CHAPTER II

THE METHODOLOGY AND MEASUREMENT

1. Introduction

In the previous chapter we have shown that with certain assumptions, dX (change in actual consumption of basic commodity) and dW (change in basic welfare) are directly and proportionately related. This would imply that change in X could be used to measure the change in W. However, the empirical issue which would arise here is that how do we measure X and dX? This is because X is defined to be the consumption of the basic commodity, which is directly and substantially affected by the government efforts and whose marginal utility to the non-poors is extremely low as compared to the poors. Moreover, X is defined to be the actual consumption of basic commodity and not the production or supply of it in the economy.

Studies by Reddy (1976 a) and Rao (1983) suggest that government expenditure on certain items like health and education could be considered as a proxy for the consumption of the respective items. Assuming that expenditure on these items is equivalent to their consumption, they have studied the inter-state variation in social consumption. Another way of measuring X, which is of course, implicit in studies by

Mukharjee (1978) and Gothaskar (1978) is to consider physical inputs or infrastructural development in a particular sector as an index of consumption of that particular commodity. They feel that one can use the input indicators as proxies for output indicators of those sectors, since inputs and outputs are likely to be positively, highly correlated. However, according to us all such studies can be said to have measured the 'efforts' for the consumption or 'intended consumption' rather than actual consumption of basic commodities. They have thus assumed away all the problems of government inefficiencies and leakages. They take it for granted that in all the states, whatever has been spent has efficiently and effectively resulted into the outcomes intended by the government.

Even if we assume that every thing is efficiently produced and consumed in each state, still, the above studies require an empirical assumption of identical, uniform and stable production function in and across different states, in the country. However, both these empirical assumptions are too weak to sustain the burden of the empirical evidence, particularly in the case of India, as we have already noted (see, Section IV, Chapter I). Similarly, the studies by Dholakia R.H. (1985) and Lakdawala et al. (1974) . clearly suggest that production function across different states in India substantially differ and

the difference is not likely to remain stable over time. This implies that estimation of X is likely to be highly misleading. We have therefore, tried to measure X in terms of certain indicators, improvement in which would invariably and unfailingly indicate a definite increase in the consumption of basic commodities, particularly by the poor.

In terms of our framework presented in the first chapter, this amounts to defining the variable X, which represents the quantity of basic commodity entering the utility functions of both the poor and the non-poor groups. In the next section, we consider this question in detail.

In order to measure the welfare and distribution impact of government expenditures, it is necessary to postulate some plausible functional relationships between the government effort and the basic commodity X in the system. In the third section, we present our postulated functional relationships and examine in detail the possible implications and interpretations of such relationships. Based on detailed considerations of possible interpretations of our postulated relationships between government effort and the basic commodity X, we derive the precise measurements of these two pivotal variables in the fourth section. Some of the minor but necessary empirical problems of making certain adjustments and/or filling data gaps to derive consistent and comparable

series for all the major states in India for the required period are discussed in the Appendix A at the end of the thesis.

2. Measuring The Consumption of Basic Commodity (X)

2.2.1 Components of X : As already noted above, X in our framework is defined to be the consumption of basic commodity whose marginal utility to the non-poors is almost zero and which is (supposed to be) directly and substantially affected by the government efforts. Keeping these two criteria in mind we can decompose X in to three broad categories viz.
(i) Medical care and Health (ii) Basic literacy and
(iii) Food, nutrition and other minimum requirements.
All of these items have a very high marginal utility to the poors.*1 Moreover, in a developing economy like India, the major role of the government is to adequately increase the consumption of the above items through various direct and indirect as well as monetary and non-monetary measures. Therefore, we have attempted to measure X through the above mentioned components.

---

*1 Although the poors may not view the consumption of basic education as the primary requirement, from government's point of view the primary education has direct positive and significant impact on the welfare of the poors.

2.2.2 Some Empirical Studies On Measurement Of X (BW) : The major problem is regarding the empirical measurement of X. As has already been pointed out in the previous section, measurement of X (consumption of basic commodities) is empirically quite a difficult task and that any attempt to measure X through the 'expenditure efforts' or 'physical inputs' (i.e. 'Supply efforts') is likely to be highly misleading. Moreover, it has also been widely recognised that measurement of X through per capita income of production of total goods and services in any economy is also unsatisfactory, since such indicators reflect only the productive capacity of the region but fail to give us an idea regarding the level of personal consumption as well as composition of various consumption items (see, Ganguli and Gupta, 1976).

Economists in recent years have therefore, attempted to measure the level of minimum consumption (X) through the use of consumer expenditure data available from the sources like NSS and NCAER. However, these data are also not likely to capture the true extent and distribution of consumption items, since they exclude the consumption of public services and 'houseless' consumers from their survey. Moreover, the poorest groups are precisely the ones that most effectively would escape the net of monetary measurements. Although, scholars like Rajkrishna (1980) have attempted to correct at least some of the well known defects of data by adding the per

capita expenditure on public services to the per capita consumer expenditure in order to measure the true level of consumption by different income groups, his estimates are not considered to be adequate enough for drawing any reliable conclusions. Rajkrishan's (1980) estimates are considered to be defective on two counts : First is that they are arrived at by using the NSS data, which overestimate the consumption of certain items and second is, that measurement of per capita consumption of public services is made through such assumptions that public expenditures and their benefits are positively and perfectly correlated and that everybody benefits equally from public expenditures, which are highly questionable !! (see, Chapter I).

Non-Monetary Measurement of X (BW) : Perhaps, considering all such limitations of the above types of studies, authors like Ganguli and Gupta (1976), Gupta, S.P. et al. (1983) and Sinha, T.N. (1983) attempted to measure the level of consumption (often used as synonym for the standard of living) through several non-monetary indicators. Gupta, S.P. et al. (1983) have rightly observed that "In a country like India, with its inherent heterogeneity in its people, land and culture, a mere per capita state domestic product comparisons or even household consumer expenditures could not capture the welfare content of her people... appropriate index of welfare is needed both for intertemporal and interregional

comparisons".*2 In fact economists in recent times have realised the need for a multidisciplinary approach to appropriately analyse any economic problem. Leontief (1971) had also emphasized that "To deepen the foundation of our analytical system, it will be necessary to reach unhesitatingly beyond the limits of the domain of economic phenomena as it has been stated up to now. To penetrate below the skin-thin surface of conventional consumption functions, it will be necessary to develop a systematic study of the structural characteristics and of the functionings of households, an area in which description and analysis of social anthropological and demographic factors must obviously occupy the centre of the stage".*3

Although, the serious thinking about non-monetary measures of poverty and level of consumption started long back, the literature in this field grew at a relatively faster rate only during the last few years. Eminent researchers have come out with varying sets of indicators for measuring the welfare (or level of consumption) in the so

---

* 2 S.P. Gupta et al. : "Indicators of Standard of Living", in REGIONAL DIMENSIONS OF INDIA'S ECONOMIC DEVELOPMENT, (Lucknow : State Planning Commission, U.P.), 1983,p.228.

