ECONOMIC REGIONALIZATION OF INDIA
1960-61 AND 1970-71
A STUDY IN QUANTITATIVE METHODS

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Introduction

A massive investment programme has been undertaken in India through the process of planning. But the effects of such investment on economic growth are worked out only at the aggregative level for the country as a whole; its contribution to the growth of the different regions in the country is yet to be adequately understood. Now, for a large country like India with significant regional disparities in the level of living, an essential objective of development policy should be to reduce the existing economic inequality between the regions — in particular, the inequality in the level of living. The priority given to certain key projects in the country led to an early multiplication of national income and the redistribution of the same was thought necessary to reduce the inequality in level of income and hence in level of living. The need for forming stable regions which can themselves generate income through their existing economic activities and need not depend on the system of redistribution of national income has not received the importance it deserves.

The object of this study is to provide a systematic approach for evaluating the levels of overall and sectoral economic activities prevailing in the districts of the country for 1960-61 and 1970-71 so that we can observe the growth process of the regions and the causal factors relevant to it. Levels of economic activity will mainly be measured on the basis of employment as the objective of planning should be to raise the standard of living by creating more employment. The delineation of economic regions on the basis of overall economic activity is, therefore, a prime objective in our study. Overall economic activity consists basically of the activities of two sectors — agriculture and non-agriculture. We shall say that a region has a balanced combination of activities if the levels of agricultural and non-agricultural activities are close to each other.

Secondary and tertiary activities, being the vital parts of non-agricultural activity, can properly grow only if there is favourable growth of agricultural activity. Since tertiary activity is dependent on the flow of output from secondary activity, it follows that there should be a balanced emergence of secondary and agricultural activities. These two kinds of activity are to a great extent mutually dependent. They need to be given special attention and analysed in greater depth. Agricultural activity has to be examined with special reference to the pressure of labour on agriculture and the role of inputs in promoting agricultural production. The study of secondary activity, on the other hand, will be concerned with the concentration of industrial activity with a special reference to its two components, small and large industrial activity, taken separately.

The study has been divided into six chapters of which the first discusses the different studies relevant to our study. It also includes a review on the limitations of the methodology adopted in these studies. The second chapter deals with the identification of economic regions on different levels of overall economic activity. For every sector of activity, important spatial variables are suitably chosen so that they together represent the magnitude of the level of activity of the sector concerned. The variables for each sector are combined into a single index to indicate the level of sectoral activity. The sectoral indices are then combined into a composite index which represents the level of overall economic activity. It might be observed that at each stage of our analysis we need to use suitable indices to classify the regions according to the different criteria adopted. The conventional indices are not always helpful in this regard. We shall therefore devise a set of indices which reflect adequately the role of the relevant economic characteristics under study. The indices are worked out on the basis of principal component analysis through a number of stages. The methodology for the construction of the indices is also discussed in Chapter 2. This chapter also includes the analysis of the relationship between overall economic activity and per capita income. This analysis identifies the regions where the levels of overall economic activity and income do not coincide.

In Chapter 3, our analyses will be concerned with agricultural activity with special reference to agricultural labour. We attempt to construct an index of labour absorbability in agriculture depending on which the levels of labour pressure for the different districts will be evaluated for the two time points 1960-61 and 1970-71. The next step of our investigation is concerned with the relationship between the levels of agricultural activity and agricultural labour pressure at the regional level. Further, the role of the growth rates of agricultural labour, agricultural production and cropped area in explaining the level of the growth rate of agricultural labour pressure prevailing during the period is analysed. Since agricultural production is the main factor which helps in the absorption of agricultural labour, the respective extents of contribution made to the growth rate of production by growth rates of agricultural labour, productivity of land, productivity of agricultural labour, cropped area and cropped area per unit agricultural labour are derived for Indian agriculture as a whole.

Productivities of land and labour are two important factors in an analysis of agriculture. It is therefore proposed to examine the effects of inputs i.e., the use of fertilizer and the extents of irrigation and rainfall to explain the change of productivity of land as well as of labour. The role of technological factors in addition to that of natural phenomena like rainfall will be clear from the analysis.

Chapter 4 takes up the analysis of secondary activity with special reference to the large factories, the concentration of large factories in spatial units being regarded as providing the main impetus to the growth of industrial and related activities. For different groups of industries taken in turn, concentration indices for industrial labour derived by the aggregation of absolute and relative location factors of the group of industrial labour under consideration, are used to identify the regions under different levels of industrialization. In our analysis, total industrial labour (excluding household industries) is disaggregated into two kinds of labour. These may be called small factory labour and large factory labour — factories which employ less than 100 labour being classed as small and the rest as large. The labour in large factories is further split up into five groups corresponding to five broad groups of industries. There are two phases in our analysis. In the first phase, the regions of different levels of secondary activity are analysed in the light of the levels of concentration indices of small factory labour, large factory labour and total industrial labour (other than household industries). The pattern of development of small and large industrial activity is thus made clear. In the next phase, the regions derived by the level of the concentration index of large factory labour are examined to find out the patterns of concentration of large factory labour in five different groups of industries. From the above analyses we identify the non-traditional industrial regions and the patterns of occurrence over spatial units. This analysis refers to the year 1970-71.

In Chapter 5, we derive some results relating to the equal weighting system of aggregation of variables (Pal, 1971). In addition, we provide some results on two-stage use of the system. The two-stage method of aggregation of variables is required for controlling the associations between the variables and the index to be constructed according to the a priori economic hypotheses which indicate the purpose of the index.

Chapter 6 presents the summary of our findings. The dominant features of the economic regions are summarised in this chapter.

CHAPTER 1

An Overview of Methodology

1.1 Objective

The objective of our sutdy is to present a systematic analysis of the problem of economic regionalization of India. Several authors have treated separate aspects of the problem. We have sought to improve upon the methods of analysis in the course of our study in a number of directions. Another important feature of our study is that we have endeavoured to bring together different dimensions of causal relationships to explain any given level of economic activity. In this chapter we shall examine (i) the methodological aspects of those studies which have some bearing on our study, and (ii) the coverage of these studies. The discussion will also help to explain the approach followed in our study.

1.2 Overview

In Chapter 2 we have analysed the regional pattern of economic activity by means of an index of overall economic activity. Pal (1963, 1975) attempted a similar analysis to obtain a 'development index' for 1960-61 over the Indian districts. Mitra (1965, 1966) also carried out the same type of study in a different mode. Pal (1963, 1975) did not impose any restriction based on a priori economic considerations or hypotheses on the variables constituting the development index while Mitra's work (1965, 1966) suffers from a lack of rigour in the selection of the variables and subjectivity in the treatment of relationships among the variables. Mitra (1965, 1966) has not considered givin any sort of weights to the variables concerned, so that it is not known how much of the variations of the constituent variables has been borne by the unweighted aggregated index. Moreover, the extent of representation by each variable in terms of its association with the aggregated index is not evident. Mitra (1965, 1966) also appears to implicitly make certain assumptions which are difficult to justify on a priori grounds — for example, he appears to assume a positive association between the proportion of persons belonging to a scheduled caste or scheduled tribe and the level of development. This is not borne out by the facts; on the contrary, there exists a negative association between the two variables (see also Pal (1974)). Schwartzberg (1962) also attempted to rank Indian States (or State-groups) by constructing a development index on the basis of a subjective weighting system. Pathak, Aziz and Chattopadhyay (1970) carried out a similar study of the districts of the States of Bihar, Orissa and West Bengal to identify the planning areas. But there was no control on the weights relating to the variables. Comparative studies for 1960-61 to 1970-71 have been undertaken by Patnaik and Chattopadhyay (1975), Sharma (1975) and De (1976) on the districts of the States of Orissa, Rajasthan and West Bengal respectively. Moreover, all the studies, including those of Pal (1963, 1975) and Mitra (1965, 1966), are principally analyses of activities, though frequently the term 'development' has been used by taking into account some variables on social amenities. Comparability over time in the analyses by Patnaik and Chattopadhyay (1975), Sharma (1975) and De (1976) is lost owing to two kinds of errors — (i) definitional adjustment for agricultural workers over time has not been incorporated, and (ii) indices for economic activities have not been derived from a common statistical framework. The definitions of agricultural workers for the two time points 1960-61 and 1970-71 are different in the respective Censuses as a result of which some correction is badly needed. Again, unless the same aggregation system with invariant parameters is introduced for both time points one can hardly regard the index as meaningful and comparable over time. Moreover, the studies made by Patnaik and Chattopadhyay (1975), Sharma (1975) and De (1976) for the three different States of Orissa, Rajasthan and West Bengal respectively have been conducted independently of one another and are strictly not comparable. Since the planning process in India is operated centrally and the progress of the districts in every State is dependent on centralised planning, all the districts of India should undergo similar treatment of statistical methods in order that they might be ranked suitably. This has been done in Chapter 2 of our study. Thus we shall deal with economic regionalization based on different levels of overall economic activity. But our analysis does not stop here. We intend to go further in our investigation, taking up first, agricultural, and then, secondary activity.

In Chapter 3 we have studied the role of causal factors which control agricultural activity. Minhas and Vaidyanathan (1965) attempted a study on agricultural growth in which they found the annual growth rate of cropped area to be about 1.62 per cent during 1951-61. In the subsequent period 1960-61 to 1970-71 we observe that the growth rate became as low as 0.46 per cent. Again Pal and De (1979a) found it to be

0.29 per cent during the period 1963-64 to 1971-72. But the growth of agricultural labour shows no signs of slowing down. Thus, agricultural labour is becoming a heavy burden on agricultural production and cropped area. Pal and De (1979a) have computed an index of growth rate of agricultural labour pressure during 1963-64 to 1971-72 without attempting to measure the extent of agricultural labour pressure in each of the time points. Nor have they related agricultural labour pressure with agricultural activity. We attempt, in Chapter 3 of this study, an analysis incorporating these aspects.

In discussing the influence of growth rates of labour, productivity of land, productivity of labour, cropped area and cropped area per unit agricultural labour on the growth rate of agricultural production we do not use either the 3-factor model by Minhas and Vaidyanathan (1965) or the 4-factor model by Pal (1971) or the revised 3-factor and 4-factor model by Pal and De (1979b). Additive decomposition of the growth of production is not necessary to reveal the role of each factor. As such, no mathematical decomposition is necessary for our purpose. Dandekar (1980) has already argued the demerits of these models. Pal and De (1979b) found out factor shares in changing the growth rate of agricultural production for 1963-64 to 1971-72. But that does not give us much evidence in establishing our findings as their definitions of basic factors differ from that of the factors in our study. They used the components of 3-factor and 4-factor models whereas we use the simple growth rate of every attribute as factor.

In Chapter 4, we take up the analysis of secondary activity in the light of concentration of different industrial activities. Pal (1974), Karan (1957, 1964), Karan and Jenkins (1959) and Pathak (1975) carried out studies on identification of traditional industrial regions. These mostly relate to the time point 1960-61. In Chapter 4, our study relates to the time point 1970-71. Moreover, our emphasis is on separately studying the concentration of labour in large and small factories for all the districts of the country. Also, we have classified the large factories into a number of groups. It may be noted that our definition of the large and small factories will not compare with that adopted in other studies.

In Chapter 5, we suggest a method of aggregation that is more helpful in satisfying an a priori objective that an index may be required to fulfil. Kendall (1939) and Pal (1971) have suggested two methods of aggregation of variables. Pal's method provides the equal weighting system and Kendall's method the unequal weighting system. These are useful in deriving regional indicators. But the drawback of the two methods is that none of them may yield an indicator in accordance with some a priori objective.

CHAPTER 2

Regional Analysis of Overall Economic Activity

2.1 Introduction

The object of the present study is to provide an analytical method which can improve our understanding of the pattern of economic growth in different regions of India. It is intended to present here an index of overall economic activity for the individual regions that can provide a guideline to policy makers for regulation of investment patterns in accordance with the objective of regional development.

We have attempted to identify the level of spatial units in terms of existing economic activity in 1960-61 and 1970-71. Overall economic activity is primarily disaggregated into two broad sectors — (i) agricultural sector, and (ii) non-agricultural sector. The latter is again sub-divided into three sectors — (iia) secondary sector, (iib) tertiary sector, and (iic) urban sector. Firstly, for every sector, an index is derived to indicate the level of the sectoral activity. Secondly, a composite index for non-agricultural activity is obtained on the basis of indices for secondary, tertiary and urban activities. It indicates the overall level of non-agricultural activity. Thirdly, by combining the index for agricultural activity with that for non-agricultural activity, an index for overall economic activity is worked out. It will be possible for us to provide estimates of per capita income for the spatial units on the basis of the index for overall economic activity and the total income of the States so as to relate them in determining the levels of regional development.

2.2 Spatial and Temporal Coverage, Variables and Data Sources

2.2.1 Spatial and temporal coverage

We have taken 323 districts for agricultural activity and 334 districts for non-agricultural activity for our consideration. Three cities — namely Bombay, Calcutta and Madras — are excluded in the study of agricultural activity because it is absent or negligible there. Moreover, there are 8 districts — Uttar Kashi, Chamoli, Tehri Garwal, Garwal, Pithoragarh, Almora, Chandigarh and Goa-Daman-Diu considered for non-agricultural activity but not for agricultural activity due to non-availability or unreliability of agricultural data. Again, in our analysis, a small part of India is not taken into account owing to the fact that no reliable data is available for that part. They are hilly districts or Union Territories. The study refers to two time points 1960-61 and 1970-71. Therefore, there are 646 observations for agricultural and 668 observations for non-agricultural activities. It may be noted that districts which did not undergo any major change in boundary are considered as the spatial units in the study. Of course, small States like Tripura or Union Territories like A and N islands, Delhi etc., are also considered as spatial units.

2.2.2 Description of Variables

The following variables are considered under different economic sectors.

A. Agricultural activity[0/]

X_1 : Productivity of land.

X_2 : Productivity of agricultural labour

X_3 : Percentage of irrigated area in total gross area sown.

X_4 : Soil response index[1/].

B. Secondary activity

X_5 : Density of labour in secondary sector per sq. km.

X_6 : Share of labour in secondary sector per thousand of total labour.

X_7 : Share of labour in large factories per thousand of labour in secondary sector.

X_8 : Density of labour in large factories per hundred sq. km.

X_9 : Average size of labour of large factory in thousands.

X_{10} : Density of large factories per thousand sq. km.

0/ The variables in agricultural activity are not derived from the agricultural labour alone, for higher concentration of agricultural labour or greater share in total labour does not indicate a higher level of agricultural economic activity. They remain mostly unorganised.

1/ Extending Roychoudhuri's idea [36, 37] to the aggregated physical yield rate of five crops, namely Rice, Wheat, Jowar, Bajra and Ragi, a soil response index is derived by dividing aggregated physical yield rate of five crops corresponding to every spatial unit by all-India aggregated yield rate of the crops for 1960-61 and 1970-71 to make it free of units of measurement.

C. Tertiary activity

X_{11} : Density of labour in tertiary sector per sq. km.

X_{12} : Share of labour in tertiary sector per thousand of total labour.

X_{13} : Density of labour in trade and allied sector 2/ per sq. km.

X_{14} : Share of labour in trade and allied sector 2/ per thousand of total labour.

D. Urban activity

X_{15} : Share of urban population per thousand of total population.

X_{16} : Density of urban population per sq. km. of total area.

X_{17} : Density of urban population in thousands per sq. km. of urban area.

X_{18} : Average size of population of town in thousands.

2.2.3 Data sources for agricultural variables

As many as 23 principal crops are taken into consideration. They are — (1) Rice, (2) Wheat, (3) Jowar, (4) Bajra, (5) Maize, (6) Ragi, (7) Barley, (8) Gram, (9) Tur, (10) Potato, (11) Black Pepper, (12) Dry Chillies, (13) Dry Ginger, (14) Groundnut, (15) Mustard and Rapeseed, (16) Sesamum, (17) Linseed, (18) Castorseed, (19) Sugarcane (gur), (20) Cotton, (21) Jute, (22) Mesta, and (23) Tobacco and relate to 1960-61 and 1970-71. Total agricultural production is computed in value terms using all-India average market period prices of principal crops for the triennium centered at 1961-62 [10]. The sources of data relating to yield, area of the crops,

2/ Trade, commerce, storage and repairing activities are together termed as trade and allied sector.

and the extent of irrigation are various State Crop Season Reports, State Statistical Abstracts, District Handbooks, various issues of Agricultural Situation of India and Estimates of Area and Production of Principal Crops in India. The source of data for agricultural workers is the Census of India 1961 and 1971. The definition of agricultural workers were however different for the two Censuses. A substantial volume of non-workers had been termed as workers in the 1961 Census due to the somewhat loose definition adopted. The bulk of agricultural workers as defined in the 1961 Census could be presumed to be the disguised unemployed. In order to retain comparability over the two Censuses, the data for agricultural workers in the 1961 Census was adjusted by a suitable method for applying the definition of agricultural workers in the 1971 Census. Having adjusted the district areas of the 1961 Census that underwent changes during 1961-1971 in accordance with that of the 1971 Census, Pal, De and Malakar [29] arrived at a revised estimate for agricultural workers in 1961 which are comparable with those in the 1971 Census on the basis of some reasonable hypotheses.3/ We use the revised estimate of agricultural workers and consequently the revised estimate of total workers.

3/ The hypotheses were as follows.

(i) Agricultural activity being predominantly carried out in rural areas, the growth of agricultural workers in 1971 over the revised 1961 estimate should be compatible with that of the rural population,

(ii) The less developed areas contained a larger proportion of persons nominally engaged in gainful occupations and thus, over-reporting of agricultural workers is more likely to be present there.

It was further assumed that the 1961 revised estimate would be a linear function of 1961 unrevised estimate depending upon the

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2.2.4 Data sources for non-agricultural variables

The main source of data for non-agricultural variables is the Census of India. The districtwise data on large factories and their workers is not available in the Census of India. They are collected from the Annual Survey of Industries, the Labour Bureau and the various reports like State Statistical Abstract, Economic Review etc. They are related to 1958 and 1970-71. Large factory is defined as a factory where the size of workers is not less than 100. Secondary activity here excludes household industry.

The defence forces, in the Census of India, are categorised in "Other services" of the tertiary sector. If defence forces are taken into account it is possible to show border districts or areas inhabited by military personnel as highly economically active which would be a distortion of facts. If trade, commerce, storage and repairing activities are termed as trade and allied activity (as followed henceforth), a reasonable decision would be to derive variables from trade and allied activity so as to restrict the adverse effects of "Other services" due to the inclusion of defence service in the tertiary sector.

