25, which means that an individual who has at least completed higher secondary and has not completed his or her graduation degree to postgraduate and above in various streams such as engineering, medicine, agriculture and others have also been considered as achievement of higher education. This chapter presents the overall scenario.

1 others means they have at least completed graduation in subject other than agriculture, engineering and medicine discipline respectively
in India in terms of achievement of higher education. Chapter 4 presents the achievement in higher education by social groups for selected states of India.

The 18-25 age-group was primarily considered since, it is assumed an average individual by the age eighteen would have completed his or her higher secondary education and by the age of twenty five his or her post graduate degree in the given disciplines.

Chapter 5 presents the future distribution in higher education by social groups, in context of present distribution of the social groups in terms of achievement in higher education by using census 1991 and 2001 data. The model used in projecting the future distribution of population by social groups for a short period takes into account two main criteria. The first is the current trend of representation in higher education and second is the growth rate of population in education as well as growth of the population between past two decades for the respective age groups. The model assumes that the death and migration to be closed across the social groups and during the given time period. The c-series socio-cultural tables of census provides data on completed level of education by age groups, male-female and rural-urban. The social groups considered here are SC, ST and Other caste. The Other castes also include the Other Backward Caste; the reason for this is census does not gather information on Other backward castes. The merging of both Other Backward Caste and Other caste is likely to give the overestimate representation of the caste Others. Hence, here we can say that somewhat overestimation would be there in terms of distribution in representation of higher education for caste SC and ST when compared with the Others caste. Projection is mainly done by taking the time period 1991 as the base period. The difference in the proportionate population representing higher education is taken as the growth rate of the population. For example, the population in the
age group 15-19 with matriculation and above during the period 1991 would be expected
to be in the age group 25-29 with graduation and above by 2001.
Chapter 6 presents the trends in representation of employment, by social groups of India using various sources of data. The data mainly compiled and extracted from the website [www.indiastat.com](http://www.indiastat.com) and official statistics on employment for various time periods.

In Chapter 7, data from both NSSO 55th round (1999-2000) on employment and unemployment survey in India is used for comparative analysis by social groups in terms of representation in employment. NSSO data gives the usual activity status by household type and also the occupation by NIC classification. The 15-59 age group population representation in employment is analysed by both with and without higher education for social groups and background characteristics such as, region, gender is also given.

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### 2.2 Methods of Analysis

In Chapter 3 different measures of disparity have been used to study the level of inequality in terms of achievement in higher education by social groups of India. Since, there is no lower age cut-off; the denominator includes a sizeable population of those below 18 years who, individual exceptions apart, cannot have obtained the degree of higher secondary. Depending up on the demographic history, the share of the population in the age group 0-18 could also vary among the four social groups. Similarly, specifying an upper age bound is equally necessary for the chosen indicator also, from the
perspective of the policy focus on reservation of “seats” indicators relating to completed levels of education, even when more narrowly restricted to population say, the 18-25 age-groups are inappropriate. For, differences in failure/drop-out rates across social groups would convert even an initial “fair” allocation at the enrollment stage into an “unfair” outcome in terms of proportions with a given level of completed education. Hence, it can be checked in the NSS Employment-Unemployment Survey, a closer approximation to the structure of enrollments is available in terms of the population reporting current attendance in educational institutions (further classified by course of study) as their Usual Activity Status. This shift of focus to completion in education at different level also helps specify the age limits more realistically.

An analysis by age of the sample population reporting attendance in institutions for graduate (and post-graduate) studies shows that the age-group 18-25 accounts for nearly 90 percent of the population. This would suggest the age-group 18-25 as appropriate for the population with “graduate and above” level of completed education. Progression at each level in the educational pyramid is conditional on the successful completion of the preceding stage of education. Thus, holding a graduate degree is must for entry into a post-graduate programme and a higher Secondary or equivalent qualification is necessary for entry into an under-graduate programme, and so on down the line. Since the study was on higher secondary and above, the age group from 18-25 was considered.