* 3 W. Leontief : 'Presidential Address to the American Economic Association', AMERICAN ECONOMIC REVIEW, 1971.

called objective way.*4 Few such studies are discussed below.

The pioneering work in this field must be attributed to the U.N.Committee of experts on 'International development and measurement of standard of living, headed by V.K.R.V. Rao (1954). The committee felt the desirability of sort of a pluralistic approach and accordingly suggested the use of several non-monetary indicators (such as student enrolment, teacher-pupil ratio etc.) to cover the different aspects of living (such as health education etc.). The recommendation of this committee were subsequently discussed by a number of specialised agencies of the United Nations and were followed by another report (1961). Nine components of levels of living were proposed" (1) health (2) Food and Nutrition (3) Education (4) Employment and conditions of work (5) Housing (6) Social Security (7) Clothing (8) Recreation and (9) Human freedom. It also proposed a further category of essential components for providing basic information necessary for the interpretation of the levels of living. They were specified as follows: (1) Population and labour force (2) Income and expenditure (3) Communications and Transport - (a) Mass communication and (b) Tele-communications (c) Transportation. The working party also proposed three additional general indicators :
(i) Proportional Mortality indicator, that is the proportion of deaths at ages 50 years and over to all deaths
(ii) Expenditure on food as a percentage of household

---

* 4 For various studies on this line see, REGIONAL DIMENSION OF INDIA'S ECONOMIC DEVELOPMENT, opp. cit. 1983.

expenditure (iii) Ratio of male labour force in agriculture / to total male labour force.

Further work was undertaken at the U.N.Research Institute for Social Development (UNRISD). The authors Drewnoski and Scott (1966), propose the use of seven components to measure the level of living. They are (1) Nutrition (2) Shelter (3) Health (4) Education (5) Leisure and Recreation (6) Security (7) Surplus income. For this purpose, they suggested nearly 19 indicators such as per capita calorie intake, access to hospital, school enrollment ratio, leisure time, density of occupancy etc. In 1970, another report of UNRISD prepared by Dewnoski was published where few changes were introduced. For instance, the surplus income component in the early study (1966) defined in terms of money was replaced by 'environment' which was defined in terms of non-monetary elements such as communication, travel etc. However, the main premises on which the earlier index (1966) was based remained almost unchanged.

Following broadly the definition and methodology provided by the UNRISD, the scholars like Ganguli and Gupta (1976) attempted to measure the level of living (consumption) among major Indian states. They divided the measurement of total consumption level into two major components viz. primary component and secondary component of which the former would measure the 'subsistance' or minimum level of consumption and the latter would measure the consumption of secondary items

like radio, newspaper, available length of road, post offices, electricity for domestic use etc. They treated the latter set of indicators as 'secondary' because without fulfilment of the basic needs (first component) like water, food, health etc. the secondary component has very little meaning. In all, 13 indicators were chosen for the primary component and 10 indicators were selected for constructing the secondary component.

Recently, a noted effort in this direction was also made by Gupta S.P. et al. (1983) who attempted to measure the level of living through nearly 38 indicators relating to the following different components of level of consumption; (1) Nutrition (2) Education (3) Housing (4) Health (5) Transport (6) Power (7) Communication (8) Miscellaneous. Sinha T.N. (1983) also selected a few non-monetary indicators relating to education, nutrition etc. However, almost all these studies suffer from certain common limitations which are listed below.

2.2.3 Common Limitations of The above Studies :

(a) Some of the above types of studies attempted to measure the welfare through the supply inputs, assuming implicitly that creation of inputs is the necessary as well as sufficient condition for welfare. Although, availability of inputs are likely to have significant impact on outputs

or results, their functional inter-dependence may not remain identical in various regions as already mentioned in the previous section.

(b) As Morris et al. (1982) have pointed out, such studies often intermix the development indicators with welfare.

(c) Some of the studies which also consider the 'output' indicators, quite often combine the variety of 'input' indicators with 'output' indicators to reflect upon the level of consumption, which is not warranted. For instance, to measure the health component of welfare, Ganguli and Gupta (1976) and Gupta S.P. et al. (1983) have combined the 'output' indicators like birth rate, death-rate and life-expectancy, with 'input' indicators like availability of hospitals, nurses, beds etc. Such an index may grossly overestimate or underestimate the extent of welfare particularly, when available infrastructure facilities are not utilised effectively and efficiently due to several social constraint to demand or due to inefficiency, corruption and lack of consistent planning in a given region.

(d) Moreover, construction of a composite index through consideration of input indicators implicitly assume that a specific categories of inputs are must for the achievement of the final expected social output. Such studies

therefore rule out the consideration of any possible less costly solutions for the developing economies. Morris and McAlpin (1982) had therefore emphasized that measurement of welfare should not assume a specific pattern of development or should not be biased towards any culture or belief. "The need to avoid culturally biased measures suggests that we should seek indicators that measure results rather than inputs. Obviously there are many reasons to seek information about inputs. But if our object is to determine the distributive effectiveness of an expenditure, we want to know how much illness or mortality was reduced or literacy was increased. If for example, death rates were dramatically reduced by the use of inexpensive barefoot doctors, medical care should not be considered inadequate because there are no swollen budgets for costly medical facilities and hospitals... One of the basic defects "of basic needs" and "welfare measures has been the tendency to mix indicators that reflect inputs and results".*5

(e) Another major defect with the studies by Gupta S.P. et al. (1983) and Ganguli and Gupta (1976) is that they have not considered the distribution aspect of welfare in an appropriate way. This can be inferred from their choice of indicators whose improvement do not necessarily imply the

---

* 5. Morris and B.McAlpin : MEASURING THE CONDITIONS OF INDIA'S POOR : THE PHYSICAL QUALITY OF LIFE INDEX, (New Delhi : Promilla and Co., 1982, pp. 8-9.

improvement in the conditions of the poor. For instance improvement of the indicators like construction of pucca houses as a proportion to total, per capita consumption of cotton as considered by Ganguli and Gupta (1976) or the indicators like availability of telephones, post offices etc. may not necessarily imply that welfare of the poors have definitely increased.

Considering the shortcomings of the above types of studies in appropriately and adequately measuring the welfare of the masses, it was felt that an approach should be evolved which takes into account the quality of life achieved by the people. In this regard, the World Bank (1980) also emphasized the need for identifying certain socio-economic variables (which are termed as centripetal forces of the vicious circle of poverty) which would measure the welfare of the poors through their quality of life.

2.2.4 The Physical Quality of Life Index : Studies by Morris David Morris (1979) and Morris and McAlpin (1982) appear to be quite appealing and appropriate in this regard. The authors constructed an index called Physical Quality of Life Index (PQLI) to measure the minimum measurable welfare of the people. PQLI was primarily constructed for measuring the welfare of the world's poorest countries but

afterwards was used for measuring the welfare of India's poors. The PQLI does not measure total welfare but measures only desired (minimum) qualities of life. The selection of indicators was governed by the following six. Criteria*6 : (1) The indicators should be objective in the sense that they should be true and relevant for any type of economy - poor non-poor, non-urban, non-market, non-industrial; capitalist or socialist (2) The indicators should not be culturally biasely (3) The indicators should reflect results, not inputs; (4) The indicators should be able to reflect the distribution effect of desired social results (5) The indicators should be simple to construct and easy to comprehend, (6) The indicators should lend themselves to international comparison.