2.2.5 Data sources for State-level per capita income

The Statewise income data for 1960-61 and 1970-71 are collected from various State Statistical Abstracts and the Central Statistical Organisation. They are deflated according to 1960-61 prices using general price index for the States. The State income is available for 20 States

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Footnote 3/ contd. from previous page -

level of development of the concerned district in 1961 with the restriction that the revised estimate cannot exceed the original Census estimate and that the limiting value for the revised estimate should be zero when the Census estimate tends to zero.

including Union Territories for two time points. Thus, the data consists of 40 observations covering 1960-61 and 1970-71.

2.3 Method

2.3.1 Procedure of transformation of variables

If there be k variables (X_1, X_2, ..., X_k) under consideration for characterisation of levels of economic activity, P_i ($i = 1, ..., N$) denotes a point representing the ith observation (X_{1i}, X_{2i},...., X_{ki}) in k-dimensional Cartesian space. Unless all the points P_i remain in the same direction, the essence of aggregation of variables would be lost. If any element in the correlation matrix is found negative, then either the variable causing negativity is excluded from the system or a suitable form of the variable is chosen so as to arrive at positive correlations with all other variables. The next step is to increase the magnitude of positive linear mutual relationship between the variables by applying transformations. So far as the variables are concerned in the study, there are two kinds of variables. The first group of variables is related to approximately normal distribution and the second group to approximately lognormal distribution. After transforming the lognormal variables to approximately normal we observe that the magnitude of positive linear mutual relationship between the normal variables has improved.

To characterize the distribution pattern, some primary investigations into the data are made. For example, variables in agricultural activity for some districts in the States of Haryana and Punjab, and in non-agricultural activity for big cities in India assume exceptionally high values, where they are specialized in nature and their concentration lies in the extreme right tail of the distribution. So, ignoring the upper 2.5 per cent of observations of every variable a frequency curve is charted out to decide upon the major form of distribution. If $f(X_\alpha)$ and t_α be the α th fractile of the logarithmic transformed variable X and the α th normal deviate respectively, then the degree of relationship can be checked by the equation (2.1).

$$f(X_\alpha) = a + bt_\alpha , \qquad \ldots \quad (2.1)$$

where $0 \leq \alpha \leq 1$ and a, b are parameters for mean and standard deviation respectively of the distribution of population with respect to the variable f(X) [1].

In our system, the choice of a threshold parameter in logarithmic transformation is required for the following reason. There is a theoretical possibility of economic variables assuming zero values and therefore, incorporation of a threshold parameter is essential. But, in order to keep same starting point for both original and transformed form of the variables at zero value, the form of log function f is to be so chosen that f(0) = 0. That is, the form $f = \log_e (C.X + 1)$ is to be considered instead of $f = \log_e (X + T)$ which gives $\log_e(T)$ for $T > 0$ at $X = 0$. Therefore, the equation (2.1) needs to be revised as the equation (2.2).

$$f(X_\alpha) = \log_e (X_\alpha + T) = a + bt_\alpha$$

or

$$\log_e\left(\frac{X_\alpha}{T} + 1\right)T = \log_e (C. X_\alpha + 1) - \log_e C = a + bt_\alpha$$

where $C = \frac{1}{T}$, $T > 0$

i.e., $$\log_e (C.X_\alpha + 1) = a' + bt_\alpha \qquad \ldots (2.2)$$

where $a' = (a + \log_e C)$, T being the threshold parameter and C may be termed as threshold multiplier.

The determination process of C is twofold. Firstly, C_o as an initial value of C is so chosen that C_o multiplied by min (X), $(X > 0)$ becomes very close to unity by which the condition that the threshold parameter is a function of the least sample value [1] is not violated. Secondly, by varying C around C_o a final $C = C_1$ is achieved on the basis of significant maximum degree of multiple correlation of the equation (2.2). Without appreciably disturbing the degree of fitness of the equation (2.2), a slight modification of C_1 to its nearest integral value is sometimes found very useful as there is some advantage of realistic interpretation of the linear change C.X in this context. Thirty-nine fractile points are chosen ranging from 2.5 per cent to 97.5 per cent such that $\alpha = 2.5 + i\ 2.5$, $i = 0, \ldots, 38$, by which regression analyses for all the variables are carried out in accordance with the equation (2.2).

2.3.2 Unequal and equal weighting systems of aggregation of variables

After suitable transformations of the variables, they need to be aggregated into an index. There are two methods of aggregation — unequal weighting system [17] and equal weighting system [26]. According to the unequal weighting system [17] the aggregated index, say Z, is given by the equation (2.3).

$$Z = \underset{(r_1)}{a_1} X_1 + \underset{(r_2)}{a_2} X_2 + \ldots\ldots + \underset{(r_k)}{a_k} X_k \qquad \ldots (2.3)$$

where $X_1, X_2, \ldots, X_k$ are k variables, a_i's $(i = 1, \ldots, k)$ physical weights (see Appendix) and r_i ($i = 1, \ldots, k$) correlation coefficient between Z and X_i ($i = 1, \ldots, k$) termed as logical weight or representativeness in which we are interested (see Appendix), $\sqrt{\sum_{i=1}^{k} r_i^2/k}$ represents average representativeness of X_i's into Z and ($\sum_{i=1}^{k} r_i^2/k$)100 gives the percentage of variance explained. Mean of Z is adjusted to unity.

So far as the equal weighting system of aggregation of variables [26] is concerned, the aggregated index, say Z', is given by the equation (2.4)

$$Z' = \underset{(r)}{b_1}X_1 + \underset{(r)}{b_2}X_2 + \ldots + \underset{(r)}{b_k}X_k \qquad \ldots (2.4)$$

where $X_1, X_2, \ldots, X_k$ are k variables, b_i's ($i, \ldots, k$) physical weights (see Appendix) and r for all X_i ($i = 1, \ldots, k$) denotes the correlation coefficient between Z' and X_i for all $i = 1, \ldots, k$. r is the logical weight or representativeness of our interest associated with every variable (see Appendix). Mean of Z' is adjusted to unity. Note that r is the average representativeness of variables into Z'.

The representativeness of variables in the equal weighting system is always less than the average representativeness in the unequal weighting system of aggregation of variables. The latter may be found less efficient than the former system if it violates any of the following criteria — (i) logical weight of any variable should not be low, and (ii) logical weights of the variables are consistent with economic principles or a priori notions. Due to the structure of the unequal weighting system itself, the control over logical weights in satisfying minimum economic principles and minimum representativeness of every variable might get lost. By subgrouping the variables, two-stage use of aggregation through unequal weighting in each stage may yield results according to our desire. In the first stage, indices for subgroups are derived using the system of unequal weighting and in the second stage, the indices are aggregated into a single index through the same system. But even when the two-stage aggregation by unequal weighting fails, the system of equal weighting may yield a better result in the sense that it gives an unbiased judgement by setting all variables to a common degree of representativeness. Moreover, if one does not have any prior economic consideration it becomes a more legitimate choice. There are limitations in the applicability of this system as well. Whenever there exists a relatively high degree of correlation corresponding to a small number of variables, the average representativeness becomes drastically low. In such cases, use of two stages of aggregation through equal weighting in every stage may give better results. One needs to choose the subgroups judiciously in each specific case.

2.3.3 Model for estimation of district-level per capita income

Estimates of per capita income available at the national level or State level are convenient for our analyses. The direct estimation of per capita income at micro-level is not an easy task. But to obtain an indirect estimate of micro-level per capita income is nonetheless important. It takes into account the notion of productivity. Therefore, the index of overall economic activity that will be derived, in due course, on the basis of variables obtained from physical information will be considered suitably to get estimates of per capita income at micro-level. It yields a comparable estimate over micro-level spatial units. For this purpose we make use of direct estimate of per capita income at State level. It is available in the publications of the different State Governments and the Central Statistical Organisation.

As the first step, we derive the best functional relationship between per capita income and index of overall economic activity using State-level data in India. Using the functional form and index of overall economic activity for micro-level spatial unit we obtain tentative estimates of per capita income at micro-level. Using the corresponding State's income, the tentative micro-level estimate of per capita income is corrected so that its weighted sum by district-level population equals the State's total income.

2.3.4 Procedure of regionalization and classification

Economic regionalization could be aimed at by the index of overall economic activity. This index is characterized by the spatial and temporal levels of sectoral indices. Economic regions and isolated spatial units are classified on the basis of districtwise weighted averages of the index values for overall economic activity corresponding to 1960-61 and 1970-71. For weights, populations in the respective time points are used. Three categories of levels — low (L), medium (M), and high (H) are considered for deriving economic regions.

Regarding classification of the index for overall economic activity we take the help of histograms. For classifying sectoral indices, a reverse process of derivation of sectoral indices is followed. Regression equations can be obtained for the indices of agricultural activity and non-agricultural activity separately on the index for overall economic activity. Putting the boundary values of intervals for the index of overall economic activity in these equations, the intervals for the indices of agricultural activity and non-agricultural activity can easily be obtained. Following the same procedure one can classify all the sectoral indices.

To form economic regions of per capita income we also obtain the weighted average of estimates of per capita income corresponding to the time points 1960-61 and 1970-71 for every spatial unit (weight by population in respective time points) as we have decided for the evolution of economic regions under the index of overall economic activity. The estimate of per capita income is classified using the regression equation of per capita income on the index for overall economic activity. Puting the boundary values of class intervals for the index of overall economic activity into the regression equation we obtain the boundary values of class intervals for per capita income.

2.4 Estimation

2.4.1 Functional forms of variables after transformation

The method described in Section 2.3.1 has been applied for the variables X_1 to X_{18}. The variables X_1 to X_4 are found to be approximately normal and the variables X_5 to X_{18} are also made approximately normal after log-transformation. The relevant regression equations are cited below in the equations (2.5) to (2.36) for which degree of freedom is 1, 37.

$$X_1 = \underset{(6.76972)}{459.00940} + \underset{(7.36277)}{220.67970}t_\alpha \quad \ldots\ldots (2.5); \quad R^2 = 0.96044$$

$$X_2 = \underset{(10.78876)}{478.75440} + \underset{(11.73390)}{244.76890}t_\alpha \quad \ldots\ldots (2.6); \quad R^2 = 0.92163$$

$$X_3 = \underset{(0.93681)}{19.83641} + \underset{(1.01888)}{18.33295}t_\alpha \quad \ldots\ldots (2.7); \quad R^2 = 0.89744$$

$$X_4 = \underset{(0.00526)}{0.88266} + \underset{(0.00572)}{0.35744}t_\alpha \quad \ldots\ldots (2.8); \quad R^2 = 0.99061$$

$$X_5 = \underset{(1.11476)}{6.97471} + \underset{(1.21242)}{8.30416}t_\alpha \quad \ldots\ldots (2.9); \quad R^2 = 0.55906$$

$$\ln(X_5+1) = \underset{(0.03074)}{1.63904} + \underset{(0.03343)}{0.89705}t_\alpha \quad \ldots\ldots (2.10); \quad R^2 = 0.95112$$

$$X_6 = \underset{(4.58979)}{87.85787} + \underset{(4.99188)}{65.39549}t_\alpha \quad \ldots\ldots (2.11); \quad R^2 = 0.82264$$

$$\ln(X_6+1) = \underset{(0.00606)}{4.24707} + \underset{(0.00659)}{0.75403}t_\alpha \quad \ldots\ldots (2.12); \quad R^2 = 0.99718$$

$$X_7 = \underset{(6.44646)}{92.41033} + \underset{(7.01120)}{100.95430}t_\alpha \quad \ldots\ldots (2.13); \quad R^2 = 0.84857$$

$$\ln(X_7+1) = \underset{(0.11549)}{3.42202} + \underset{(0.12561)}{2.02294}t_\alpha \quad \ldots\ldots (2.14); \quad R^2 = 0.87516$$

$$X_8 = \underset{(36.92646)}{103.84150} + \underset{(40.16137)}{175.31550}t_{\alpha} \quad \ldots (2.15) ; \quad R^2 = 0.33990$$

$$\ln (X_8+1) = \underset{(0.06448)}{2.90166} + \underset{(0.07013)}{2.14914}t_{\alpha} \quad \ldots (2.16) ; \quad R^2 = 0.96210$$

$$X_9 = \underset{(0.02628)}{0.38279} + \underset{(0.02858)}{0.38435}t_{\alpha} \quad \ldots (2.17) ; \quad R^2 = 0.83012$$

$$\ln(10X_9+1) = \underset{(0.02743)}{1.26614} + \underset{(0.02983)}{0.86713}t_{\alpha} \quad \ldots (2.18) ; \quad R^2 = 0.95805$$

$$X_{10} = \underset{(0.38195)}{1.79662} + \underset{(0.41541)}{2.66213}t_{\alpha} \quad \ldots (2.19) ; \quad R^2 = 0.52606$$

$$\ln(10X_{10}+1) = \underset{(0.04384)}{1.91128} + \underset{(0.04768)}{1.52745}t_{\alpha} \quad \ldots (2.20) ; \quad R^2 = 0.96520$$

$$X_{11} = \underset{(1.51019)}{12.77586} + \underset{(1.64249)}{12.98179}t_{\alpha} \quad \ldots (2.21) ; \quad R^2 = 0.62803$$

$$\ln (X_{11}+1) = \underset{(0.01503)}{2.24701} + \underset{(0.01635)}{0.89883}t_{\alpha} \quad \ldots (2.22) ; \quad R^2 = 0.98791$$

$$X_{12} = \underset{(3.61217)}{163.12940} + \underset{(3.92862)}{78.44544}t_{\alpha} \quad \ldots (2.23) ; \quad R^2 = 0.91505$$

$$\ln (X_{12}+1) = \underset{(0.00355)}{5.00285} + \underset{(0.00386)}{0.47859}t_{\alpha} \quad \ldots (2.24) ; \quad R^2 = 0.99760$$

$$X_{13} = \underset{(0.57849)}{5.05299} + \underset{(0.62916)}{5.31668}t_{\alpha} \quad \ldots (2.25) ; \quad R^2 = 0.65870$$

$$\ln(X_{13}+1) = \underset{(0.01825)}{1.48202} + \underset{(0.01985)}{0.81143}t_{\alpha} \quad \ldots (2.26) ; \quad R^2 = 0.97834$$

$$X_{14} = \underset{(1.79891)}{63.01348} + \underset{(1.95650)}{36.13650}t_{\alpha} \quad \ldots (2.27) ; \quad R^2 = 0.90215$$

$$\ln(X_{14}+1) = \underset{(0.00503)}{4.01720} + \underset{(0.00547)}{0.58687}t_{\alpha} \quad \ldots (2.28) ; \quad R^2 = 0.99761$$

$$X_{15} = \underset{(7.74523)}{160.69660} + \underset{(8.42374)}{119.65650}t_{\alpha} \quad \ldots (2.29) ; \quad R^2 = 0.84504$$

$$\ln (X_{15}+1) = \underset{(0.01015)}{4.82937} + \underset{(0.01104)}{0.80205}t_{\alpha} \quad \ldots (2.30) ; \quad R^2 = 0.99304$$

$$X_{16} = \underset{(4.53865)}{35.73212} + \underset{(4.93626)}{40.08032}t_\alpha \quad \ldots (2.31) \; ; \quad R^2 = 0.64052$$

$$\ln (X_{16} + 1) = \underset{(0.01403)}{3.04320} + \underset{(0.01526)}{1.16340}t_\alpha \quad \ldots (2.32) \; ; \quad R^2 = 0.99368$$

$$X_{17} = \underset{(0.08662)}{2.66663} + \underset{(0.09420)}{1.90099}t_\alpha \quad \ldots (2.33) \; ; \quad R^2 = 0.91671$$

$$\ln(10X_{17}+1) = \underset{(0.01420)}{3.08779} + \underset{(0.01545)}{0.77694}t_\alpha \quad \ldots (2.34) \; ; \quad R^2 = 0.98558$$

$$X_{18} = \underset{(1.58893)}{26.72421} + \underset{(1.72813)}{18.67406}t_\alpha \quad \ldots (2.35) \; ; \quad R^2 = 0.75938$$

$$\ln (X_{18} + 1) = \underset{(0.01861)}{3.12217} + \underset{(0.02024)}{0.68246}t_\alpha \quad \ldots (2.36) \; ; \quad R^2 = 0.96848$$

Therefore, if Y_i's are taken as the transformed version of X_i's ($i = 1, \ldots, 18$), then Y_i's are defined as follows. $Y_i = X_i$ for $i = 1, \ldots, 4$; $Y_i = \log_e (X_i + 1)$ for $i = 5, \ldots, 8$; $Y_i = \log_e (10X_i+1)$ for $i = 9, 10$; $Y_i = \log_e (X_i + 1)$ for $i = 11, \ldots, 16$; $Y_i = \log_e(10X_i+1)$ for $i = 17$; and $Y_i = \log_e (X_i + 1)$ for $i = 18$.

2.4.2 Aggregation of variables

2.4.2.1 Index for agricultural activity

The mutual correlation coefficients among the agricultural variables Y_1 to Y_4, based on 646 observations, are displayed in the table (2.1).