Disparity Index: To measure the extent of representation of social groups SC, ST, OBC compared to Others (reference group), we use the following disparity index:
Let \( s_i \) represents each of social group ST, SC and OBC and the suffix \( i, i = 1 \ldots 5 \) represent completed level of education i.e higher secondary and above, graduate and above in agriculture, engineering, medicine and others respectively \( \sum s \) represents the total population in the age group 18-25 irrespective of educational status. Similarly \( o_i \) represent the social group OTHERS, taken as the reference group and the suffix \( i \) same as above. \( \sum o \) represents the total population in the age group 18-25 for the group Others.

The disparity index denoted by \( x \) is calculated as follows:

\[
    x = \frac{\sum o_i s_i}{\sum o s_i}
\]

If

\( x = 1 \), indicates the population with achievement in higher education for the group ‘s’ equals in terms of achievement in higher education for the reference group ‘o’.

\( x <1 \), indicates the achievement in higher education of the group’s’ is greater than the reference group ‘o’.

\( x >1 \), indicates the achievement in higher education of the group total number of is less than the reference group ‘o’.

For example, the value of index \( x \) for a social group s say ST is greater than 1 say 1.5 with that of the reference group others, that means for the given age group the social group ST has to increase by 1.5 times in terms of if its available population in the given age group to be equal to the other group population in achieving higher education.
Thus, disparity index indicates the level of disparity between a given social group compared with the reference group Others in terms of achievement in higher education. In addition, it also gives the difference in absolute numbers required for a group in the given age group to be equal to the reference group others in achievement of higher education.

*Disparity Index by Krishnamurthy and Kulkarni:*

Another method used to measure the disparity is given by (Krishnamurthy and Kulkarni, 1993) by social groups as:

\[ \gamma = \ln(p_i)/\ln(p_{ref}) \]

which is based on the relation \( p_i = (p_{ref})^\gamma \)

Where, \( p_i \) is proportion in group \( p_i \) with higher education for social groups like SC/ST/OBC and \( p_{ref} \) is the proportion with higher education in the reference group the Others group. Here the Others category is taken as the reference group due to the larger representation of population with higher education from this group.

*Theil Index:*

Further to study the existence of between and within group disparities by background characteristics in higher education, the Theil index has been applied. This index provides a decomposition of the total inequality in two main components: between and within group inequality, thus this index can be used to analyze whether between group disparities by social groups or within group disparities by background characteristics or both impacts the level of inequality in terms of achievement in higher education by social groups. The interaction between these two components although is complex but it gives the overall disparity between the groups. For our analysis, let us consider the total number of individuals \( i \) in the age group 18-25, grouped into four categories: ST, SC, OBC and Others.
Let, \( R_i \) = ratio of the total number of students with higher education to the total number of population in the age group 18-25 and \( P_i \) = population share of the group \( i \) in the entire population of age group 18-25. Then overall inequality can be represented as follows:

\[
T = \sum_{i=1}^{4} P_i R_i \log R_i + \sum_{i=1}^{4} P_i R_i T_i
\]

Where \( T_i \equiv \frac{1}{n_i} \sum_{j \in S_i} r_j \log r_j \)

Where \( j \in S_i \) indicates that \( T_i \) is generated by summing up all persons comprising group \( i \), and \( r_j \) is the ratio of individual with that educational level to the total number of population in the age group 18-25 for a given background characteristics such as region, gender and household types. The first term in the value of \( T \) gives the extent of between group inequality across all the four groups and the second term is the extent within group inequality across all the four groups, thus, it is a group specific measure. At different level of education, if the Theil index value is approximately equal to zero then we can say that the within group, disparity is lower. Negative value of each term in the summation of the total index will represent the negative contribution to the overall Theil index which again contributes in bringing down the scale of equality among different social groups. On other hand, positive value of each term in the summation of the total index contributes positively towards overall scale of equality. Thus overall the summation ‘\( T \)’ shows positive or negative values, the decompositional property of ‘\( T \)’ will show the individual groups contribution to the overall sum.
Chapter 5 presents the growth rate of the population with respect to time $t$ is calculated using the Verhulst logistic growth model with the competition factor and limited resource was given by