According to the authors, only three indicators namely Life expectancy (LE), basic literacy rate (LR) and Infant mortality rate (IMR) meet all the six criteria, hence were selected for the construction of PQLI. Although, on the whole their efforts of measuring the welfare is quite logical and systematic - particularly in that they try to measure the welfare through some concrete results (rather than inputs) together with distribution aspect - it has several short comings which are discussed below.

---

* 6 See, Morris and McAlpin, Ibid., pp. 6-10.

Limitations of PQLI :

(a) Consideration of only three indicators by the authors appears to be inadequate to capture all the aspects of welfare. What is more important to point out is that an important component of basic needs namely food and nutrition is conspicuously absent in this index.

(b) Moreover, out of three components of PQLI, two relate to the health and are given almost 2/3 of the total weightage in the composite PQLI. Thus the index (PQLI) appears to be heavily biased toward health.

(c) The authors argue that data on indicators like IMR and life expectancy are easily available in any country and hence the construction of PQLI does not pose any problem. However, it should be noted that these 'available' data are not usuable and the usable data are not easily available, particularly in developing economies. It is a well-known fact that the extent of under-reporting of births and deaths is usually very high among the less developed economies under which circumstance the data on IMR and LE may be having serious measurement errors. If two out of three components are having severe measurement errors, than the estimates of PQLI may give highly distorted picture.

On the other hand, selection of a large number of indicators would reduce the measurement errors on account of aggregation and make the PQLI more sturdy.

(d) For construction of indicator indexes the minimum (worst observed) values of LE and IMR as chosen by them are 37 years and 229 per thousand live births respectively, based on the historical performance of different countries after 1950. But if we examine the data on various countries we find that there are certain countries which are so backward that even in early seventies the LE in those countries was nearly 28 to 29 years and IMR was as high as 263 per thousand live births (see, UN Year Book, 1982). This suggests that the selected values of the lower end of the indexes should have been much lower than the authors have considered.

(e) In regard to their work on India, (1982) two things need to be pointed out. One is, that the number of indicators are too few to make satisfactory comparison of the performances of the states. In fact, for a comparison among regional units within a country there are less problems of definition and hence, the authors could have easily considered a few more indicators to make the PQLI more comprehensive and stable. Second is, that they have excluded the states like Bihar and

West Bengal from their study on the ground of non-availability of reliable data. These two states are among the major states of India and have generated a lot of interest among economists due to their socio-economic and demographic characteristics. If these states are excluded then it amounts to throwing the baby with the bath water!!

This also reinforces our statement that data on IMR and LE could prove to be a major hurdle for the construction of a reliable PQLI, since the quality of such data is a positive function of a level of development. However, this does not mean that one should not make use of the available data at all. It only means that a larger number of indicators could be used, so that errors in measurement of indicators might be offset in the aggregate if they are random.

However, despite these limitations, the studies by Morris and Morris (1979) and Morris and McAlpin (1982) can be considered to be quite worth while since not only that they attempt to measure the desired welfare through objective, unbiased, output indicators but also consider the distributional aspects of welfare. The present study therefore attempts to measure X on the similar line. However, it may be noted that the set of criteria used for selecting the indicators, number of indicators and composition of indicators in our work are not the same. Unlike their work,

selection and composition of indicators for the present work are derived from systematic theoretical framework presented in the Chapter I.

2.2.5 Criteria for selecting Indicators for the Basic Welfare Index :

i. Indicators should measure the consumption of those items whose marginal utility to the poors is very high and that to the non-poors is extremely low.

ii. Indicators should lend themselves the comparability among various Indian states as well as among the group of Less Developed Countries (LDCS). Morris et al. (1982) talk about the international comparability whereas we have considered the comparability among less developed countries only. This is because the concept of welfare in developed countries is substantially different from those of LDCS and that there is no point in comparing almost uncomparables !!

iii. Indicators should reflect the output or achievement of certain objectives rather tnan 'inputs' or 'efforts'.

iv. Indicators should be as unethnocentric as possible, implying that they should be true for all the regions, LDCS, castes, religions etc.

v. Indicators should be such that whose improvement should invariably imply the improved consumption of basic commodities by a large section of the poors and the populace. While the indicators may not in themselves explicitly identify how the benefits they reflect are distributed among social groups at any moment, an improvement in these indicators should mean that the proportion of the people sharing the benefits almost certainly has risen. In other words, each of the measure should be fairly sensitive to distribution effects (see, Morris et al., 1982).

Considering above criteria as well as the availability of data, we have identified nearly eleven indicators, each one of which reflects the specific aspect of health, education, nutrition etc.; which are the basic components of X.

2.2.6 The three component Indexes of X : As has been mentioned, X (BW) is decomposed in to three components viz. health, education and nutrition & other.

Component Index of Health : Health is recognised to be one of the primary needs of the population and hence almost 1/3 of the total weight is attached to this component in our composite index of X. The consumption of all the necessary inputs for health is measured through the achievement of

the values of four indicators viz. life expectancy at Birth (LE), Death Rate (DR), Birtn Rate (BR), and Infant Mortality Rate (IMR). Improvement in the value of these indexes would certainly imply an increased consumption of necessary health inputs.*7 Moreover, majority of the LDCS are characterised by the poor values of these indexes (low LE and high DR, BR, IMR) and there is a good potential for the substantial improvement in them. This implies that we can also use the same set of indicators for measuring the performance of various LDCS/Indian states over a few coming years. Further, each of our indexes is fairly sensitive to the distribution aspect. If the indexes of these indicators improve they necessarily imply improvement in the consumption of health inputs by the poorest sections of the society. This is because each of these indicators has a realistic upper limit. If the rich have already attained it there is no way to improve it still further. Even if the rich also have relatively low level of these indexes and therefore have the possibility of improvement in these indexes, it will not have a very great impact on the overall average.

---

* 7 Improvement in the index of BR and DR implies fall in actual BR and DR. We have converted the indicator in to an index number in such a way that upward movement in the value of index shows improvement in the situation and vice-versa.

The indicators are also objective i.e. true for all castes, regions, religions etc. This is because on an average people do prefer to live longer than shorter lives. Similarly, infant deaths are also considered undesirable by the people. As far as BR is concerned some groups may be indifferent towards it or may even prefer to increase, but, from the society's point of view the welfare of these groups can be increased through reduction in BR and hence it is also considered to be one of the indicators.

Component Index of Basic Literacy (BLI): Literacy is now an objective to which every rational society has committed itself in principle. Though literacy can also be seen as an input, there is a particular justification for treating it as a result (output), where the object is to measure benefits going to the very poorest groups (see, Morris and McAlpin, 1982). Increase in literacy not only has economic implications in terms of employment, productivity and economic justice but it also affects the other socio-economic variables like BR, DR, IMR etc. The total weight given to the basic literacy index in our composite X is 1/3 (1/6 to FLR and 1/6 to MLR).