Table (2.1) : Correlation matrix between variables Y_1 to Y_4

	Y_1	Y_2	Y_3	Y_4
Y_1	1.00000			
Y_2	0.38685	1.00000		
Y_3	0.54406	0.38124	1.00000	
Y_4	0.76068	0.25198	0.45924	1.00000

The unequal weighting system yields an index which is constituted by the logical weights or associations (0.89480, 0.59374, 0.76644, 0.82846) corresponding to (Y_1, Y_2, Y_3, Y_4). It suggests that the least logical weight is associated with labour productivity (Y_2). It means that the minimum variance which has gone into the index is that of the labour productivity variable. In other words, the constituted index does not reflect well the characteristics of labour productivity. But this variable indicates the extent of gainful employment of agricultural labour. As such it is one of the relevant indicators of magnitude of agricultural activity. One should bear in mind that the agricultural sector being unorganised, the labour productivity variable plays an important role in depicting the true nature of agricultural activity. We should therefore obtain such an index that the representativeness of labour productivity is fully ensured. In this situation the application of the equal weighting system does not help. To meet the situation we shall attempt a two-stage application of the unequal weighting system. The variables are classified into two sub-groups — (i) relating to land, i.e., Y_1, Y_3 and Y_4, (ii) relating to labour, i.e., Y_2. Using the unequal weighting system, the associations with the index comprised of Y_1, Y_3 and Y_4 are 0.91318, 0.75986 and 0.88006 respectively corresponding to Y_1, Y_3 and Y_4. Let us call the index Z_L. To obtain a final agricultural index we are to combine Z_L with Y_2. The mutual association between them is 0.39561. The association held by Z_L and Y_2 with the constituted index, say Z_A, is given by 0.83535. Finally we observe that Z_A is correlated with labour productivity (Y_2), land productivity (Y_1), the soil response index (Y_4) and the extent of irrigation (Y_3)

in decreasing order of magnitude, the correlations being 0.83535, 0.77814, 0.68300 and 0.67759. Thus, the agricultural index Z_A meets our requirement. The explicit functional forms of Z_L and Z_A are given by the equations (2.37) and (2.38).

$$Z_L = \underset{(0.91318)}{0.0008172Y_1} + \underset{(0.75986)}{0.0082569Y_3} + \underset{(0.88006)}{0.5075500Y_4}{}^{4/} \qquad \ldots (2.37)$$

$$Z_A = \underset{(0.83535)}{0.5534200Z_L} + \underset{(0.83535)}{0.0009132Y_2}{}^{4/}$$

$$= \underset{(0.77814)}{0.0004523Y_1} + \underset{(0.83535)}{0.0009132Y_2} + \underset{(0.67759)}{0.0045695Y_3}$$

$$+ \underset{(0.68300)}{0.2808883Y_4}{}^{4/} \qquad \ldots (2.38)$$

2.4.2.2 Index for secondary activity

The correlation matrix depicting mutual associations between the variables Y_5 to Y_{10} based on 668 observations is given in the table (2.2).

Table (2.2) : Correlation matrix between variables Y_5 to Y_{10}

	Y_5	Y_6	Y_7	Y_8	Y_9	Y_{10}
Y_5	1.00000					
Y_6	0.73028	1.00000				
Y_7	0.45327	0.38263	1.00000			
Y_8	0.78317	0.60268	0.87409	1.00000		
Y_9	0.39591	0.33585	0.87500	0.77084	1.00000	
Y_{10}	0.84132	0.63520	0.76147	0.94346	0.54094	1.00000

4/ Figures within brackets indicate the correlation coefficients between the index on the left hand side and the concerned variables on the right.

Since large factories are considered to be the main instrument for the economy's growth, we have here the prior expectation that the index for secondary activity to be constructed would be largely influenced by the variables relating to large factories, i.e., by Y_7 to Y_{10}. The application of the unequal weighting system yields associations with (Y_5, Y_6, Y_7, Y_8, Y_9, Y_{10}) as (0.82494, 0.70817, 0.86074, 0.98328, 0.76896, 0.93615) which is consistent with our expectations for nearly all the variables. The index so developed is termed the index for secondary activity. It is denoted by Z_S and given by the equation system (2.39).

$$Z_S = \underset{(0.82494)}{0.0751230}Y_5 + \underset{(0.70817)}{0.0908910}Y_6 + \underset{(0.86074)}{0.0406200}Y_7 + \underset{(0.98328)}{0.0432970}Y_8 + \underset{(0.76896)}{0.0858580}Y_9 + \underset{(0.93615)}{0.0553980}Y_{10} \quad \text{4/} \quad \ldots(2.39)$$

2.4.2.3 Index for tertiary activity

The correlation matrix for variables Y_{11}, Y_{12}, Y_{13} and Y_{14} is given in the table (2.3). It is expected that the variables derived from trade and allied activity would be largely associated with the index for tertiary activity to be constructed because it is necessary to eliminate the adverse effect of the inclusion of defence activity in the construction of the index. Using the unequal weighting system we

Table (2.3) : Correlation matrix between variables Y_{11} to Y_{14}

	Y_{11}	Y_{12}	Y_{13}	Y_{14}
Y_{11}	1.00000			
Y_{12}	0.74191	1.00000		
Y_{13}	0.97544	0.69812	1.00000	
Y_{14}	0.74314	0.85787	0.78514	1.00000

obtain an index with which the associations are 0.94044, 0.89103, 0.94028 and 0.91647 respectively corresponding to the variables Y_{11}, Y_{12}, Y_{13} and Y_{14}. Let us denote the index by Z_T. It satisfies our requirement. Had we applied the equal weighting system for aggregation we would have got an index, say Z'_T, with which the correlation coefficient would have been 0.91932 for all the variables Y_{11}, Y_{12}, Y_{13} and Y_{14}. We shall now illustrate the fact that the influence on Z'_T of the districts where there is a high percentage of defence or military personnel has not been adequately eliminated by Z'_T despite the fact that the correlation coefficient between Z_T and Z'_T is as high as 0.99656.

The following illustration will show that the index Z_T for tertiary activity eliminates the effect of over-reporting of potentials due to military service more than Z'_T. To see the difference between Z_T and Z'_T one needs to compute the following difference denoted by D and given in the equation system (2.40).

$$D = \frac{Z'_T - 1}{s.d\ (Z'_T)} - \frac{Z_T - 1}{s.d\ (Z_T)} \text{ [5/]} \qquad \ldots (2.40)$$

$$= \frac{Z'_T}{s.d\ (Z'_T)} - \frac{Z_T}{s.d\ (Z_T)} - C$$

where $C = \frac{1}{s.d\ (Z'_T)} + \frac{1}{s.d\ (Z_T)}$ is a constant.

Therefore,

$$D = D' - C \qquad \text{where } D' = \frac{Z'_T}{s.d(Z'_T)} - \frac{Z_T}{s.d\ (Z_T)}$$

5/ It may be noted that the means of Z'_T and Z_T are unity.

Instead of computing D we propose to compute D' for all districts for 1960-61 and 1970-71. D' values for sixteen districts selected on the basis of high value of D' in 1960-61 and 1970-71 are given in the table (2.4). It has been observed that D' attains high values mainly in border districts. Therefore, there is no point in accepting Z'_T. The

Table (2.4) : Comparison of Z_T and Z'_T for tertiary activity

Sl. No.	Districts	1960-61			1970-71		
		Z'_T	Z_T	D'	Z'_T	Z_T	D'
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	N. C. Hills	0.86185	0.78604	1.18650	1.00391	0.95937	1.14118
2.	Kutch	1.01186	0.96534	1.15981	1.01303	0.98277	1.07163
3.	Chamba	0.71812	0.64425	1.04733	0.80967	0.75488	1.02446
4.	Lahul and Spiti	0.76874	0.66967	1.23086	0.89391	0.78950	1.37157
5.	Kinnaur	0.73488	0.63910	1.18255	0.85131	0.74896	1.32266
6.	Ladakh	0.66794	0.57723	1.09487	0.81818	0.71096	1.31978
7.	Doda	0.69198	0.61836	1.02263	0.78452	0.72500	1.02793
8.	Bikaner	1.03175	0.99495	1.12428	1.04138	1.00649	1.12238
9.	Jaisalmer	0.81157	0.73462	1.14776	0.90639	0.82353	1.26499
10.	Jodhpur	0.99325	0.96853	1.02359	1.02155	1.00259	1.01730
11.	Uttar Kashi	0.65707	0.58360	0.99056	0.75703	0.67840	1.10825
12.	Chamoli	0.68737	0.61761	0.99729	0.79318	0.72358	1.09102
13.	Pithoragarh	0.76845	0.70534	1.03326	0.87549	0.82122	1.08043
14.	Khasia and Jaintia Hills	0.77340	0.71276	1.02418	0.97795	0.95257	1.01353
15.	A and N islands	0.93538	0.86635	1.21502	1.05372	1.01379	1.16113
16.	Manipur	0.90076	0.86720	0.98940	0.93478	0.90089	1.02162

explicit functional form of Z_T in terms of Y_{11}, Y_{12}, Y_{13} and Y_{14} is given by the equation system (2.41).

$$Z_T = \underset{(0.94044)}{0.0477090}Y_{11} + \underset{(0.89103)}{0.0974380}Y_{12} + \underset{(0.94028)}{0.0505880}Y_{13} + \underset{(0.91647)}{0.0806870}Y_{14}^{4/} \quad \ldots \quad (2.41)$$

2.4.2.4 Index for urban activity

The correlation matrix between the variables Y_{15} to Y_{18} is given in the table (2.5). The variable relating to the density of population in urban areas should be assigned low logical weight with respect to other variables in urban activity because the variable represents only an urban characteristics confined to urban areas. But we cannot totally ignore the aspect of urban congestion which indirectly indicates the magnitude of urban activity for urban areas. On the other hand, areal

Table (2.5) : Correlation matrix between variables Y_{15} to Y_{18}

	Y_{15}	Y_{16}	Y_{17}	Y_{18}
Y_{15}	1.00000			
Y_{16}	0.74768	1.00000		
Y_{17}	0.47455	0.59073	1.00000	
Y_{18}	0.68994	0.80364	0.61831	1.00000

concentration of urban population for the total area should preferably be given maximum logical weight in the index to be constructed. It is important to indicate the magnitude of urban activity with respect to the district's total area. Thus, after application of the unequal weighting system for aggregation we obtain logical weights 0.84885, 0.91941, 0.76350 and 0.90936 respectively corresponding to Y_{15}, Y_{16}, Y_{17}, Y_{18}. The maximum association with the index thus constituted is assumed by areal concentration of urban population followed by average size of town, sectoral concentration of urban population and urban areal concentration of urban population. This is what we desired. Let us denote the index for urban activity by Z_U. The explicit functional form of Z_U in terms of Y_{15}, Y_{16}, Y_{17} and Y_{18} is given by the equation (2.42).

$$Z_U = \frac{0.0715610Y_{15}}{(0.84885)} + \frac{0.0564840Y_{16}}{(0.91941)} + \frac{0.0742440Y_{17}}{(0.76350)} + \frac{0.0808570Y_{18}}{(0.90936)} \quad \ldots \quad (2.42)$$

4/

2.4.2.5 Index for non-agricultural activity

The correlation matrix for Z_S, Z_T and Z_U — indices for secondary, tertiary and urban activities respectively — is given in the table (2.6). Here, we have the prior notion that secondary activity should get no less

Table (2.6) : Correlation matrix between indices Z_S, Z_T and Z_U

	Z_S	Z_T	Z_U
Z_S	1.00000		
Z_T	0.78412	1.00000	
Z_U	0.71468	0.82039	1.00000

importance than the tertiary and urban activities in constructing the index for non-agricultural activity. The unequal weighting system gives rise to an index which is associated with Z_S, Z_T and Z_U at the level of correlation coefficients 0.90235, 0.94393 and 0.91746 respectively.

It suggests that the index bears maximum association with the index for tertiary activity and minimum with the index for secondary activity. This does not fulfil our requirement because secondary activity is assigned the least importance in the index. Instead of this we may obtain another index for non-agricultural activity using the equal weighting system where all the three activities will be treated equally. Economically, secondary, tertiary and urban activities should be considered equally important aspects for characterisation of the magnitude of non-agricultural activity of a spatial unit. None of the three activities can be thought of in isolation from each other. Thus the equal weighting system can express the condition appropriately here. Equal weighting system yields an index, say Z_N, for non-agricultural activity with which every index among Z_S, Z_T and Z_U holds correlation coefficients at level of 0.91936. The explicit functional expression for Z_N in terms of Z_S, Z_T and Z_U is given by the equation (2.43).

$$Z_N = \frac{0.25931}{(0.91936)} Z_S + \frac{0.32462}{(0.91936)} Z_T + \frac{0.41607}{(0.91936)} Z_U \quad \ldots (2.43)$$

4/

2.4.2.6 Index for overall economic activity

The correlation coefficient, based on 646 observations, between Z_A — index for agricultural activity — and Z_N — index for non-agricultural activity — is found to be 0.44206. For two variables, the unequal and equal weighting systems of aggregation of variables give rise to the same index. Therefore, we obtain an index by applying either of the systems. Let us denote the index of overall economic activity by Z_0. The explicit functional form is given by the equation (2.44).

$$Z_0 = \underset{(0.84914)}{0.33915}\, Z_A + \underset{(0.84914)}{0.66355}\, Z_N \quad \text{4/} \qquad \ldots \quad (2.44)$$

2.4.2.7 Statistical prediction model for index of overall economic activity for districts with partial data

The index for overall economic activity — Z_0 has been constructed on the basis of 646 observations or 323 districts for 1960-61 and 1970-71. No data on agricultural variables were available for 11 districts (see Section 2.2.1) which were therefore ignored in the construction of the index for overall economic activity. Since data for non-agricultural variables for those 11 districts is available, the general relationship obtained by regressing Z_0 on Z_N can be used for prediction of the index values for overall economic activity of the 11 districts under consideration. The relationship is presented in the equation (2.45). Next we adjust the mean of the 668 index values for overall economic activity to unity.

$$Z_0 = \underset{(0.02390)}{0.04701} + \underset{(0.02345)}{0.95688}\, Z_N \quad \ldots . \quad (2.45)$$

$$R^2 = 0.72103$$

Among the 11 districts, there are 8 districts for which indirect estimates for index values of agricultural activity may be found with the help of the relationship obtained by regressing Z_A on Z_0. The remaining 3 districts Bombay, Madras and Calcutta are excluded because of absence of agricultural activity. The relationship between Z_A and Z_0 is cited in the equation (2.46).

$$Z_A = \underset{(0.03719)}{-\,0.47427} + \underset{(0.03628)}{1.48001}\, Z_0 \qquad \ldots (2.46)$$

$$R^2 = 0.72103$$

Since the intercept parameter is significant and negative, all values of Z_0 below 0.32005 will yield negative value of Z_A. This is not realistic. Therefore, a lower tail correction becomes unavoidable. Following the method given by Pal, De and Malakar [29] and using one-sigma limit which is adequate for our purpose the relationship in the equation (2.46) is modified to the relationship given by the equation (2.47).

$$\left.\begin{aligned} Z_A &= -\,0.47427 + 1.48001\, Z_0 \quad \text{if } Z_0 \geq 0.4576 \\ &= 0.48735\, Z_0 \end{aligned}\right\} \qquad \ldots (2.47)$$

Therefore, putting the indirect estimates for index of overall economic activity obtained by the equation (2.45) for the 8 districts in the relationship presented in the equation (2.47) one may obtain indirect estimates for index values of agricultural activity for those districts.

2.4.3 Estimation of district-level per capita income

The relationship — based on 40 observations of States or Union Territories — between per capita income at 1960-61 prices and the index for overall economic activity[6] (see Section 2.3.3) is given by the

---

6/ The values of the 18 variables Y_1 to Y_{18} are available for the States as well. Using them in the functional forms of the indices Z_A, Z_S, Z_T, Z_U, Z_N and Z_0 derived for the districts, we also obtained the values for indices of different activities and particularly the values of the index for overall economic activity for the States.

equation (2.48).

$$P_I = \underset{(46.25995)}{19.88492} + \underset{(15.52843)}{99.46} \exp(Z_0) \qquad \ldots \quad (2.48)$$

$$R^2 = 0.55224$$

P_I and Z_0 denote per capita income at 1960-61 prices and index for overall economic activity respectively. The intercept parameter is insignificant even at the 5 per cent level of chance. The other parameter is significant at the 1 per cent level of chance. The preliminary estimate for per capita income for districts of India are obtained with the help of the relationship presented in the equation (2.48) and the index values of overall economic activity for districts. Now the preliminary estimates of per capita income are proportionately adjusted to such an extent that the total State income is obtained by the aggregation of the estimates of per capita income of the constituent districts multiplied by district population.

But the problem of estimation of per capita income remains for Khasia and Jaintia Hills, Garo Hills, A and N Islands, Pondicherry, Chandigarh, and Goa-Daman-Diu as no income data for the State of Meghalaya7/ and the above Union Territories is available. It may be noted that it has been possible to break up the State incomes into the income of its constituent districts only where official estimate of State income was available. Therefore, one would realise the difficulty where State income is not available. Our suggestion would be to

7/ Khasia and Jaintia Hills, Garo Hills are two districts of the State of Meghalaya. For Meghalaya, no State income is available.

determine another relationship between the estimated per capita income and index for overall economic activity over the districts for two time points 1960-61 and 1970-71 (328 such districts available). It is given by the equation (2.49).

$$P_I = \underset{(8.24810)}{62.08384} + \underset{(2.79863)}{81.95962} \exp(Z_0) \qquad \ldots \quad (2.49)$$

$$R^2 = 0.56736$$

The first hand estimate for per capita income can be obtained from the relationship presented in the equation (2.49) using the index values for overall economic activity for the districts of Khasia and Jaintia Hills, Garo Hills and for the Union Territories of A and N Islands, Pondicherry, Chandigarh , and Goa-Daman-Diu. These estimates cannot be adjusted to add to State income as the latter is not known.

2.4.4. Classification of activity indices and estimates of per capita income

Now we intend to classify the values of the indices and the estimates of per capita income for districts in two time points 1960-61 and 1970-71 thus computed into three levels — low (L), medium (M) and high (H). We want to derive intervals in such a way that for a given class interval of the index for overall economic activity it is possible to derive all other class intervals for the remaining indices and the estimates of per capita income. We will follow the 'reverse process' of the construction of indices and the derivation of estimates of per capita income. Thus the indices other than the index for overall economic activity and the estimates of per capita income are classified on the basis of the following regression equations (2.50) to (2.55).

$$Z_A = \underset{(0.03719)}{-\,0.47427} + \underset{(0.03628)}{1.48001}\, Z_0 \qquad \ldots \quad (2.50)$$

$$R^2 = 0.72013$$

$$Z_N = \underset{(0.01747)}{0.18330} + \underset{(0.01688)}{0.81670}\, Z_0 \qquad \ldots \quad (2.51)$$

$$R^2 = 0.77848$$

$$Z_S = \underset{(0.02661)}{-0.55814} + \underset{(0.02584)}{1.55814}\, Z_N \qquad \ldots \quad (2.52)$$

$$R^2 = 0.84523$$

$$Z_T = \underset{(0.01157)}{0.32265} + \underset{(0.01123)}{0.67735}\, Z_N \qquad \ldots \quad (2.53)$$

$$R^2 = 0.84523$$

$$Z_U = \underset{(0.01544)}{0.09612} + \underset{(0.01499)}{0.90389}\, Z_N \qquad \ldots \quad (2.54)$$

$$R^2 = 0.84523$$

$$P_I = \underset{(8.24810)}{62.08384} + \underset{(2.79863)}{81.95962} \exp\,(Z_0) \qquad \ldots \quad (2.55)$$

$$R^2 = 0.56736$$

The class interval for medium level of the index Z_0 is chosen as (0.90 - 1.10) after examining the histogram of Z_0. Putting the class boundaries for Z_0 in the equations (2.50), (2.51) and (2.55), we obtain class boundaries of medium level for Z_A, Z_N and P_I. Again, using the boundaries for Z_N in the equations (2.52), (2.53) and (2.54) we obtain the boundaries of class intervals for Z_S, Z_T and Z_U. The class intervals are cited in the table (2.7). The values and the corresponding levels of the indices and the estimates of per capita income for districts in two time points 1960-61 and 1970-71 are given in the table (2.8) in the Appendix.