$$S_{t+n} = r_t \times S_t \times \frac{K_i - C_i O_i - P_i}{K_i}$$

Where $S_{t+n}$ is the social group whose growth rate has to be calculated, $K_i$ is the carrying capacity of the population can be termed as the upper limit of the population after which the growth rate becomes negative, and is calculated as the difference between the actual figure from the data to the hypothetically calculated i.e the hypothetical situation in which each social group is represented by their actual percentage to the total population, i.e the representation where each one is distributed equally by their percent share in the population. This was done by assuming that if the population is represented by their actual representation with the limited resource, there will be no further growth and hence the growth rate would became negative. $C_i$ is the competition factor and is calculated for each social group as the proportion to the total difference of that social group and others and $O_i$ is the reference group.

Chapter 6 presents the trends in employment from various sources of data for different social groups in India. Employment from various public sector organization as well as the grades in employment is taken to show the disparities in representation at various levels of employment by social groups of India. The candidates recommended for various public service examination, the probability of those appeared to those selected by social groups, the trend in representation for various time period is studied. In addition the concentration of the employment by social groups is analysed throughout the trend.
Chapter 7 presents the distribution pattern by social groups in employment for usual activity known as principal work status in the NSSO 55\textsuperscript{th} round (1999-2000) of data, and of the workforce by each household. The employment level along with the educational level and social group is analysed for various social groups in India. Using NSSO 55\textsuperscript{th} round (1999-2000), the decomposition of household employment is done for grades of employment and by background characteristics. Comparative analysis by social group population with and without higher educational at different grades of employment of India is analysed by using the measure of inequality between employment rich and poor ratio is given as the natural logarithm of the ratio of the arithmetic mean employment rate to the geometric mean employment rate and is calculated as follows:

\[ I_e = \log(e) - \sum_{k=1}^{4} n_k \log(e_k) \]

Where The arithmetic mean is defined as:

Let us consider a population is divided into k mutually exclusive and exhaustive groups: group k contains \( P_k \) persons of working age group fifteen to fifty nine, \( E_k \) persons who are employed.

For the present chapter we partition the population into 4 social groups: SC, ST, OBC and Others caste, hence our \( k = 1, 2, 3, 4 \). Then the corresponding totals is denoted by

\[ P = \sum P_k ; E = \sum E_k , \]

\[ e = \sum_{k=1}^{4} e_k p_k , \text{ where } p_k = P_k/P \text{ and } P \text{ is the total population in the age group } 15-59. \]
And employment rate for group k is defined as $e_k = E_k / P_k$ as the employment rate for the group k with $\sum_{k=1}^{4} p_k = 1$ and

The geometric mean is defined as $e^g = \prod_{k=1}^{4} (e_k)^{P_k}$

2.3 Chapterization of the Thesis

This thesis is organized in the following 8 chapters.

Chapter 1 provides the introduction, literature review, need for the study and objectives of the study.

Chapter 2 describes the data sources and methods of analysis.

Chapter 3 presents results of the representation in higher education by various social groups and by demographic characteristics for India. Further, it analyses the extent of disparity between and within social groups according to background characteristics using different disparity indices.

Chapter 4 presents results of state wise representation in higher education by various social groups. Using Disparity index and Theil index, the extent of disparity is analysed for each social groups by background characteristics for major states of India.

Chapter 5 presents the results of distribution by various social groups in two time periods and examines the existing distribution by logistic growth model and project the future distribution in higher education by social groups.
Chapter 6 presents the trends of employment scenario in India and its major states by various social groups using data from Census of India and official statistics on employment.

Chapter 7 presents results of analysis of employment with higher education in India and its major states by various social groups using data from employment and unemployment surveys, NSSO.

Chapter 8 presents the summary and conclusion, limitations of the models and need for further exploration in the study area and critical policy issues.