A number of studies have given special emphasis to female literacy for its positive and major role in terms of fertility reduction, mortality reduction etc. The government

of India also emphasized the education of females for several known reasons. In the light of this, we have kept the index of FLR and MLR separate throughout our study. These indexes measure the consumption of inputs for basic education in the economy. These indicators are also sensitive to distribution. This is because once the literacy is attained, it can not increase or decrease (though education can increase). This implies that once the elite or rich group has achieved it there is no way to add to it further. Even if we assume that all the rich persons were illiterate in the initial years and became literate in the subsequent period under consideration, average literacy index will not be affected much since the rich form a very small section of the society. Alternatively, if the literacy indexes improve it means that a large section of the economy namely the poors have improved in these respects. Thus we can see that almost all the criteria are met by the above indicators and hence are selected for the purpose.

Component Index of General Economic And Social Conditions (GESC) : This index attempts to measure the long-term consumption of the items of food and nutrition as well as other minimum requirements like clothing, minimum housing etc.. Such an index is likely to capture the true extent of poverty. As already mentioned earlier, the available data

on calorie consumption are not adequate enough to reflect upon the extent of poverty and hence they need to be supplemented by a few more indicators. Following five indicators are selected for this purpose :

i. Child Worker Participation Rate (CWPR)

ii. Male Participation Rate In Non-Agriculture Sector (MPRNA)

iii. Cognizable Crime Rate (CR)

iv. 'Females' mean Age At Marriage (FMAM)

v. Proportion of People Consuming less than minimum required calories, usually known as proportion of people below poverty line (PBP)

Increase in the value of (i), (iii) and (v) indicators imply deterioration in the general economic and social conditions and increase in (ii) and (iv) imply the improvement in it. As has been mentioned the indexes are constructed in such a way that improvement in the index of each of these indicators would imply improvement in the General Economic and Social Conditions and vice-versa.

What do The above Indicators Measure?:

i. Child Worker Participation Rate (CWPR) : This indicator measures the extent of child-labour in an economy. Technically speaking the term child labour is used as a synonym for

'employed' child, but more commonly, the term child-labour is used in a perjorative sense. It suggests something which is hateful and exploitative. A high extent of child-labour usually suggests that the families in those societies do need supplementary income earned by their children to fulfil their normal requirements.

A seminar on the subject also came to the conclusion that "Millions of families were below the poverty line and they had to deploy their children in the labour market in order to eke out a bare subsistence".*8 The extent of child-labour is very high in rural areas. Almost 93 percent of child-labourers are in the rural areas (see, Kulshreshtha, 1978), where successful implementation of the statutory laws is not possible. This implies that substantial changes in the CWPR can be brought about largely through economic factors like increase in income and employment of adults.

ii. Male Participation Rate in Non-Agricultural Sector (MPRNA) : It is very well recognised that employment is a major determinant of income and consumption. In a developing economy like India, where agricultural sector is backward and overflooded with either unproductive or less productive labourers, the indicators like MPRNA would indicate the

---

* 8 See, the report on a seminar on Child labour in India, Organised by The National Institute of Public Co-operation and Child Development, New Delhi, Nov. 25-28, 1975.

extent to which employment opportunities are created and exploited (consumed) by the people. If MPRNA increases it definitely implies greater employment with relatively stable and higher income which in turn imply positive changes in level of consumption. Authors like Srivastava (1983) have therefore, rightly emphasized the need for indicator like MPRNA for measuring the level of living or consumption.

Looking to the objectives of the government and the role played by the employment in the overall level of living we can be justified in treating this indicator as an output indicator. Moreover, substantial changes in the MPRNA can be brought about only through changes in the employment of masses which implies that the indicator also takes into account the distribution aspects.

There are two reasons why we have selected only male participation rate in Non-agriculture sector and have excluded the females. One is that males are considered to be the major bread winners of the families and hence increase or constancy of MPRNA may indicate directly the level of consumption and poverty. On the other hand, females' participation, particularly in non-A sector is also a matter of subsidiary importance resting on belief, cultural and social values, hence constancy of FPRNA may not necessarily be associated with the level of income and consumption. Although, FPRNA has positive implications in terms of

reduction of BR, DR etc. it may itself be a result of variety of factors. Secondly, due to change in definition of "worker" between 1961- and 1971 censuses, the data on female labour force as compared to male labour force are highly non-comparable and suffer from high unknown margin of errors (Ambannavar, 1973; Dholakia, R.H., 1977; Krishnamurthy, 1984). Though the 'Resurvey' on workers (1974) has attempted to produce comparable estimates of 1961- and 1971 - they have not been able to do so in a satisfactory way (Dholakia, R.H., 1985). Considering all these, it is desirable to exclude the indicator of females' employment.

iii. Crime Rate (CR) : This indicator includes only the cognizable, major crimes like murder, decoity and house breaking. Though increase in crime-rate is also experienced by developed economies like U.S., the reasons behind them are significantly different. In a developing economies these phenomena are largely due to poverty, frustration, lack of education, employment and fulfilment of basic requirements. Therefore, if crime rate increases it would largely indicate the deterioration in general economic and social conditions. Though, synergism between poverty and crime rate is not always established among all the less developed economies, it is largely attributed to the high reporting errors. What is more important to note is, that in India, over a period of time the incidence of murder rates have relatively

declined and incidence of decoity and housebreaking have increased, which may be attributed to the long-term unavailability of adequate food, clothing, housing, drinking water etc.. This led us to consider the crime rate as one of the indicators. This indicator reflects results rather than inputs. Moreover, it also takes into account the distribution aspects since noticeable fall in average crime-rates can be brought about only through improvement of the large number of people.

iv. Females' Singulate Mean Age at Marriage (FMAM) : Low mean age at marriage is another characteristic of the third world poor countries. The inter-country data on mean age at marriage reveals that relatively richer sections have higher FMAM and vice-versa. Though, much less work has been done on the causes of low FMAM we have attempted to study these relationships on the basis of some a priori consideration along with little available information. Low FMAM in LDCS largely indicate the prevalence of backwardness and existence of social customs and taboos but it also implies, to some extent, a heavy economic burden on the families. Families are eager to get their sons married because they largely view their daughter-in-laws as an important source of labour (Mead Cain, 1984). If this index improves it indicates improvement in the social as well as economic conditions. Of course, what is more interesting is the

implications of FMAM on education, birth rate, fertility rate and early deaths of women and it is because of these reasons that there is a good deal of concern among demographers and economists regarding females' mean age at marriage.

v. Proportion of People Living Below the Poverty Line (PBP): In the present context, proportion of people below the poverty line (PBP) is defined to be the number of persons, consuming less than minimum required calories, as a proportion of total number of people in the region. Despite the near unanimity among the economists on the point that during last three decades poverty ratio has remained fairly high, there exists divergence of opinion on the concept measurement and identification of poverty. The data on poverty produced by various scholars are not strictly-spatially as well as temporally-comparable. Nevertheless, the importance of such an indicator cannot be over-emphasized and hence the available data are used, inspite of their defects.