Table (2.7) : Class intervals for indices and estimates of per capita income

Levels	Z_O	Z_A	Z_N	Z_S
(0)	(1)	(2)	(3)	(4)
L (low)	- ≤ 0.90	- ≤ 0.85774	- ≤ 0.91833	- ≤ 0.87275
M (medium)	$0.90 < \leq 1.10$	$0.85774 < \leq 1.15374$	$0.91833 < \leq 1.08167$	$0.87275 < \leq 1.12725$
H (high)	$1.10 <$ -	$1.15374 <$ -	$1.08167 <$ -	$1.12725 <$ -

Levels	Z_T	Z_U	P_I
	(5)	(6)	(7)
L (low)	- ≤ 0.94468	- ≤ 0.92618	- ≤ 263.70
M (medium)	$0.94468 < \leq 1.05532$	$0.92618 < \leq 1.07382$	$263.70 < \leq 309.10$
H (high)	$1.05532 <$ -	$1.07382 <$ -	$309.10 <$ -

Explanation : Z_O = Index for overall economic activity

Z_A = Index for agricultural activity

Z_N = Index for non-agricultural activity

Z_S = Index for secondary activity

Z_T = Index for tertiary activity

Z_U = Index for urban activity

P_I = Estimate of per capita income at 1960-61 price.

2.5 Regional Analysis of Activity Indices

The objective of this analysis is to derive a set of economic regions based on overall economic activity and to examine the main causal factors that explain the level of overall economic activity in those regions. After the identification of the regions under specific levels of overall economic activity we enquire into the levels of sectoral indices at the two time points 1960-61 and 1970-71. In the process of characterisation of the nature of combinations of activities, the regions will be broadly identified in respect of whether they are based chiefly on agricultural or non-agricultural activity or both agricultural and non-agricultural activities. Subsequently we would analyse the pattern of three sectors — secondary, tertiary and urban of non-agricultural activities. Later, in the subsequent chapters, we would discuss the characteristics of agricultural activity and secondary activity with a special emphasis on industrial activity which induces tertiary and urban activities to grow.

Therefore, for delineation of economic regions, we take the help of the index for overall economic activity. As mentioned in Section 2.3.4, we consider the weighted average of the index values corresponding to every district for 1960-61 and 1970-71. The weight is determined by the size of population in the respective time points. Three broad categories bearing low, medium and high levels of overall economic activity have been chosen for the purposes of regionalization.

In an ideal case, agricultural activity and non-agricultural activity should not appear as mutually exclusive activities in region formation. The extent of mutual exclusiveness is widened as the gap between the levels of agricultural activity and non-agricultural activity increases. A stable region formation is only possible if the levels relating to the two types of activity are identical. However, in the final analysis there are variations in the roles of such activities when regionalization is made according to the levels of overall economic activity. Therefore, for the three types of regions it is important to test the extent of validity of our hypothesis that on the whole the extent of mutual exclusiveness of agricultural and non-agricultural activity is low in the regions of high and low level but on the other hand the two types of activity are to a great extent mutually exclusive in the regions of medium level overall economic activity.

During the decade 1960-61 to 1970-71 there were 97 districts for which the weighted average of the index values for 1960-61 and 1970-71 relating to overall economic activity attained high level. These districts account for about 38 per cent of the population and 18.5 per cent of the geographical area of India. Excluding 31 isolated districts, the districts form three distinct regions in northern, southern and eastern India respectively consisting of 34, 21 and 11 districts (Figure 2.1, Table 2.8).

2.5.1 Regions with high level of overall economic activity

The area north of the State of Rajasthan, south of the State of Himachal Pradesh and the north-western part of the State of Uttar Pradesh or in other words, mainly the States of Punjab and Haryana and the north-western part of the State of Uttar Pradesh constitute the northern region of high level overall economic activity during the decade 1960-61 to 1970-71 (Figure 2.1). This region accounts for about 10 per cent of the population and 5.8 per cent of the geographical area of India. There was practically no difference in the levels of overall economic activity at the two time points in the region (Figures 2.11 and 2.12). Among the 34 districts there are only three districts which were backward in 1960-61 but have attained high level in 1970-71. The agricultural and non-agricultural activities are usually found to have been equally preponderant. The districts which were backward in either of the two sectors — agricultural and non-agricultural — in 1960-61 have been able to boost up the weaker sector in 1970-71. The districts Bhatinda, Sangrur, Jind, Ganganagar and Hoshiarpur where agricultural activity was high but non-agricultural activity relatively poor and the districts Bareilly, Dehradun and Agra where agricultural activity was relatively poor but not non-agricultural activity, have been able to reduce these gaps during the decade (Figures 2.21, 2.22, 2.31 and 2.32). These are supported by the following facts. In Punjab, about 75 per cent of the total geographical area was under cultivation and more than 75 per cent of the population were engaged in agriculture. In Haryana also, more than 70 per cent of the population were engaged in agriculture. The region is a gift of the Green Revolution in technology and became surplus in foodgrains, particularly in wheat and rice. Agricultural prosperity has also been supplemented by the small scale industries. Sericulture, footwear, machine tools, bicycle parts etc. are some of the important small scale industries. Besides, in 1970-71, the employment of labour in large factories for this region was 2.8 lakhs — 9.16 per cent of the national figure. Of this labour, those employed in these industries of basic metals and their products, textiles and related works, and food processing, etc. form respectively 8.25 per cent, 7.95 per cent and 10.90 per cent of the corresponding national figures. In terms of secondary, tertiary and urban activities, the relatively backward districts in the region have generally improved their position over the decade. Apart from this, the districts with high level of these activities in 1960-61 maintained their level in 1970-71 (Figures 2.41, 2.42, 2.51, 2.52, 2.61 and 2.62). The districts Bhatinda, Sangrur, Jind, Ganganagar and Hoshiarpur attained at best the medium level in non-agricultural activity at the end of the decade because of the following reasons. Secondary activity was low in the districts of Bhatinda and Jind, tertiary activity low in the district of Ganganagar, and secondary and urban activities medium in the districts of Sangrur and Hoshiarpur for both the time points.

The southern region of high level overall economic activity is constituted by the southern parts of the States of Tamil Nadu and Kerala (Figure 2.1). The geographical coverage is only 4.61 per cent of the country and population is about 10 per cent. The salient feature of the region is that agricultural and non-agricultural activities are equally important in promoting the level of overall economic activity (Figures 2.21, 2.22, 2.31 and 2.32). Except for the district Ramanathapuram which emerged as highly active in 1970-71 from medium level in 1960-61 in overall economic activity, all other districts in the region maintained the high level ranking in overall economic activity for both the time points (Figures 2.11 and 2.12). The districts Quilon and Ramanathapuram

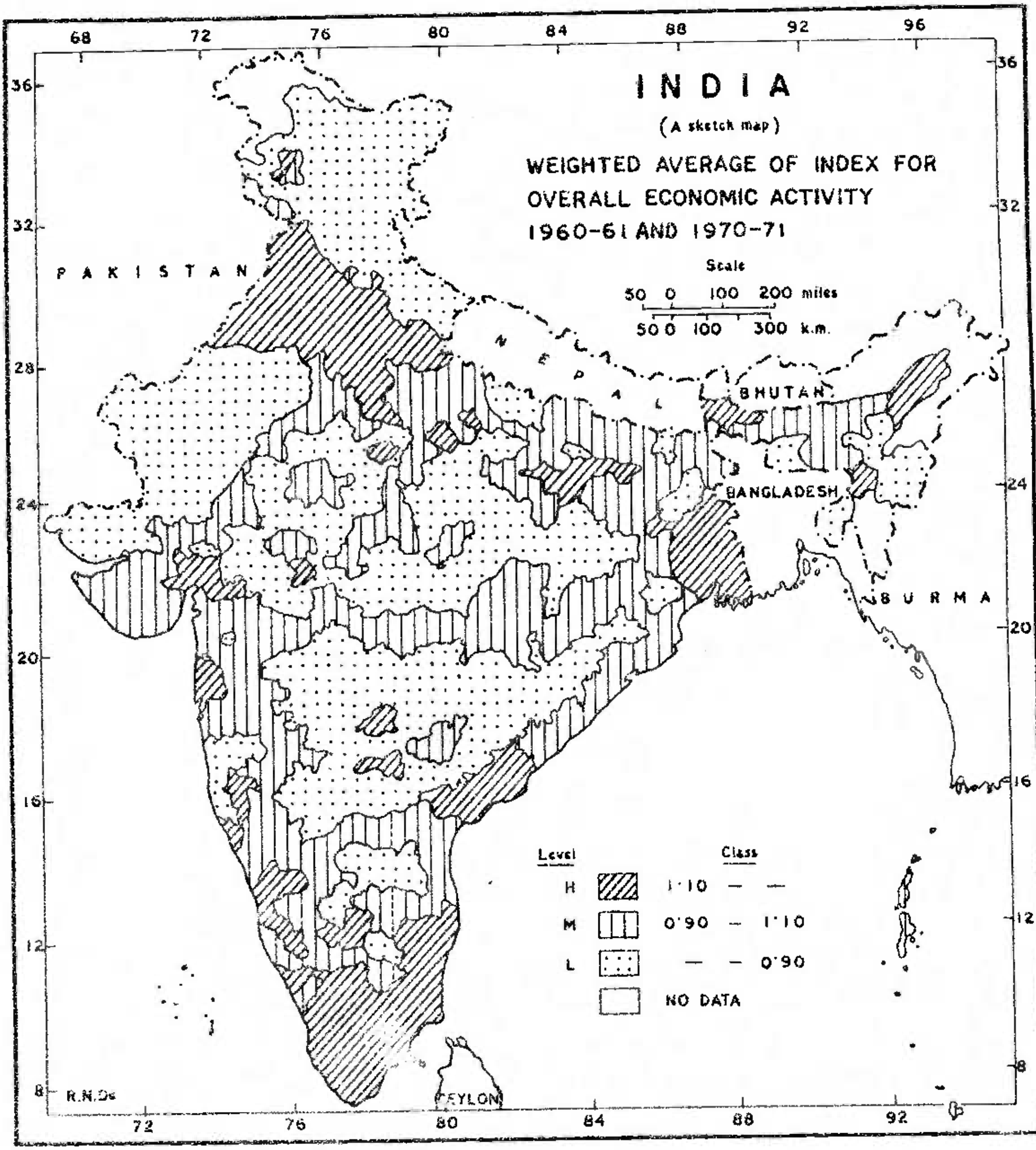

INDIA
(A sketch map)
WEIGHTED AVERAGE OF INDEX FOR OVERALL ECONOMIC ACTIVITY 1960-61 AND 1970-71
Scale
50 0 100 200 miles
50 0 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H 1·10 — —
M 0·90 — 1·10
L — — 0·90
NO DATA
R.N.De
68
72
76
80
84
88
92
96
36
32
28
24
20
16
12
8

FIGURE - 2·1

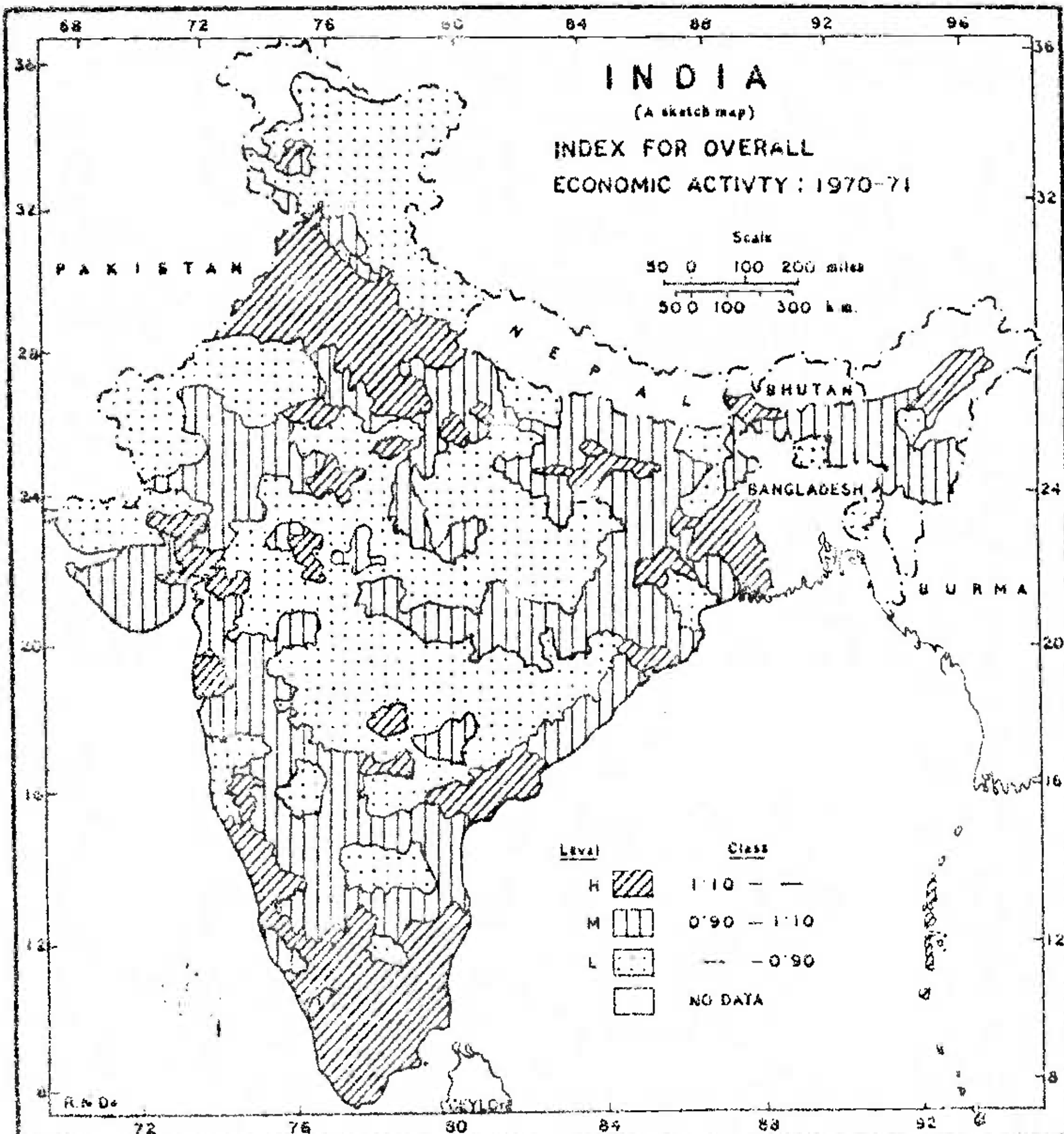

INDIA
(A sketch map)
INDEX FOR OVERALL
ECONOMIC ACTIVTY : 1970-71
Scale
50 0 100 200 miles
50 0 100 300 km.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H 1·10 — —
M 0·90 — 1·10
L — — 0·90
NO DATA
R. N. De

FIGURE – 2·11

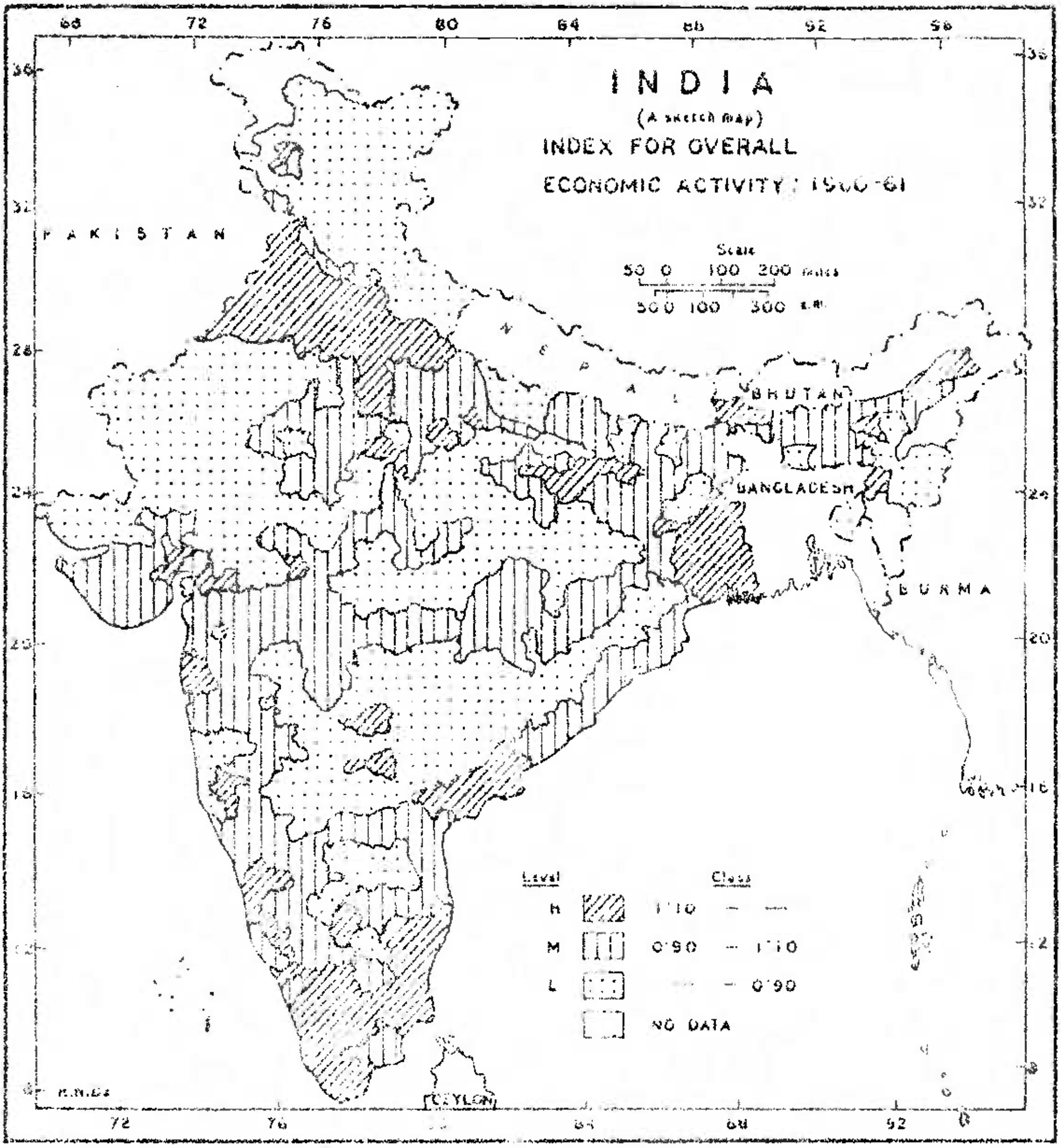

INDIA
(A sketch map)
INDEX FOR OVERALL
ECONOMIC ACTIVITY : 1960-61
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Scale
50 0 100 200 miles
Level
Class
H
M 0.90 – 1.10
L – 0.90
NO DATA

FIGURE – 2.12

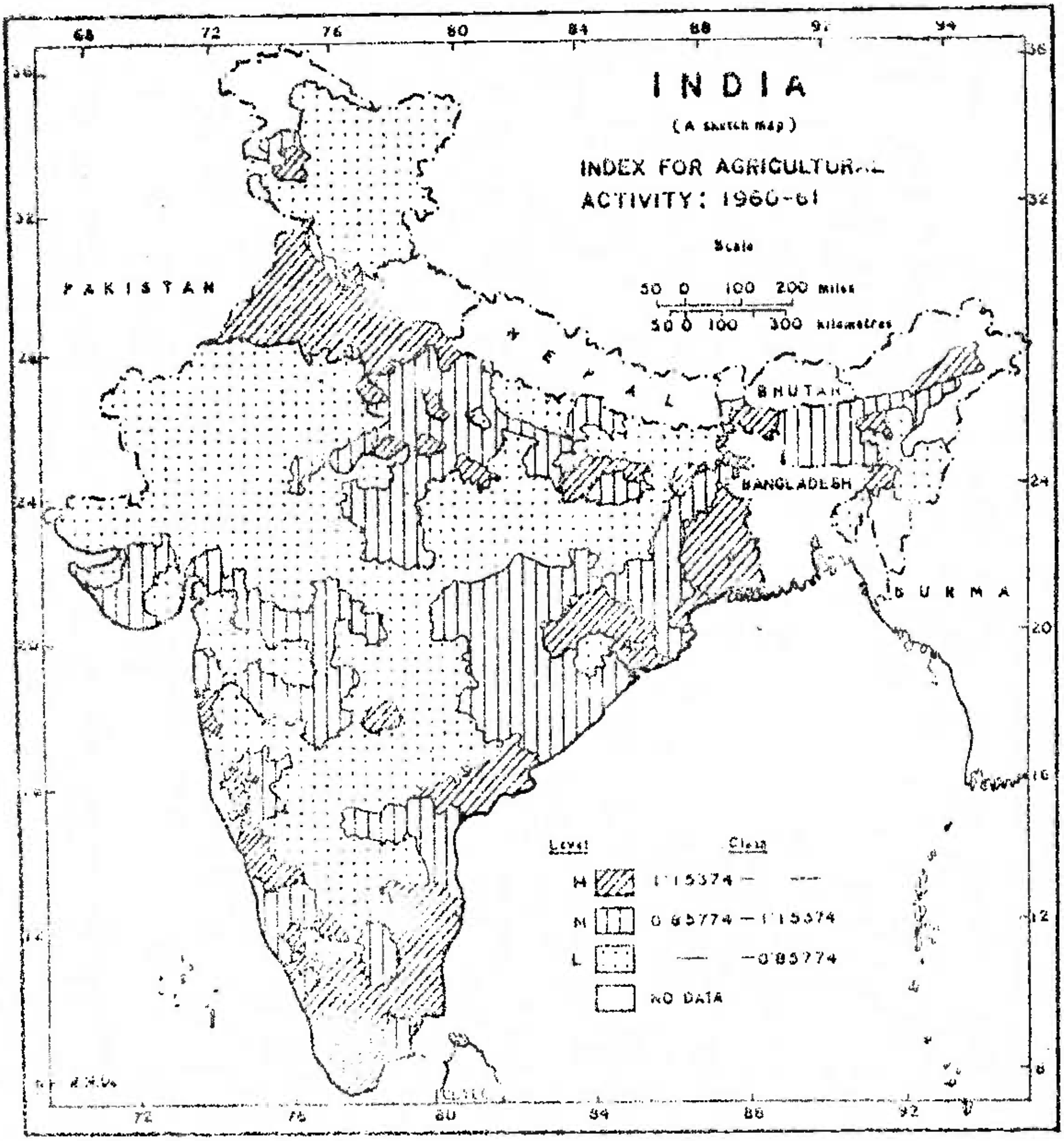
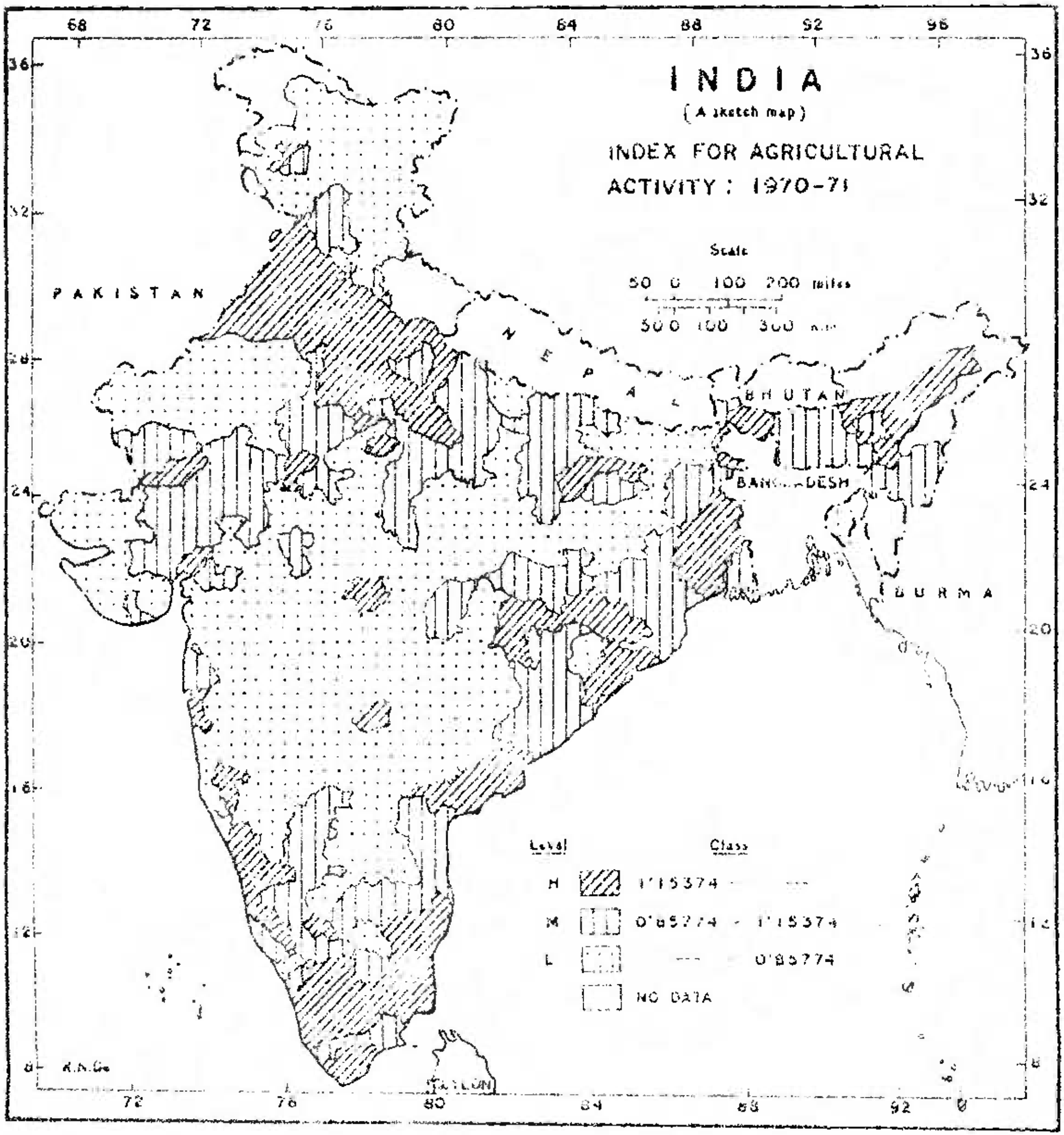

INDIA
(A sketch map)
INDEX FOR AGRICULTURAL ACTIVITY: 1960-61
Scale
50 0 100 200 miles
50 0 100 300 kilometres
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
Level
Class
H
1·15374 —
M
0·85774 — 1·15374
L
— 0·85774
NO DATA

FIGURE 2·21



INDIA
(A sketch map)
INDEX FOR AGRICULTURAL
ACTIVITY : 1970-71
Scale
50 0 100 200 miles
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H
M
L
NO DATA
0'85774 - 1'15374
0'85774

FIGURE - 2·22

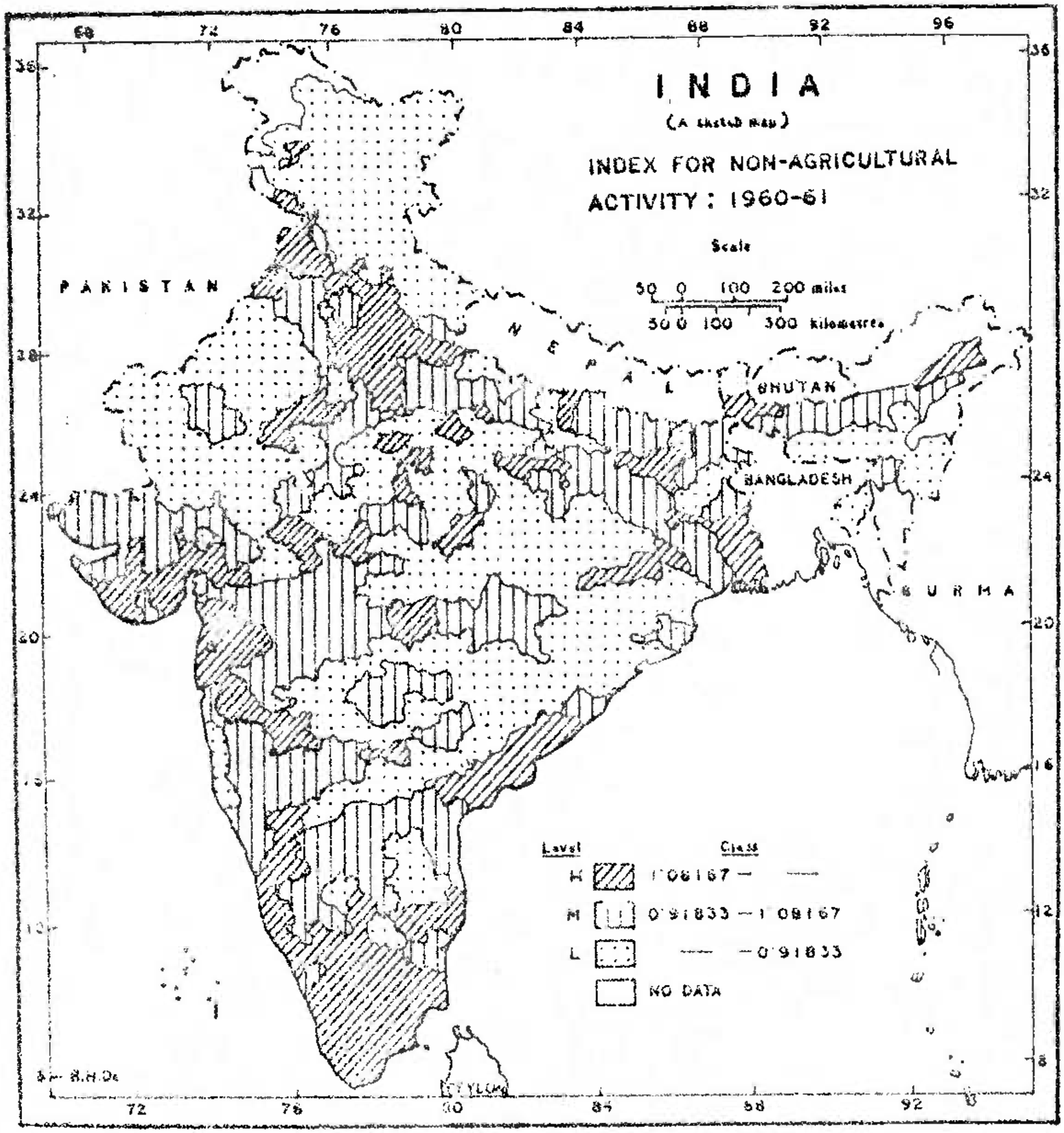

INDIA
(A sketch map)
INDEX FOR NON-AGRICULTURAL ACTIVITY : 1960-61
Scale
50 0 100 200 miles
50 0 100 300 kilometres
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H 1·08167 —
M 0·91833 — 1·08167
L — 0·91833
NO DATA
72
76
80
84
88
92
96

FIGURE – 2·31

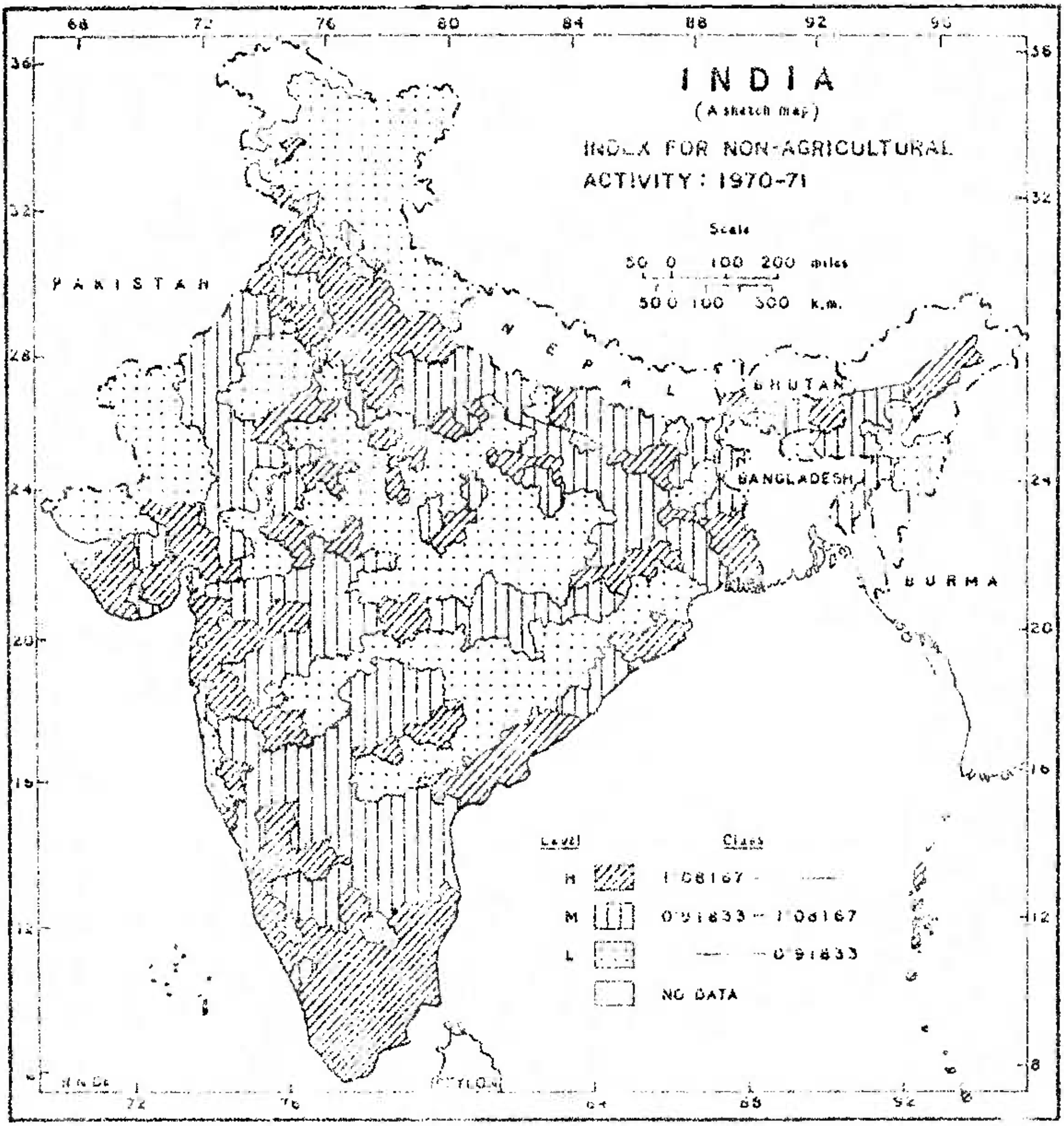

INDIA
(A sketch map)
INDEX FOR NON-AGRICULTURAL ACTIVITY : 1970-71
Scale
50 0 100 200 miles
500 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H
1·08167 -
M
0·91833 - 1·08167
L
- 0·91833
NO DATA