The estimates of poverty used in the present study are based on the NSS consumer expenditure data. Although the surveys of Indian Council of Medical Research (ICMR) and some private studies have attempted to measure the calorie consumption in a direct way, a consistent data set is not available for all the periods and for all the states. This difficulty led us to select the NSS consumer expenditure

based data on poverty. The indicator is likely to be fairly sensitive to the distribution and culturally unbiased.

2.2.7 Construction of Indicator Indices : As discussed above the component indexes of health, basic literacy and General Economic And Social Conditions (GESC), respectively measure the consumption of health, education and food-nutrition as well as other munimum requirements. The composite index of the above component indexes would thus measure the X (BW).

Because these indicators are measured in different units, e.g. LE is measured in years, whereas infant mortality is measured in terms of rate per thousand live births, we have to resort to the construction of indicator indexes. Moreover, since these indicators are output indicators, it is also necessary to measure their performance in terms of movements towards the targeted value from the initial level. Since worst and best (potential) values are fairly well defined in each case, it is easy to construct unidirectional indices out of these indicators. The methodology for constructing indicator indices is the same as followed by Morris and McAlpin (1982). For each indicator the performance of individual state is put on 0 to 100 scale where 0 represents an absolutely defined worst performance and 100 represents an absolutely defined best performance. The selection of

worst and best is not based on theoretical consideration such as 0 is worst and 100 is best, except a few cases where data could not be readily obtained. Selection of the worst and best values are based on the examination of historical experience, modified wherever necessary by expectation of possible change. Thus, the value 0 represents worst observed and not worst possible value. Similarly, 100 represents either the best achieved or targeted value of the indicator. Historical data of various countries since 1950 were examined for this purpose (see, U.N.Demographic Year Books).

2.2.8 Critical Values of The Indicators:

i. LE : It is defined to be the estimated average number of years a person of a given age (0 in this case) can be expected to live. It is usually quite low in LDCS. The lowest reported LE at birth during earlier sixties was 28 years (and not 38 years considered by Morris and McAlpin, 1982) in different countries of middle Africa.*9 Hence 28 is taken as the lower end (worst value), of the index. In highly developed countries the LE (male female combined) is observed to be more than 74 but is expected to increase up to 78 years. In fact, in various provinces of Canada it has already crossed 76 years (see, Statistics Canada, 1981).

---

* 9 See, various volumes of U.N.DEMOGRAPHIC YEAR BOOK.

This led us to set the upper limit of LE as 78 years for men and women combined (=100). The formula for converting the value of this indicator in to an index number is as follows :

$$\text{Index of LE} = \frac{\text{Actual LE} - 28}{0.50}$$

ii. DR : It is measured in terms of rate per thousand of population per year. The highest death rate after nineteen fifties was 47, observed in countries like Somalia, Ghana etc. (see, U.N.Year Books). Therefore, 47 is taken to be the lower end (=0) of the index. The best value of this indicator is achieved by the countries like U.S.S.R., Japan, FGR etc. The lowest death rate was 6 per thousand per year. This is therefore, considered to be the realistic upper limit (=100) for the index of DR. The formula for constructing an indice of DR is thus, as follows :

$$\text{Index of DR} = \frac{47 - \text{Actual DR}}{0.41}$$

iii. BR : It is measured as the number of births per thousand of population per year. The highest recorded BR was 60 recorded in the least developed countries like Mauritia, Somalia, Malwi, Ghana etc., after late fifties. Thus the highest recorded birth rate is 60 which is taken as the worst value (=0) of the indicator. On the other

hand, the lowest reported birth rate is nearly 7.9 recorded in case of U.S.S.R.. This is therefore, taken to be the best (=100) value of the indicator.

$$\text{Index of BR} = \frac{60 - \text{Actual BR}}{0.521}$$

iv. IMR : It is defined to be the number of infant deaths per thousand of live births per year. Morris and McAlpin (1982) had taken 229 as the worst value of this indicator arguing that it was the highest reported rate. But our examination of the country data reveal that even in late sixties and early seventies the IMR was as high as 263 in some of the countries of South Africa and Kampucnia of south east Asia (U.N.Demographic Year Books). Therefore, we have taken 263 as the lower end (=0) of the index. The lowest reported IMR is in case of Japan and Sweden which is 7 per thousand live births. Thus the upper end (=100) is taken to be 7 for this indicator. The formula for converting the value of IMR in to an index number is :

$$\text{Index of IMR} = \frac{263 - \text{Actual IMR}}{2.56}$$

v. & vi. MLR And FLR : Male Literacy Rate and Female Literacy Rate are measured in terms of percentage of their respective population. A person who can read and

write is considered to be a literate person as per census definition. In order to consider the effective literacy rate we have excluded the population of 0-4 from the denominator as well as numerator. Literacy is almost hundred percent in countries like Canada, U.S., Sweden etc. which is therefore taken to be the upper end (=100) of the index. On the other hand, literacy rate is quite low in countries like Afghanistan, Etheopia, etc. particularly female literacy rate is so low that we have considered 0 as the lower end of the index. Since 0 and 100 are the lower and upper end of these indexes, the indexes are identical with the percentage of literates to their respective population.

Thus indexes of MLR and FLR are :

$$MLR = \frac{\text{Literate Males}}{\text{Total no. of males}} \times 100$$

and

$$FLR = \frac{\text{Literate females}}{\text{Total female population}} \times 100$$

vii. CWPR : Child worker participation rate is defined to be the number of 'working' children per hundred of population of children of that age. We have excluded the population of 0-4 years for this purpose. The data of different less developed economies reveal that in some

of these countries, almost one third of the children are engaged in one or the other type of work which can be considered as child-labour. On the other hand, in countries like U.S. and Sweden the extent of child-labour is quite negligible.*10 Therefore, 0 is taken to be the upper end (=100) of the index and 30 is taken to be the lower end (worst value) of this index. The formula for constructing an index of CWPR is

$$\text{Index of CWPR} = \frac{30 - \text{Actual CWPR}}{0.30}$$

viii. MPRNA : It is defined to be the total number of males employed in non-agriculture sector as a percentage of total population of males of that age. We have excluded the population 0-4 for this purpose. The value of MPRNA was nearly 45 (if we exclude the population 5-14 it will be still more) in developed economies like Japan, U.S. and Canada in the years after 1950's.*11 On the other hand, the poorest performance in this regard is taken to be 5 which is observed in some of the least developed economies of

---

* 10 See, report IV of the 57th Session of International Labour Conference, Geneva, 1972.

* 11 The figure for MPRNA in developed economies appears to be small since it includes the population of age 5-14.

the world after 1950's. The formula for constructing an index is :

$$\text{Index of MPRNA} = \frac{\text{Actual MPRNA} - 5}{0.40}$$

ix. CR : Crime rate is measured as number of cognizable reported crimes per lakh of population. We have considered only the major crimes viz. murder, decoity and housebreaking for this purpose, since the data on other categories are likely to be more unreliable for certain states in India. We could not obtain the data for many countries on this indicator and hence arbitrarily considered 0 as the best value of this indicator. Similarly the worst value of this indicator was taken to be 100 per lakh of population. The index number of CR is calculated with following formula :

$$\text{Index of CR} = \frac{100 - \text{Actual CR}}{1}$$

x. FMAM : The females' mean age at marriage was found to be quite low in countries like India, Pakistan, Bangladesh etc. For instance in India, in some of the states like Bihar and Rajasthan it was less than thirteen years during some of the years around 1950's. Therefore, 12.5 is taken to be the lower end (worst) of this indicator. On the other hand, in countries like Norway, E. Germany, France etc. the FMAM is about 24 years (see, Mitra, 1978). This age can be

considered to be the ideal age for marriage since not only that the females can become economically independent by this age but their fecundity is likely to be lower as compared to the age between 16 and 22. Thus marriages at this age may help to reduce birth rate and even infant mortality rate (see Chapter III). Though the minimum age prescribed by the statutory law is 18 years for females, authors like Mitra (1978) feels that it should be more than 20 years. The index of FMAM is calculated with the help of following formula :

$$\text{Index of FMAM} = \frac{\text{Actual FMAM} - 12.5}{0.115}$$

xi. PBP : Persons who are consuming less than 2250 calories are considered to be the persons below the poverty line.*12 Making use of NSS consumer expenditure data number of scholars have attempted to estimate the poverty ratio in various Indian states (see Dandekar and Rath, 1971; T.N.Srinivasan and P.K.Bardhan, 1978). The major problem in obtaining the data on poverty ratios is that the sets of data which are available from individual studies are not strictly comparable spatially as well as temporally.

---

* 12 According to Planning Commission (1978, p. 3), all those people who are consuming less than 2400 calories in rural and 2100 in urban area can be said to be living below the poverty line.

However, some broad conclusion can always be drawn from such studies. For the period of earlier sixties we used the poverty estimates of Dandekar and Rath but made some adjustments in the data for Kerala and Punjab as per Appendix A. Ideal value of this indicator (=100) is taken to be 0 acnieved by highly developed economies. The worst value of PBP is taken to be 75. Since there is disagreement among economists regarding the measurement and estimation of PBP, we have arbitrarily chosen the value 75 as the lower limit, for it is difficult to believe a priori that in any society even 25 per cent people are not able to consume the minimum required calories. The formula for converting the value of indicator into indicator indices is as follows :

$$\text{Index of PBP} = \frac{75 - \text{Actual PBP}}{0.75}$$

It may be recalled here that even though data on poverty, crime rate etc. are likely to suffer from some measurement errors, we have made use of them in absence of other reliable data. The rationale behind constructing a composite index of GESC is, that the combination of several indicators may reduce the measurement errors if they are random and hence may give fairly good proxy for consumption of certain basic socio-economic inputs in the society.

2.2.9 Construction of The Composite Welfare Index (CWI) : The composite index of X is constructed out of the above three component indexes viz. Health index, Basic literacy index and index of general economic and social conditions. This composite index would measure the level of consumption of basic commodity and hence the level of basic welfare (BW) in the economy as per our model. We may therefore, call the composite index of X as the composite index of welfare (CWI) also. All the three components are equally weighted for the construction of the composite index. Within each component all the indicators are equally weighted. One can use a more sophisticated technique for deriving weights by using the factor analysis or taxonomy or other methods. However, they are not without limitations and hence not attempted here.*13

It may also be argued that construction of indicator index based on the difference between maximum and minimum values (as we have adopted) may implicitly attach weight to the indicators. But authors like Morris and McAlpin (1982) feel that even if the problem of implicit weight of each indicator may arise, it is not so important at least

---

* 13 For limitations of various methods of weighting see, S.P.Gupta et al. "Indicators of Standard of Living", in REGIONAL DIMENSIONS OF INDIA'S ECONOMIC DEVELOPMENT", by U. P. State Planning Commission, Lucknow.

for two reasons. One is, that arbitrariness at some level is virtually impossible to exclude and second is, that so long as the weights used are made explicit and remain constant over time, one need not worry so much, if the basic purpose behind the exercise is to put all the countries or regions on a relative scale.

Finally it may be mentioned that though our way of measuring X is quite indirect, it appears to be the most effective way as discussed in earlier sections of this chapter.

3. Functional Relationship Between Government Effort (G) and Basic Commodity (X)

2.3.1 The Variables : Having defined out basic commodity X, so elaborately on the basis of criteria to identify X, derived from our basic framework developed in Chapter I, we may now proceed to investigate the basic determinants of X in the system. Since our purpose in this study is to enquire into the impacts of government expenditures which primarily affect the quantity of X, our approach here would be to relate different types of government expenditures to the basic commodity X.

As we have defined X, it is clear that its level at a given point of time depends on the total effort put in by

the government in the past up to the given point of time and also on other factors like geo-physical environment including the availability of water and weather conditions as well as socio-cultural, demographic and attitudinal factors in the system. This is evident because, the three aspects included in our definition of X viz. health, education and nutrition etc., are largely the matters of social consumption which in turn get affected by the government efforts in these directions, besides the various physical, locational factors and socio-cultural environmental factors. The latter category of factors primarily determines the level of the basic relationship between the government effort and the quantity of basic commodity X. To draw a similarity of such a function with the familiar production functions in economic theory, we might say that the category of factors like physical-location, and socio-cultural environment define the nature and level of technology, while the government efforts can be considered as equivalent to inputs for the given quantity of basic commodity X as the output. We may now present the postulated functional relationship symbolically.

$$X_t = F\ (G_t,\ Z_{1t},\ Z_{2t},\ \cdots\ Z_{nt}) \qquad (1)$$

Where, X_t is the level of basic commodity X at time t.

G_t is the cumulative stock of Government effort upto time t.

Z_{1t}, $Z_{2t} \cdots Z_{nt}$ are various geographic, locational, physical environmental and socio-cultural-attitudinal factors at time t.

From equation (1), it can be seen that it is empirically a very difficult proposition to (i) clearly identify various determinants of X, (ii) having identified the determinants, to measure them in quantitative terms and (iii) to get appropriate functional form to fit the data which are available neither over a long time series nor across sufficient number of regional units. Moreover, as it is clear from our definition of G in equation (1) above, to fit equation (1) empirically, we would require estimation of the accumulated stock of government efforts up to the time t. This in itself is a herculian task and probably too ambitious to be accomplished satisfactorily in any economy. On the other hand, our interest is not in the level of this basic relationship as described in equation (1). From the point of view of effective government intervention through well defined policy changes based on the right choice of strategies, the crucial variables are necessarily defined in terms of flow aggregates rather than the stock of government effort. In other words, from the point of view of policy the government would be controlling the flow of annual expenditure to effect changes in its accumulated stocks over time. The current annual expenditure by

government can be viewed as the time derivative of the stock aggregate G. This requires us to consider our model in terms of the first derivative of equation (1) with respect to time :

$$\dot{X}_t = F'_G \cdot \dot{G}_t + F'_{Z1} \cdot \dot{Z}_{1t} + F'_{Z2} \cdot \dot{Z}_{2t} + \ldots + F'_{Zn} \cdot \dot{Z}_{nt} \qquad (2)$$