FIGURE - 2·32

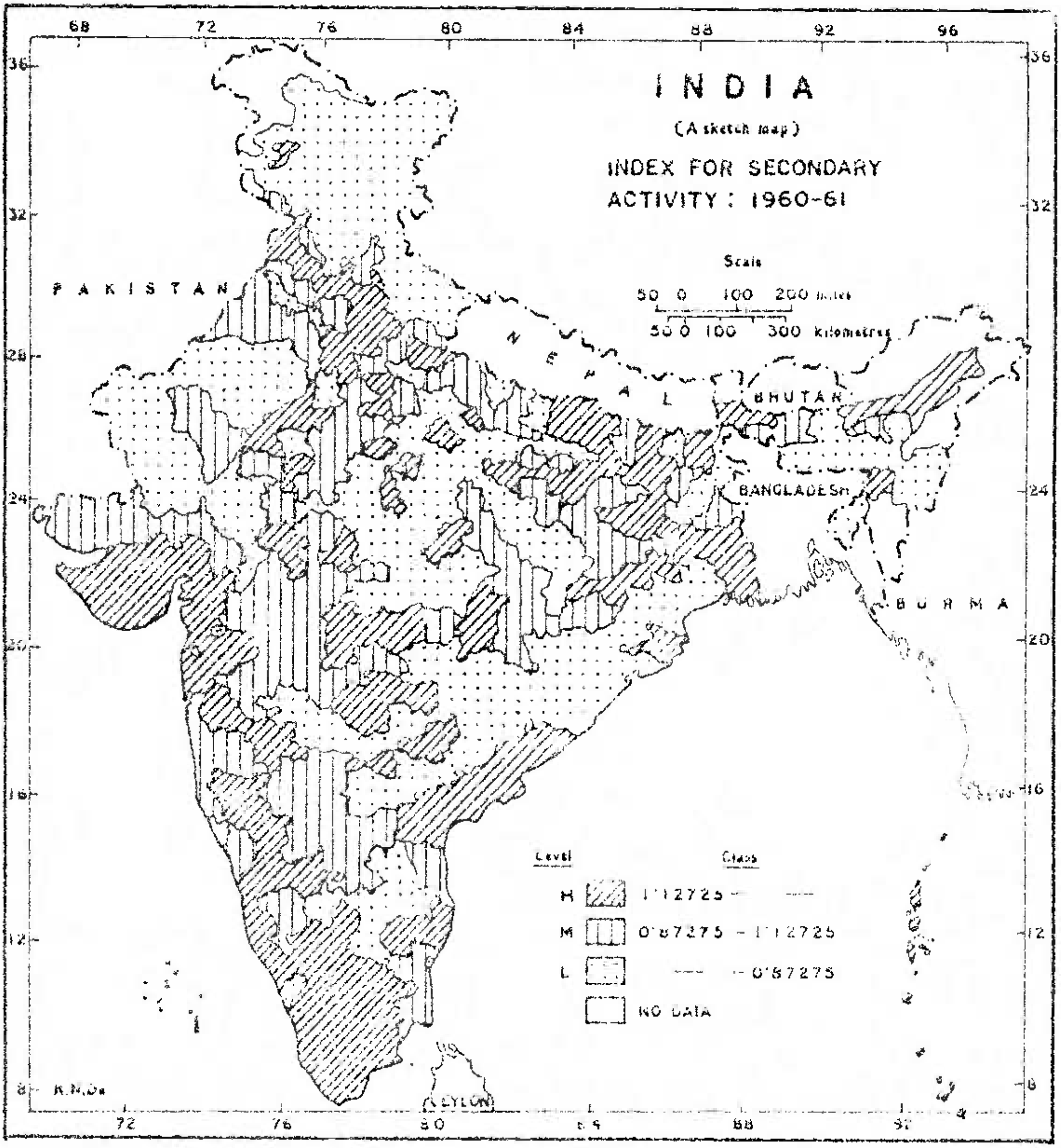
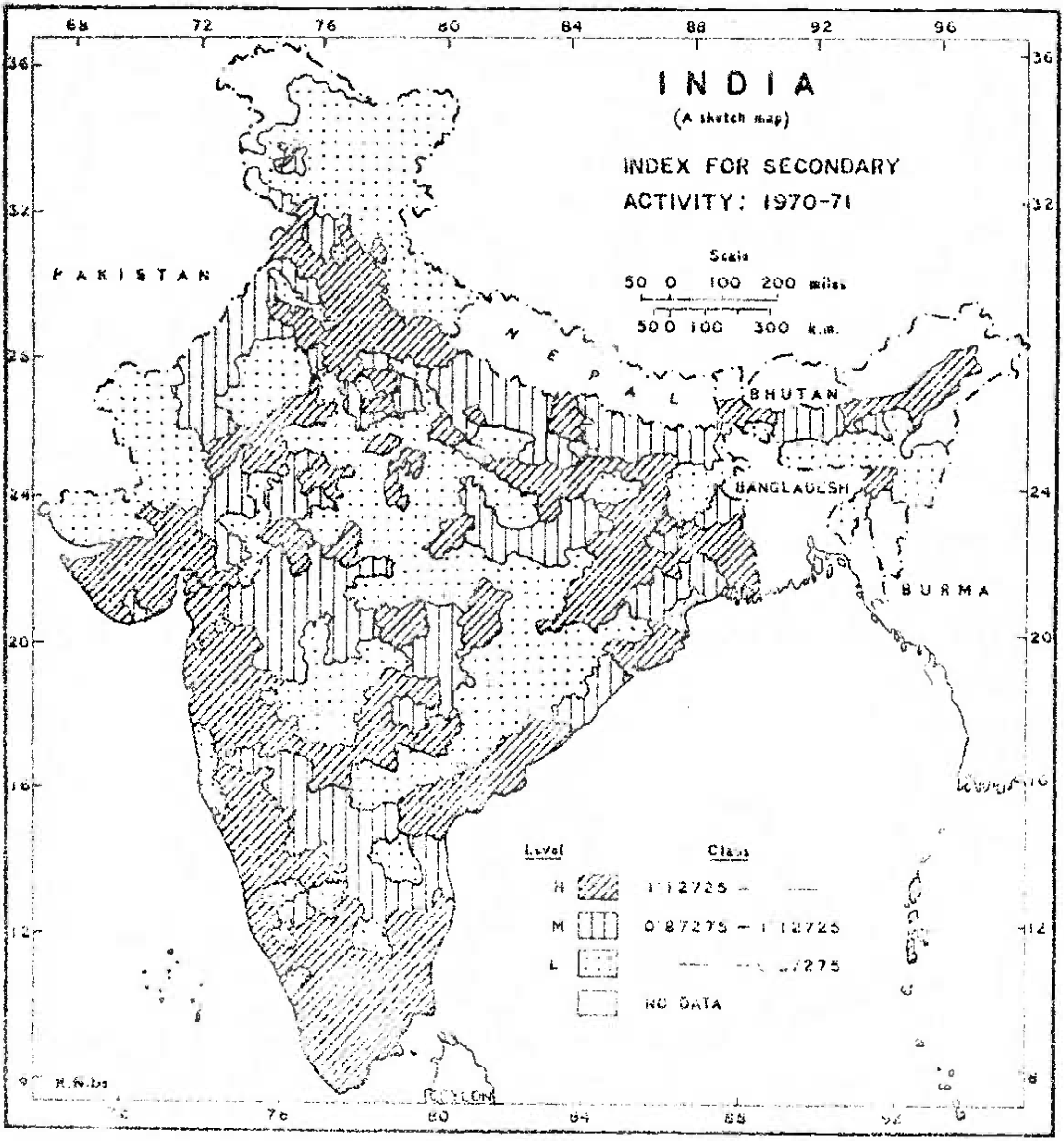

INDIA
(A sketch map)
INDEX FOR SECONDARY ACTIVITY : 1960-61
Scale
50 0 100 200 miles
50 0 100 300 kilometres
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H 1·12725 —
M 0·87275 – 1·12725
L — 0·87275
NO DATA
K.N.Das

FIGURE-2·41


INDIA
(A sketch map)
INDEX FOR SECONDARY ACTIVITY: 1970-71
Scale
50 0 100 200 miles
50 0 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
Level
Class
H
M
L
NO DATA
0·87275 – 1·12725
68
72
76
80
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92
96
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32
24
20
12
8

FIGURE – 2·42

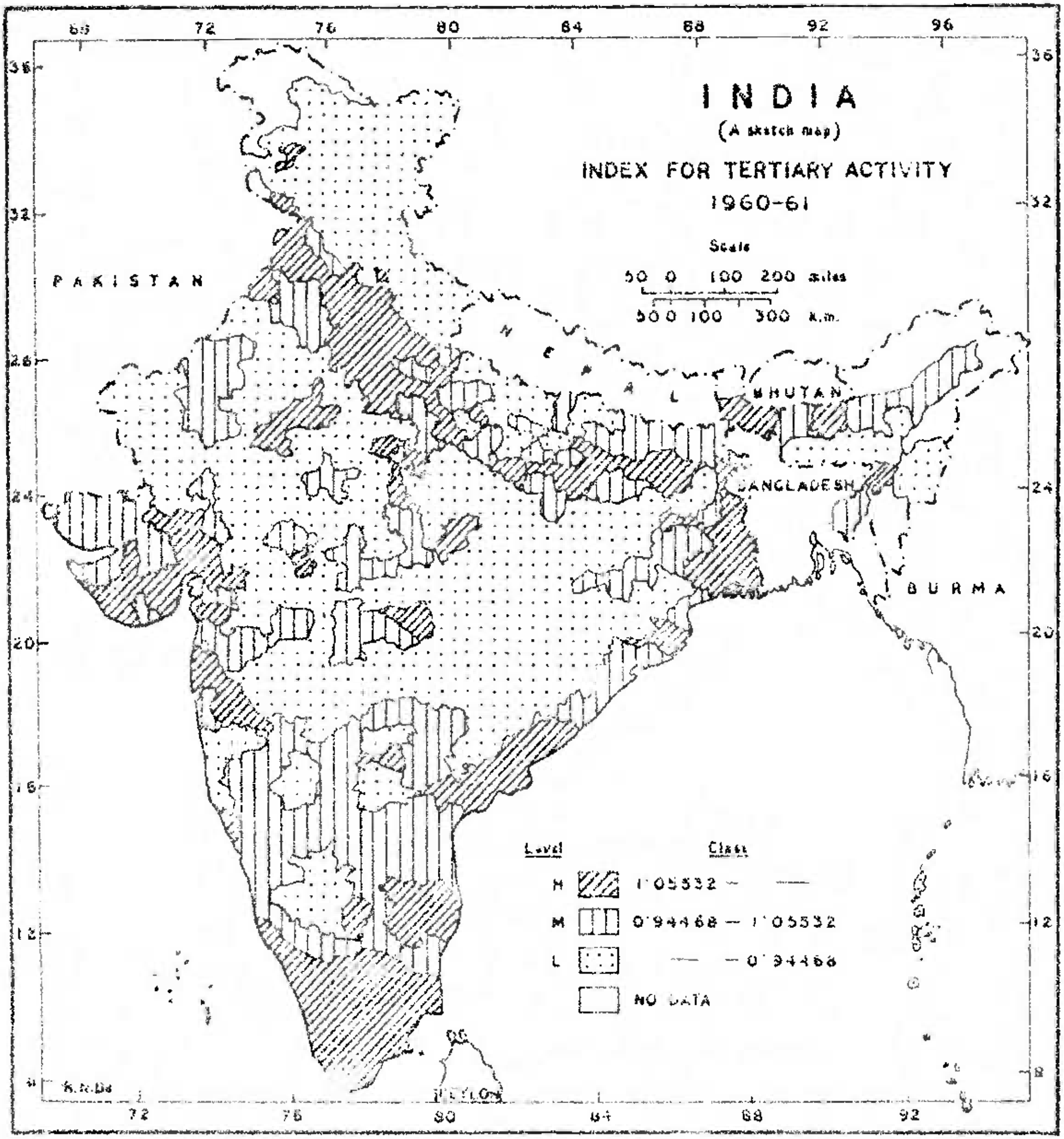
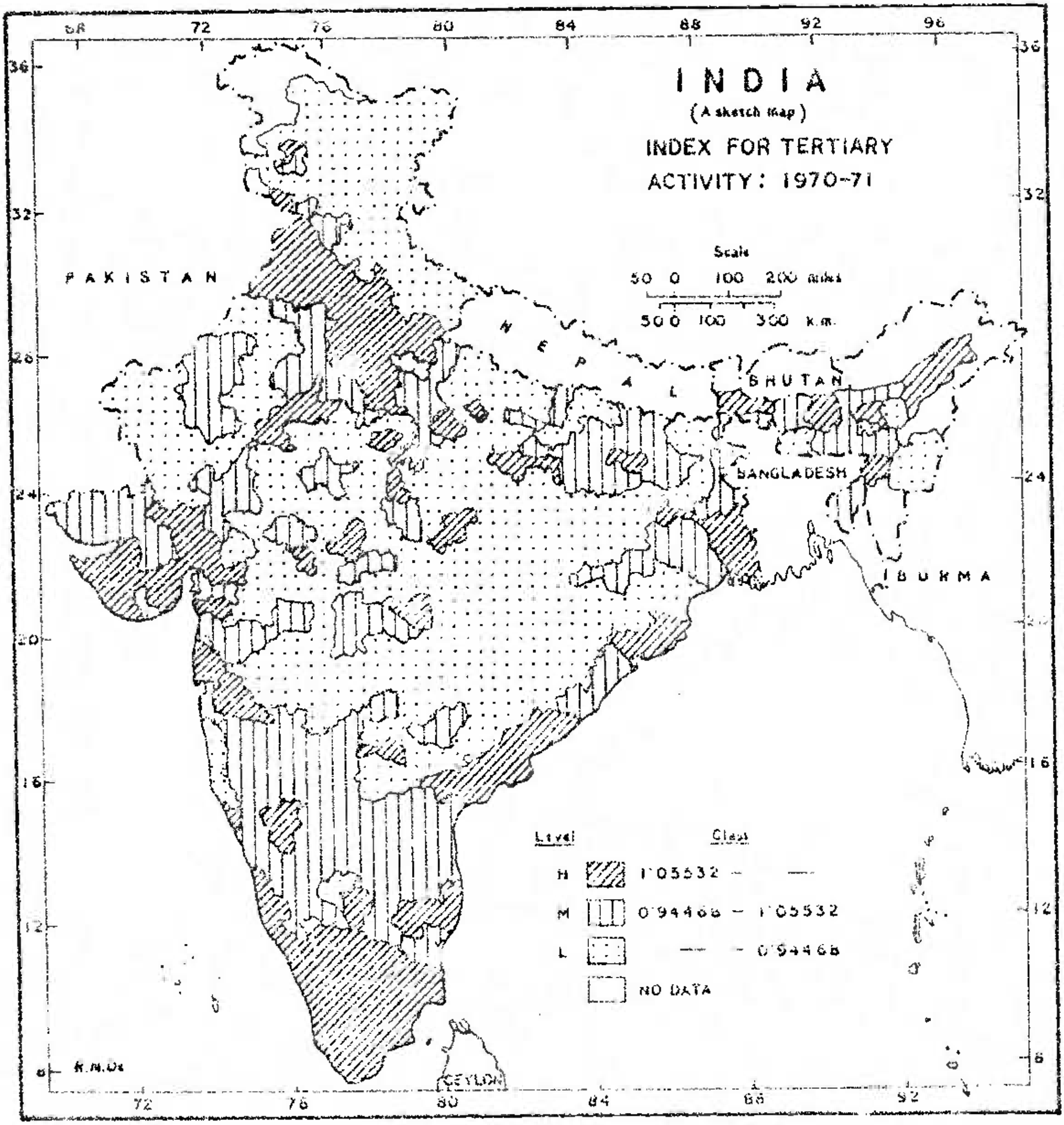

INDIA
(A sketch map)
INDEX FOR TERTIARY ACTIVITY
1960-61
Scale
50 0 100 200 miles
50 0 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
Level
Class
H 1·05532 — ——
M 0·94468 — 1·05532
L —— — 0·94468
NO DATA

FIGURE – 2·51


INDIA
(A sketch map)
INDEX FOR TERTIARY
ACTIVITY : 1970-71
Scale
50 0 100 200 miles
50 0 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H 1·05532 — —
M 0·94466 — 1·05532
L — — 0·94466
NO DATA
72
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8

FIGURE-2·52

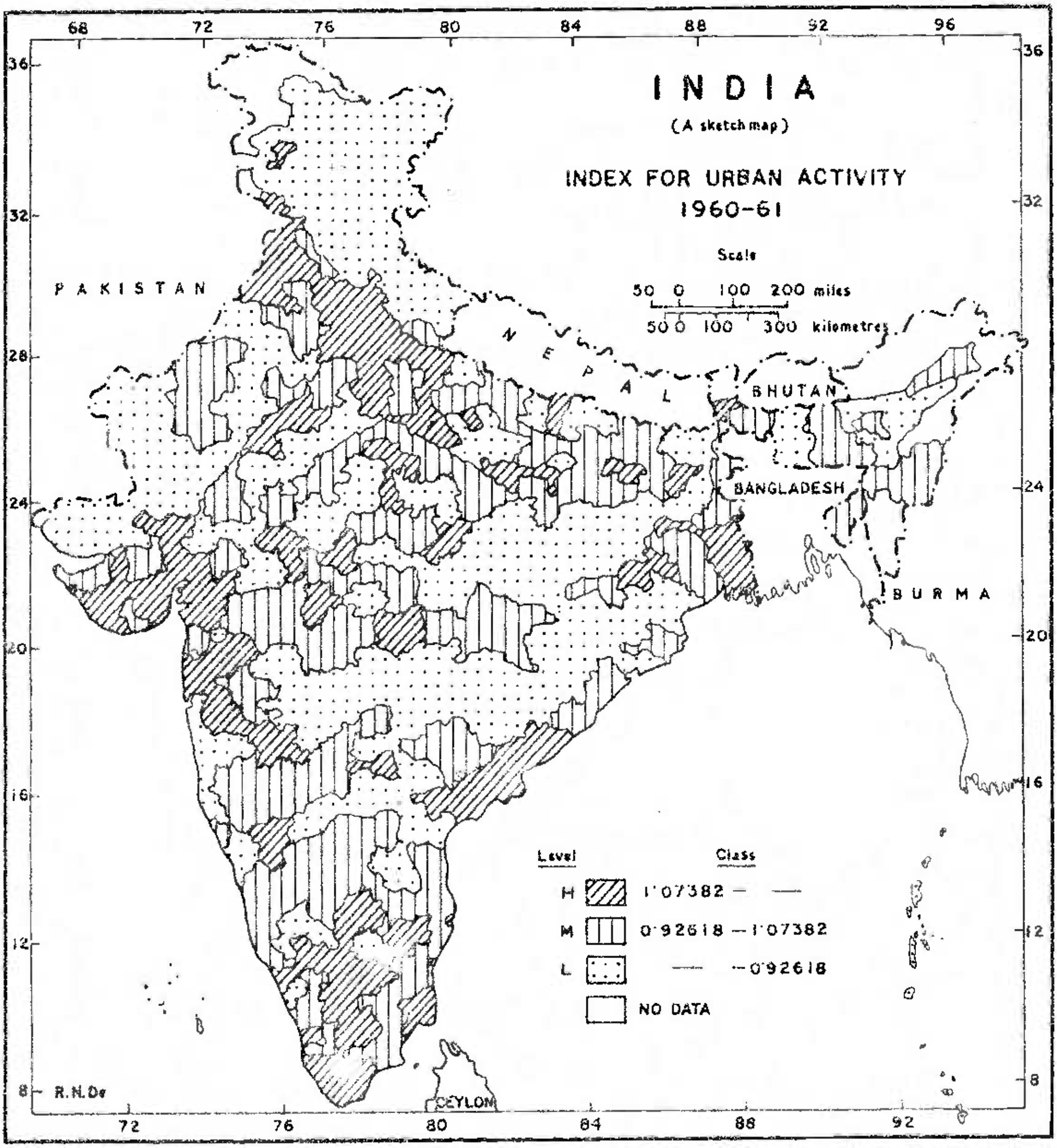
INDIA
(A sketch map)
INDEX FOR URBAN ACTIVITY
1960-61
Scale
50 0 100 200 miles
50 0 100 300 kilometres
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H 1·07382 — —
M 0·92618 — 1·07382
L — —0·92618
NO DATA
R. N. De

FIGURE – 2·61

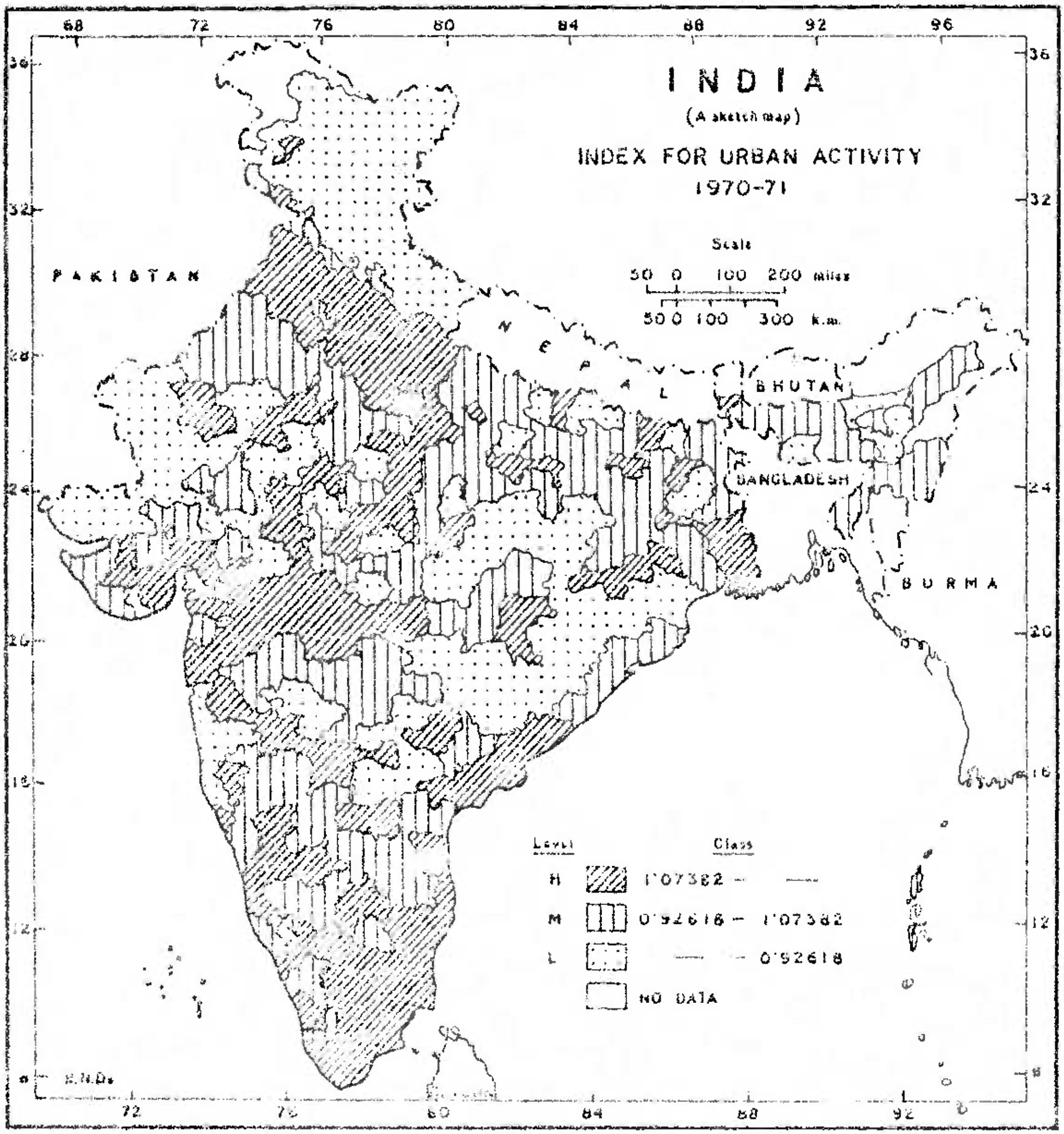
INDIA
(A sketch map)
INDEX FOR URBAN ACTIVITY
1970-71
Scale
50 0 100 200 miles
50 0 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
Level
Class
H
1'07382 —
M
0'92618 — 1'07382
L
— 0'92618
NO DATA

FIGURE – 2'62

were relatively backward in agricultural activity in 1960-61 and 1970-71 (Figures 2.21 and 2.22) whereas the district South Kanara in non-agricultural activity (Figures 2.31 and 2.32) and the district Kozhikode in agricultural activity (Figures 2.21 and 2.22) became highly active at the end of the decade though they had been relatively backward in 1960-61. Areas backward in secondary activity have become developed. The districts Pondicherry, South Arcot and Thanjavur are examples (Figures 2.41 and 2.42). Tertiary activity in the region was uniformly high during the decade (Figures 2.51 and 2.52). Except for the districts of Palghat and Kottayam where the level of urbanization was medium for both the time points, all other parts of the region either emerged as more urbanized at the end of the decade or maintained the rank of high level of urbanization at both the time points (Figures 2.61 and 2.62). The region is well-balanced in respect of the combination of agricultural and non-agricultural activities. The main food crops are rice, maize, jowar, bajra, ragi and pulses. The Thanjavur delta is known as the rice bowl area. Besides, there are important cash crops like cashewnut, arecanut, coconut, cotton, oilseeds, coffee, tea etc. in the region. Important industries are coir, cashew, electrical appliances, textiles, chemical fertilisers, printing and allied industries. In 1970-71, there were 4.68 lakhs of labour engaged in large factories. This accounts for 15.29 per cent of the all-India figure. For different groups of industries, the region's shares of the all-India figures of labour employed in large factories are as follows : 13.60 per cent in textiles and related works, 25.18 per cent in food processing etc. 9.86 per cent in basic metals and their products, 13.20 per cent in chemicals, chemical products and non-metallic mineral products, and 12.89 per cent in paper, paper products, printing, publishing etc. Further, 92.67 per cent, 44.83 per cent, 54.25 per cent and 45.20 per cent of the country's labour employed in large factories respectively in the cashewnut processing, tanneries and leather products, matches and tiles industries belong to this region. It is the industrial diversification which has raised the economic level of the region.

The southern part of the State of West Bengal, the area east of the State of Bihar and north-east of the State of Orissa give rise to the eastern region of high level overall economic activity during the decade (Figure 2.1). The geographical coverage is as small as 2.05 per cent of India's total geographical area, but 6.7 per cent of India's population is accounted for by this region. Except for the district of Midnapore whose level of overall economic activity has declined from high to medium, everywhere in the region there has been a steady endeavour to maintain the high level of overall economic activity in 1970-71 (Figures 2.11 and 2.12). In the major part of the region agricultural as well as non-agricultural activities have uniformly attained high level (Figures 2.21, 2.22, 2.31 and 2.32). The districts Midnapore, Murshidabad, Bankura and Birbhum are exceptions. They are backward in non-agricultural activity at both the time points although agriculturally they are highly active. The district Midnapore could not maintain its high level of overall economic activity in 1970-71 because the level of agricultural activity at the end of the decade has slid down to medium from high to match the level of non-agricultural activity which is medium at both the time points. The reverse situation holds for the districts of Dhanbad and 24-Parganas. Agricultural activity has declined between 1960-61 and 1970-71 whereas non-agricultural activity has remained at the high level. Therefore, the districts Midnapore, Murshidabad, Bankura and Birbhum on the one hand and Dhanbad and 24-Parganas on the other are not equipped with a balanced combination of the two sectors — agricultural and non-agricultural. So mutual exclusiveness is at work to some extent in the region. The backwardness in non-agricultural activity in the former group of districts is contributed primarily by tertiary and urban activities, followed by secondary activity (Figures 2.41, 2.42, 2.51, 2.52, 2.61 and 2.62). The region has taken a leading position among the rice-producing zones in the country. Jute and tea are major the cash crops in the region. The major industries are jute manufacturing, tea processing, cotton textiles, light engineering and basic metals. There were 5.17 lakhs of labour engaged in large factories in 1970-71. 24.21 per cent and 17.99 per cent respectively of the country's total labour employed in large factories in the industries of basic metals and their products, and textiles and its related products belong to the region. Apart from this, in the industries of wood, cork, paper, paper products, printing publishing etc., and the industries of chemical, chemical products and non-metallic mineral products the region accounts for respectively 21.67 per cent and 14.30 per cent of the total labour employed in large factories.

There are 31 isolated districts whose weighted average of index values for overall economic activity have attained high level during the decade (Figure 2.1). About 12 per cent of the country's population and

6.06 per cent of the geographical area is covered by them. It is evident that agricultural activity has either improved in 1970-71 or has been at the high level at both the time points (Figures 2.21 and 2.22). The districts Lucknow, Ahmedabad, Indore and Bangalore have experienced growth from low level to medium, and Kanpur, Sibsagar, Kaira and South Kanara from medium level to high at the end of the decade. Districts which have not come out of backwardness in agricultural activity during the decade are Hyderabad, remaining at low level and Darjeeling, Varanasi, Baroda and Thana, remaining at medium level. In non-agricultural activity there was a rise in the level from medium to high for the districts of Sibsagar, Kolhapur, Goa-Daman-Diu and Coorg whereas the districts Shahabad, Cachar, Nizamabad and Mandya were ranked medium in 1960-61 as well as 1970-71 (Figures 2.31 and 2.32). Actually, most of the districts did not have high levels of both agricultural and non-agricultural activities. Among the 31 districts, 12 districts have been relatively backward agriculturally but well developed in non-agricultural activity. Six districts which are backward in non-agricultural activity have attained high level of agricultural activity in 1970-71. This leads us to conclude that the variation in mutual exclusiveness between the two sectors was greater in isolated districts than in contiguous regions of high level of overall economic activity. The districts Coorg, Mandya and Goa-Daman-Diu were backward in non-agricultural activity because of their backwardness in secondary and urban activities. The backwardness in non-agricultural activity for the districts of Sibsagar, Shahabad and Kolhapur is attributable to their backwardness in tertiary and urban activities. In the district of Nizamabad, none of the three sub-sectors of non-agricultural activity were developed.

It is evident from the above analysis that the northern and southern regions are more balanced than the eastern region in terms of the levels of combination between agricultural and non-agricultural activities. A stronger inclination towards maintaining the high level in both the sectors exists in the northern and southern regions. In the small eastern region, a significant area is not balanced. Preponderance of one or the other of the sectoral activities during the decade is evident. This imbalance appears in a magnified form in the isolated districts showing high level of overall economic activity. The contiguity of the districts was lost mainly due to the existence of a widened gap between the levels of agricultural and non-agricultural activities. If the gap widens further, the level of overall economic activity will undoubtedly slide down to a lower level. The districts which are based on just one of the two main sectors of activity are obviously less stable.

2.5.2 Regions with medium level of overall economic activity

The circular patch along the eastern and western coasts, the northern hilly zone and the connected patch between the eastern and western coasts through central India constitute the region of medium level overall economic activity (Figure 2.1). This covers 25 per cent of the geographical area and 30 per cent of the population of India. There are 87 districts belonging to the region. Most of the area remained at the medium level of overall economic activity at both the time points (Table 2.8, Figures 2.11 and 2.12). There are, however, districts which had been poor in 1960-61 but became better off in 1970-71 in overall economic activity and vice versa. Wherever the condition of overall economic activity deteriorated in 1970-71, the main reason was the poor performance of agricultural activity. This is due to the fact that agriculture depends mainly on climatic behaviour and not on technological factors. The area within the State of Uttar Pradesh largely emerged as a progressive zone in agricultural activity (Figures 2.21 and 2.22). An area covering eastern Uttar Pradesh, South Bihar, North Orissa, eastern Maharashtra and north-western Karnataka (Figures 2.41 and 2.42) attained high level in non-agricultural activity in 1960-61 as well as 1970-71 but — owing to poor performance in agricultural activity — only medium level in overall economic activity. The districts concerned are Cannanore, Mysore, Dharwar, Sholapur, Poona, Nasik, Nagpur, Wardha, Bulsar, Surat, Sehore, Jhansi, Gorakhpur, Allahabad, Monghyr, Singhbhum, Sundargarh, Visakapatnam and Salem (Figures 2.31, 2.32, 2.41 and 2.42). In this region of medium level overall economic activity there has been, by and large, an effort to boost up the level of non-agricultural activity in the later part of the decade. In general, areas backward in non-agricultural activity became better off in 1970-71. Medium level of agricultural activity has got coupled with medium level of non-agriculral activity in the major part of this region. The area covering eastern Uttar Pradesh, South Bihar, north Orissa, eastern Maharashtra and north-western Karnataka are also high in secondary, tertiary and urban activities. Otherwise, the districts in the region remained stagnant at medium level over the decade despite a tendency to move to a higher level in secondary, tertiary and urban activities (Table 2.8). Of the country's total labour in large factories in different industries in 1970-71, the region accounted for 41.54 per cent in the vaccum pan sugar industries, 75.64 per cent in the bidi industry, 32.48 per cent in the tobacco processing industries, 47.10 per cent in dyestuffs and 19.42 per cent in cotton ginning. There are also important industries — glass and hollow ware, paper and straw board, fire bricks and cotton textiles.

The isolated districts of medium level overall economic activity exhibited a similar behaviour. Backwardness in agricultural activity prevented the districts from developing to high level of overall economic activity. The districts Kota, Ujjain, Ratlam and Jabalpur attained high level in secondary activity.

2.5.3 Regions with low level of overall economic activity

The geographical area where the weighted average of index values of overall economic activity is at the low level is 46 per cent of the country's total area and accounts for 23 per cent of its population. Three distinct regions could be identified therein — northern Himalayan, south-western and north-western, the last two with eastern extensions (Figure 2.1).

The area north of the States of Punjab and Uttar Pradesh constitute the northern Himalayan region of low level overall economic activity (Figure 2.1). The percentages of population and geographical area coverage are 1.45 and 7.22 respectively. Except for the districts of Mondi, Kangra and Sirmur where the level of overall economic activity has improved to medium from low at the end of the decade, there were 19 districts which have recorded low level in 1970-71 as well as 1960-61 (Figures 2.11 and 2.12). They are backward both in agricultural and in non-agricultural activities. In agricultural activity, the districts Baramula and Sirmur have gone down to low level from medium while a rise in level from low to medium has taken place for the districts of Mondi, Kangra and Chamba (Figures 2.21 and 2.22). However, the districts Kathua, Mondi and Sirmur are found to have become better off in respect of non-agricultural activity (Figures 2.31 and 2.32). The level of secondary activity has increased from low to medium for the district of Kangra and from low to high for the districts of Kathua, Mondi, Mahasu and Sirmur (Figures 2.41 and 2.42). The districts Kathua and Kangra alone have emerged as progressive districts in tertiary activity with their levels rising to medium in 1970-71 from low in 1960-61. As a consequence of the stagnation prevailing in tertiary and secondary activities in the region, urbanisation, too, has made slow progress (Figures 2.41, 2.42, 2.51, 2.52, 2.61 and 2.62).

The area south of the States of Madhya Pradesh, the eastern part of the State of Maharashtra, the western parts of the States of Orissa and Andhra Pradesh and the northern part of the State of Karnataka constitute the south-western region — with an eastern extension nearly reaching the east coast — of low level overall economic activity during the decade (Figure 2.1). It covers 11.81 per cent of the country's geographical area and accounts for 6.6 per cent of its population. With a few exceptions all districts remained stagnant at low level of overall economic activity at both time points (Figures 2.11 and 2.12). Overall economic activity declined to low level from medium for the districts of Buldhana, Parbhani and Akola and increased to medium level from low for the districts of Gulbarga, Raichur and Dhenkanal during the decade. The level of non-agricultural activity in the region remained comparatively higher for a number of districts — Gulbarga, Bijapur, Adilabad, Nanded, Aurangabad, Akola and Buldhana — for both the time points and for Bidar, Raichur, Karimnagar and Medak at the later time point (Figures 2.31 and 2.32). But as regards agricultural activity most of the districts were either stagnant at low level or decayed to low level. The condition of agricultural activity improved only in the district of Raichur. The district Dhenkanal had high level of agricultural a tivity but was extremel backward in non-a ricultural activity. Similarly, though medium level of agricultural activity was present in the districts of Kalahandi and Koraput, their low level of non-agricultural activity did not allow them to grow. The districts Buldhana and Yeotmal declined from medium level to low, Nanded from high to low and Akola from high to medium level in secondary activity in 1970-71 (Figures 2.41 and 2.42). Other parts of the region experienced a rise in level or remained at the same level in 1970-71. The same pattern largely held good for tertiary and urban activities. It is evident from the above analysis that there are mainly two kinds of districts. One kind represents the areas where agricultural and non-agricultural activity are mutually exclusive. That is, agricultural activity is medium and non-agricultural low in the eastern part of the region or vice versa in the western part of the region. The other kind represents the areashaving low levels of both agricultural and non-agricultural activities. That is, the two broad sectors are not strictly mutually exclusive. It may be noted that the region is chiefly represented by the first kind of districts.