Where F' with different suffix represents the partial derivative of the function F(...) with respect to the letter denoted by the suffix; and a dot over the letter represents as usual the time derivative of the variable. If we assume only the annual changes in different variables under consideration, we are not likely to find considerable or significant changes in the physical locational and socio-cultural environmental factors - $Z_{1t} \ldots Z_{nt}$ implying either zero or negligible values of $\dot{Z}_{1t}$, $\dot{Z}_{2t} \ldots \dot{Z}_{nt}$. We may therefore, be justified in ignoring these values and simplifying the equation (2) as

$$\dot{X}_t = F(\dot{G}_t) \qquad (3)$$

It should be noted here that such a simplification is valid only when we are studying the changes in the aggregates over a relatively shorter period of time when we can justifiably ignore the changes in $Z_{1t} \ldots Z_{nt}$. Over relatively longer periods of time, however, these changes in environmental factors - $Z_{1t} \ldots Z_{nt}$, are likely to assume

significant dimensions and hence, equation (3) needs modification. A careful examination of equation (2) clearly indicates the type of modification required in equation (3) if relatively longer period of time is considered for the application of equation (3). Thus, when $\dot{Z}_{1t} \ldots \dot{Z}_{nt}$ are significant, the level of relationship between $\dot{X}_t$ and $\dot{G}_t$ as described by equation (3) is likely to shift over time depending on the net effects of changes in the environmental factors. The level of the relationship can change either because the intercept changes or because the slope parameter changes. It is clear from equation (2) that the levels of environmental factor $Z_{1t} \ldots Z_{nt}$ enter not only as the determinant of the intercept of the relationship but also the slope of the relationship between $\dot{X}_t$ and $\dot{G}_t$ as described by equation (3). Thus, it is an empirically testable proposition whether environmental factors have played any significant role in the net or in the ultimate sense to significantly affect the level of the relationship as described in equation (2) over time. As will be discussed later, we have also attempted to test this hypothesis in our study.

2.3.2 Interpretation of The Slope and Intercept : Having established the primary functional relationship for empirical testing in equation - (3), we should now examine how we can interpret the slope and the intercept of this function. The

intercept of the function would represent the autonomous rate of change in the quantity of basic commodity X, reflecting the direction and magnitude of the interplay of various factors in the private economy. The intercept, in other words, represent the annual change in X_t independent of the changes in government efforts.

As far as the slope of the function as defined in equation - (3) is concerned, we might proceed as follows from equation - (2) :

$$\dot{X}_t = F'_G \cdot \dot{G}_t + F'_{Z1} \cdot \dot{Z}_{1t} + \dots + F'_{Zn} \cdot \dot{Z}_{nt}$$

As we have already discussed, we assume $\dot{Z}_{1t} \dots \dot{Z}_{nt} = 0$.

$$\therefore \quad \dot{X}_t = F'_G \cdot \dot{G}_t$$

Differentiating both the sides with respect to t,

$$d\dot{X}t/dt = d^2X_t/dt^2 = F'_G \, (d^2G_t/dt^2)$$
$$+ (\dot{G}_t) \, (F''_G \cdot \dot{G}_t + F''_{Z1G} \cdot \dot{Z}_{1t} + \dots + F''_{ZnG} \cdot \dot{Z}_{nt})$$

$$\therefore \quad d^2X_t/dt^2 = F'_G \, (d^2G_t/dt^2) + F''_G \, (dG_t/dt)^2 \qquad (4)$$

Since $\dot{Z}_{1t} = \dot{Z}_{2t} = \dots = \dot{Z}_{nt} = 0$ by assumption.

If we assume further that $\dot{G}_t$ remains constant over time under consideration, i.e. $d^2G/dt^2 = 0$, we may simplify the equation (4) as :

$$d^2X_t/dt^2 = F''_G\ (dG_t^2/dt^2)$$

$$\therefore \quad d^2X_t/dG_t^2 = F''_G \qquad (5)$$

However, d^2X_t/dG_t^2 can also be represented as the first derivative of the function in our equation (3) i.e.

$$d\dot{X}/d\dot{G}_t = d^2X_t/dG_t^2$$

$$\therefore \quad d\dot{X}_t/d\dot{G}_t = F''_G \qquad \text{using equation (5).}$$

From this derivation, it is clear that if we measure our variable $\dot{G}_t$ appropriately to ensure that $d^2G_t/d_t^2 = 0$, then, we can interprete the slope of our primary function in equation (3) as the second order partial derivative of the fundamental functional relationship between X_t and G_t. As it is welknown, in the tradition of usual production function frame, the second order partial derivation of output (X) with respect to inputs (G_t) are interpreted as showing the direction of the marginal returns to the basic inputs. In our case therefore, the slope of our function as described in equation (3) can be interpreted as showing the direction of marginal returns to the government efforts. If the slope is positive, it implies increasing marginal returns to the government efforts; if the slope is negative, it implies diminishing marginal returns to government effort; and if the slope is zero, it implies constant marginal returns to government efforts. Thus, if our interest is in

testing the direction of the marginal returns to government efforts through equation (3), the most appropriate functional form for equation (3) could only be a linear one since the linear form which implies constancy of the slope is the most suited form to test the null hypothesis of constant marginal returns to government efforts with the well defined alternative hypotheses of increasing/decreasing marginal returns to government efforts.

It may finally be noted in the context of interpreting our functional relationship described in equation (3) that we are not explicitly testing the sign or the magnitude of the marginal productivity/returns of/to the government efforts. It is assumed to have the expected sign and a level which is determined by host of factors as described in equation (1). From the policy point of view the most pertinent questions are not regarding the level of marginal returns but concerning the sign or direction of marginal returns to the government efforts. If the returns are constant or increasing, the government can hope to achieve its desired goals by accelerating the pace of its efforts in the specified direction. On the other hand, if the returns are diminishing, extra effort on margin is likely to yield lower returns, unless efforts are made to ensure reversal of diminishing returns in the specified direction.

4. Measuring $\dot{G}$ and $\dot{X}$

From the discussion of our framework so far, it clearly emerges that from the point of view of both empirical estimation and policy making, we have to consider as our crucial variables the time derivative or the annual flows in our basic variables of X_t denoting the quantity of basic commodity X and G_t, the accumulated stock of government effort. The time derivates or the annual rates of change in X_t and G_t, moreover, have to be so taken that we can meaningfully and usefully interpret the empirical findings. In this section, we propose to discuss the precise way of measuring $\dot{G}_t$ and $\dot{X}_t$ consistent with our framework.

2.4.1 Measuring $\dot{G}_t$: As we have defined our variable G_t - the stock of cumulative government effort up to point t - the annual rate of change in this stock is obviously the rate of government expenditure in real terms. This is because any meaningful measure of accumulated government effort has to be in real terms or at some base period constant prices. The flow of annual expenditure by government should also therefore be measured at constant prices. Since we are not required to estimate the cumulative stock of government effort in order to operationalise our model, we can choose any convenient base period prices to measure the real government expenditures. Considering the availability of data, we have chosen 1960-61 as the base year.

As it is well known, the data on government expenditure are invariably available in value terms at current prices. In order to convert these current price figures into the corresponding constant 1960-61 price figures, like several other studies in the field, we have made use of the implicit deflator of overall State Domestic Product (SDP) the estimates of which are readily available/derivable from the publication of estimates of SDP at current and constant prices made by different State Statistical Bureaux.

Apart from the non-availability of data on sector/commodity specific comparable and consistent details of both, allocation of expenditure and price trends at the state level in India over time, the basic justification for using the overall SDP deflator to convert the flow of government expenditures at current prices into the corresponding flow at constant prices, stems from the fact that these are expenditures on revenue account. Expenditures on revenue account are those expenditures of the state governments, which are met out of tax collections and other receipts. Thus the effort of the government measured in terms of the expenditures represents recnannelisation of resources - both physical and financial - in the whole economy.

Since our basic variable G is defined in terms of stock of accumulated government effort, and not as a

physical stock of capital created by government, the government effort in real terms should be more adequately measured at the point of withdrawal of the resources rather than at the point of expense. It seems more logical, therefore, to deflate the current price estimates by the changes in the overall purchasing power rather than commodity or sector specific price changes.

It may also be noted that we can measure the cumulative government effort in any economy adequately only when we adjust for the size of the economy. The same absolute total government effort of say Rs. 100 in two different economies with a population size of 50 and 100 respectively, cannot be considered on par, as far as its determining influence on the consumption of basic commodity X_t in our framework is concerned. We can argue in fact that expenditure of Rs. 100. in an economy with a population of only 50 is almost twice as important as the expenditure of Rs. 100 in an economy with population of 100 persons, so far as the impact on the consumption of X_t is concerned. Thus the government effort should be measured on per capita basis rather than in absolute total terms. The time rate of change in G_t viz. the annual expenditures in real terms should also be measured in per capita terms.

As we have already discussed in the previous section, the slope parameter of equation (3) can be meaningfully interpreted as reflecting the direction of marginal returns to government efforts only when we assume that the annual rate of change in government expenditure is zero. In other words, we should measure $\dot{G}_t$ in such a way as to ensure constancy of annual government expenditures over the time under consideration of the study. Since our simplification of equation (2) into equation (3) requires us to confine ourselves to the study of relatively short periods of time, we propose to divide the whole twenty year period - 1960-61 to 1980-81 into two small sub-periods of (i) 1960-61 to 1970-71 and (ii) 1970-71 to 1980-81. In order to ensure constancy of $\dot{G}_t$ over these sub-periods, we can take a simple arithmetic average of annual per capita real government expenditures over the ten years in each of the sub-periods. This would eliminate purely short-term fluctuations in real government expenditures on per capita basis and yet retain the basic feature of the change in the government effort on annual basis. In terms of the cumulative government efforts, our assumption of taking the average per capita real government expenditure for each of the year during the respective decades does not violate any consistency norms. Thus, taking annual average of per capita real expenditures over the sub-periods enables us to consistently measure our

exogenous variables and also facilitate meaningful interpretation of regression parameters for policy purposes.

Finally, we may note that the government expenditure on revenue account at state level are available by various economic and functional categories from the Researve Bank of India Bulletins and Combined Finance And Revenue Accounts Of The States And Union Government. These categories have been changing in terms of their scope and definition over years. A detailed painstaking exercise to ensure broad comparability in these classifications for major state economies in India was carried out by Rajachandrasekhar (1981). For the purpose of the present study, we have accepted his adjustments and broad categorisation which very closely confirms to the current classification in vogue in the RBI Bulletins. His study provides comparable and consistent data on government annual expenditure by different categories, both at current and constant (1960-61) prices from 1957 to 1977-78. Following the same method we have extended his series to the period 1980-81. We have considered the following categories of government expenditures for our study :

(a) Total revenue expenditure on Social And Community Services, often referred to as Expenditure on Human Capital (EHK).

(b) Total revenue expenditure on 'Economic Services',

often referred to as Expenditure on Physical Capital (EPK).

(c) Four major sub-categories of revenue expenditure on social and community services (EHK) viz.;

i. Expenditure on Primary Education (EPE)

ii. Expenditure on Education other than Primary Education (EOE)

iii. Expenditure on Medical, Health and Family Planning (EMHF)

iv. Expenditure on other social and community services (EOSCS).

(d) Four major sub-categories of revenue expenditure on Physical Capital (EPK) viz.;

i. Expenditure on Agriculture and Allied Services (EAG)

ii. Expenditure on Industry And Minerals (EIM)

iii. Expenditure on Water And Power Development (EWPD)

iv. Expenditure on Transport And Communication (ETC)

Further details of the above expenditure heads are given in the Appendix-A.

Strictly speaking, government expenditure includes expenditure made by the central government. State government, urban local self-govemment and the Zilla, Taluka and Village Panchayats. But we have considered only those expenditures that are routed through the state government together with those made directly from the state revenues. Out of total public expenditure on any sector, we have considered only revenue expenditure and excluded the capital expenditures. Revenue expenditure is the expenditure which is defined to be the expenditure met from the proceeds of taxation and other receipts classified as revenue. On the other hand, when the expenditure is met usually from borrowed funds for the creation of physical or financial assets, it is called capital expenditure. There are various problems regarding data on capital expenditure of various sub-categories due to change in classification of government expenditures after 1973-74 and recording system of this data. Hence, we used the data on revenue account only for the purpose of our illustrative exercise.

The generation of our exogenous variables namely expenditure variables thus involves the following steps :

i. To convert the various current expenditure of government in to constant (1960-61 prices) expenditures.

$X^*_{t+n} = X_{t+n} - 100$ = Disparity between the actual welfare and the ideal welfare at the end of the period.

$X^*_t = X_t - 100$ = Disparity between the actual welfare and the ideal welfare at the start of the period.

And X_{t+n} and X_t are the levels of index X at time t+n and t.

The calculation with this formula would have yielded negative results, had we, for the sake of convenience, not reversed the sign. Thus in the ultimate calculation improvement in welfare would give positive DRR and deterioration in welfare would give negative DRR. Similarly a higher DRR would indicate a rapid annual reduction of the disparity between the actual and the ideal welfare and vice versa.

Using the above formula, we calculated the DRR for all the indicator indices viz. Component indices and Composite welfare indices for the period 1961-71 and 1971-81.

The generation of endogenous variables namely, the DRR in various individual, component and the composite indices of socio-economic indicators thus involves the following steps.

i. To convert the individual indicators in to the indices with the help of the formulae given in Section 2.2.8 such that the improvement in an index

would reveal the improvement in the welfare and vice-versa. This is done for three periods viz. 1961, 1971 and 1981.

ii. To combine the individual indices in to three component indices viz. (i) health (ii) education and (iii) general economic and social conditions, by giving appropriate weights.

iii. To combine the component indices in to a composite welfare index viz., CWI, by giving appropriate weights to component indices.

iv. To calculate the average annual DRR in each indicator index with the help of formulae given in section 2.4.2; between 1961-71 and 1971-81 for all the States. Tables 2.3 and 2.4 below present the data for the endogenous variables for the two sub-periods viz. 1961-71 and 1971-81.