The north-western region — with an eastern extension — of low level overall economic activity is situated to the south of the States of Haryana and Uttar Pradesh, west of the State of West Bengal and north of the States of Maharashtra, Orissa and Gujarat (Figure 2.1). The geographical area is about 21 per cent of the country's area and population during the decade nearly 10 per cent of India's population. Overall economic activity grew from low to medium level primarily for the area within the State of Rajasthan in 1970-71. Whatever negative growth has taken place in the region is mainly confined to the area within the State of Madhya Pradesh. Other parts in the region remained stagnant at low level overall economic activity (Figures 2.11 and 2.12). Agriculturally backward districts of the State of Rajasthan belonging to the region no longer remained as backward at the end of the decade as they had been in 1960-61 but backward districts of the State of Madhya Pradesh became further backward in 1970-71 or at best maintained the 1960-61 level. There are a few districts in the border areas of Madhya Pradesh where medium level of agricultural activity has been maintained from the beginning of the decade to the end. They are Fatehpur, Hamirpur, Rae Bareli, Bhind, Tikamgarh, Balaghat and Raigarh. This could happen due to their geographical proximity to the Green Revolution districts of western Uttar Pradesh. This kind of effect also operated for the area of Rajasthan due to proximity to the States of Punjab and Haryana (Figures 2.21 and 2.22). In non-agricultural activity the region either maintained the level prevailing in 1960-61 or attained a higher level. We find two classes of districts in the region. The first consists of those which maintained backwardness in agricultural as well as non-agricultural activity during the decade. The other class of districts, due to backwardness in agricultural activity, yielded low level of overall economic activity in spite of being relatively progressive in non-agricultural activity (Figures 2.41, 2.42, 2.51, 2.52, 2.61 and 2.62).

There are 19 isolated districts of low level overall economic activity. These are not free from the general pattern prevailing in the regions of low level overall economic activity. There is evidence of some endeavour to break free from the grip of stagnation in some districts of this category. The geographical coverage of the country by these isolated districts is 14.4 per cent while population is about 7.5 per cent.

In concluding the analysis of the regions of low level overall economic activity we observe that the northern Himalayan region tended to remain backward. There is no evidence of any attempt to break free from stagnation. Neither the agricultural nor the non-agricultural sector became active in the region. But if one looks at the south-western and north-western regions, it will be evident that forces generated by non-agricultural activity boosted the overall condition of economic activity in some parts of the regions in spite of a retarded growth of agricultural activity which caused a bottleneck in raising the overall economic situation. However, by and large, the backward areas remained backward.

2.5.4 Synthesis

In the course of construction of the index for overall economic activity we have observed that the association between agricultural index and non-agricultural index is only 0.44206. It is therefore apparent that the country is yet to observe a balanced combination of the two sectors. In the following summary of our analysis we shall observe the divergence prevailing between the two sectors — agriculture and non-agriculture.

From the analyses of the three categories of economic regions — low, medium and high level — the following findings emerge. The northern and southern regions of high level overall economic activity have developed by the combination of high levels of agricultural and non-agricultural activities, but this is not true for certain districts of the eastern region. On the other hand, isolated districts of high level overall economic activity experienced increasing disparity in the growth of activity of the two sectors — agricultural and non-agricultural. The isolated districts of high level overall economic activity are inclined towards non-agricultural activity. They have caused a break in the continuity of the backward regions. In their adjoining districts the potential for non-agricultural activity, particularly secondary activity, is gradually growing. Among the isolated districts, the Krishna-Godavari delta and the Varanasi-Patna and Shimoga-South Kanara areas are balanced in both the sectors of activity. Improvement of the condition of agricultural activity in 1970-71 has raised the level of overall economic activity to high level in some of the isolated districts. The noticing feature is that due to its poor performance in agricultural activity, the Baroda-Bombay-Poona-Nagpur area could not be considered as a region of high level overall economic activity. Here insufficient water was responsible for the failure to produce a substantial volume of agricultural output.

Let us look at any of the regions of high level overall economic activity (Figure 2.1). Sufficient supply of water, fertilizer and High Yielding Varieties of seeds gave rise to a higher magnitude of agricultural production. A minimum supply of water through proper irrigation or rainfall is necessary for survival of agricultural activity. In the eastern region of high level overall economic activity we observed some districts which could not maintain high level of agricultural activity in 1970-71 as there was lack of sufficient irrigation and rainfall. While with sufficient water High Yielding Varieties of seeds can produce a considerably higher quantum of agricultural output, without water they do not yield even the normal level of production. The Krishna-Godavari delta, the Varanasi-Patna area etc. do not face shortage of water and consequently can maintain high level of overall economic activity even with marginally high level of non-agricultural activity. Among the isolated districts of high level overall economic activity, there are districts which are based purely on non-agricultural activity. Their growth has been due to historical reasons or to preferential Government policy. The districts concerned are Srinagar, Gwalior, Indore and Hyderabad. The isolated districts could not form regions mainly due to the poor condition of agricultural activity on the one hand and on the other hand erratic growth of non-agricultural activity in isolated pockets.

Coming to the regions of low level overall economic activity, we find that the imbalance between agriculture and non-agriculture has begun to increase in some parts of the regions. Agriculture has remained backward while non-agricultural activity has shown a tendency to intensify, though not being able to rise beyond medium level. However, portions of the regions have remained at low level in both agricultural and non-agricultural activity. Nor do such regions show any sign of growth in the immediate future, because of low income generation. The interesting finding is that the areas belonging to the south-western region of low level overall economic activity do not necessarily have low level of non-agricultural activity. The districts in the western part of the region show medium level of non-agricultural activity (Figures 2.1, 2.21, 2.22, 2.31 and 2.32) an , had they been provided with even marginally medium level of agricultural activity, would have formed a region of medium level overall economic activity. These districts occur in drought-prone areas. Therefore, ensuring adequate supply of water for agricultural activity would improve the situation. The reverse picture is seen in the eastern extension (Figure 2.1) of the region. The districts falling in the extension are at least medium in agricultural activity and would have formed a region of medium level of overall economic activity if they had been provided with marginally medium level of non-agricultural activity (Figures 2.21, 2.22, 2.31 and 2.32). The same sort of behaviour of the two sectoral activities is observed in the north-western region with eastern extension of low level of overall economic activity as in the south-western region with eastern extension of low level of overall economic activity. However, the northern Himalayan region of low level overall economic activity does not in general have even medium level of either of the two sectoral activities.

When a region develops, developed districts should develop further in a situation of mutual contribution by agricultural and non-agricultural activities. In the region of medium level overall economic activity, non-agricultural activity exhibits a growing tendency but agricultural activity over a large area has failed to grow leading to sectoral imbalance. Due to inappropriate level of agricultural activity compared to the existing higher level of non-agricultural activity the districts in the regions show a lower level of overall economic activity. Unsteady behaviour of agricultural activity causes a deviation in region formation. Despite the fact that the Baroda-Bombay-Poona-Nagpur area is highly developed in non-agricultural activity they fell in the region of medium level overall economic activity since they could attain at most medium level in agricultural activity. In the course of analysing the regions of low level overall economic activity we indicated the areas which could yield only low level of overall economic activity in spite of rating medium in non-agricultural activity. There we also pointed out some areas of low level non-agricultural activity but medium level of agricultural activity. Had agricultural activity been greater in the first case and non-agricultural activity in the second case these areas would have attained medium level of overall economic activity. Thus, the present regions of medium level, low level and high level would have changed if certain measures had been taken.

The regions and isolated pockets of high level overall economic activity pulled up the broad areas between them to a higher level, thus breaking the vast contiguous zone of low level overall economic activity in Central India. Since the developed regions are connected by trunk roads and railways transport systems, the areas in between them also started developing, particularly in non-agricultural activity (Figures 2.1, 2.21, 2.22, 2.31 and 2.32). One can easily see from Figure 2.1 that the eastern, northern and southern regions of high level overall economic activity and the Ahmedabad-Baroda and Bombay-Poona regions of high level of non-agricultural activity (Figures 2.31 and 2.32) are mutually connected by patches of medium level overall economic activity. The extent of imbalance between the two sectors — agriculture and non-agriculture — is greater in the region of medium level overall economic activity (Figure 2.1) compared to other regions though there are a number of districts where both agricultural and non-agricultural activity remained at the medium level.

The analysis in this section clearly indicates the necessity of integrated planning for agricultural and non-agricultural activities. We have observed that a deficiency in either of the two sectoral activities acts as an obstacle to the formation of balanced regions. Thus, any sector in the absence of the other efficient sector may face a problem of extra flow of unemployed labour from the other sector to it. Had the levels of agricultural and non-agricultural activities been same, there would have been different shapes of regions under every level of overall economic activity. It is agricultural activity that caused a good deal of variation in overall economic activity. Hence the integrated planning process should primarily consist of planning for increasing agricultural activity. Therefore, the districts which already have at least medium level of non-agricultural activity but a lower level of overall economic activity should be given priority in planning for agricultural activity. Again, the districts which have at least medium level of agricultural activity with a lower level overall economic activity should also be given priority for planning non-agricultural activity. To put it more concisely, an integrated planning approach is required to pull up the level of overall economic activity to that of the more developed of the two sectors. This means that planning should be primarily directed at raising the level of activity of the weaker sector till the two types of activity — agricultural and non-agricultural — are at the same level.

2.6 Comparative Regional Analysis between Per Capita Income and Overall Economic Activity

To relate overall economic activity and per capita income over districts, regions could also be delineated according to three levels — high, medium and low — of per capita income[8/]. For high level of

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8/ Regionalization has been made on the basis of districtwise weighted average of per capita incomes at 1960-61 and 1970-71. Size of population is chosen for the weights in the respective time points.

per capita income we have a distinct region situated in the north-western part of India (Figure 2.7). In addition there are some isolated small areas and districts scattered mainly in the southern part of India. There are two distinct regions for which per capita income, on an average during the decade, is at medium level. One of these appears in the central part and the other in the south of India. In addition there is a small area in the north-eastern hilly region as well as some isolated districts located scatteredly. The Himalayan States of northern India and central States near the eastern part of India form two broad regions of low level of per capita income (Figure 2.7).

2.6.1 Regions with high level of per capita income

The States of Punjab and Haryana, western Uttar Pradesh, eastern Rajasthan and the western coastal districts extending upto the north of the State of Karnataka constitute the north-western region of high level of per capita income during the decade (Figure 2.7). In 1960-61, there were two distinct regions, one located in the northern part and the other in the western coastal part of India. These two disjoint parts got connected through the emergence of the eastern districts of Rajasthan along the border of the State of Madhya Pradesh in 1970-71 (Figures 2.71 and 2.72) because the eastern districts of Rajasthan attained high level of per capita income in 1970-71. This suggests that the connecting area was undoubtedly progressive. While the northern part of the north-western region of high level of per capita income attained high level of overall economic activity during the decade, the other part of the region — Ahmedabad-Baroda-Bombay-Poona-Nagpur — generally had medium level of overall economic activity

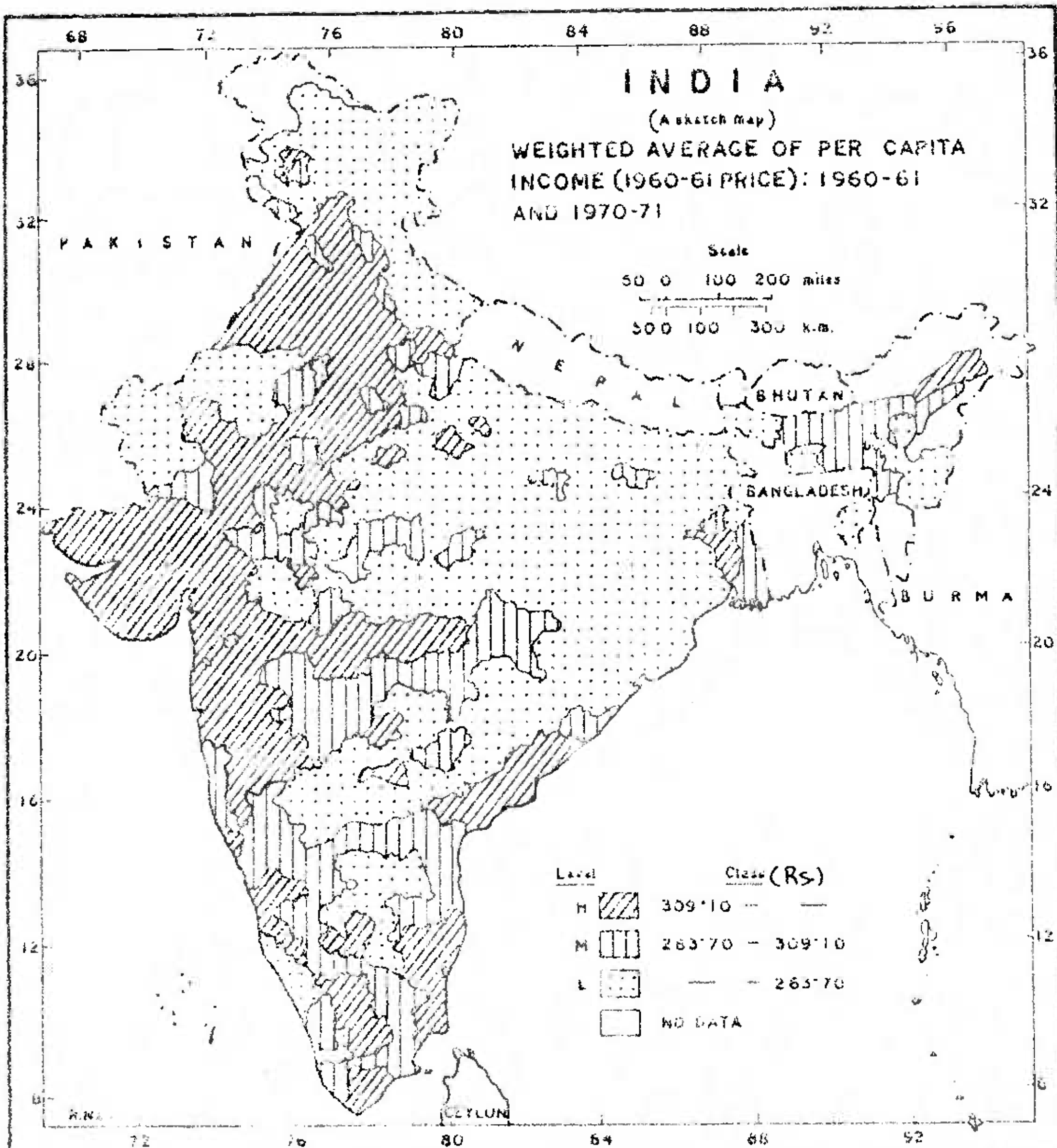
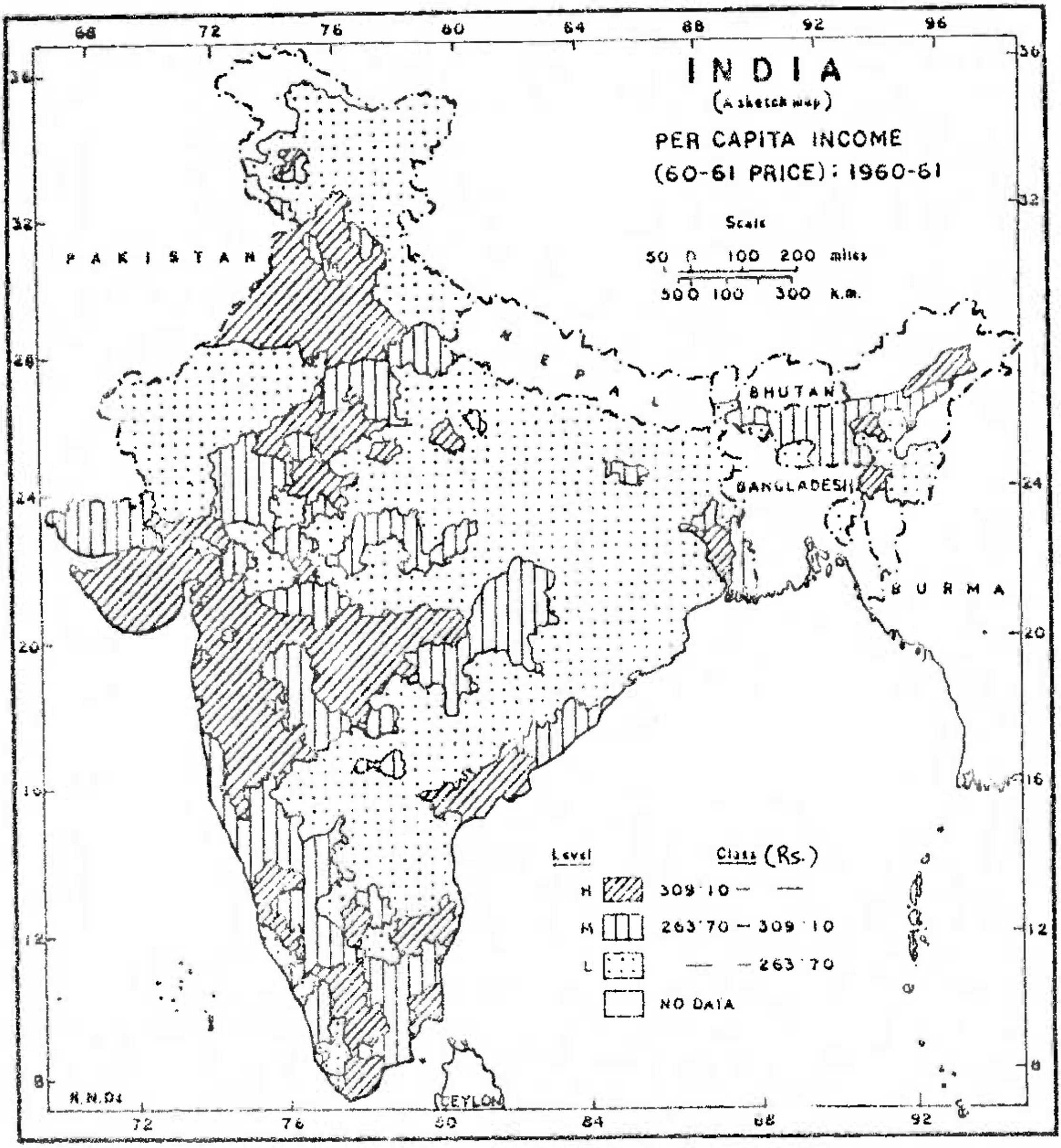

INDIA
(A sketch map)
WEIGHTED AVERAGE OF PER CAPITA INCOME (1960-61 PRICE): 1960-61 AND 1970-71
Scale
50 0 100 200 miles
500 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class (Rs.)
H 309·10 —
M 263·70 – 309·10
L — 263·70
NO DATA

FIGURE – 2·7



INDIA
(A sketch map)
PER CAPITA INCOME
(60-61 PRICE): 1960-61
Scale
50 0 100 200 miles
500 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class (Rs.)
H 309·10 — —
M 263·70 — 309·10
L — — 263·70
NO DATA

FIGURE – 2·71

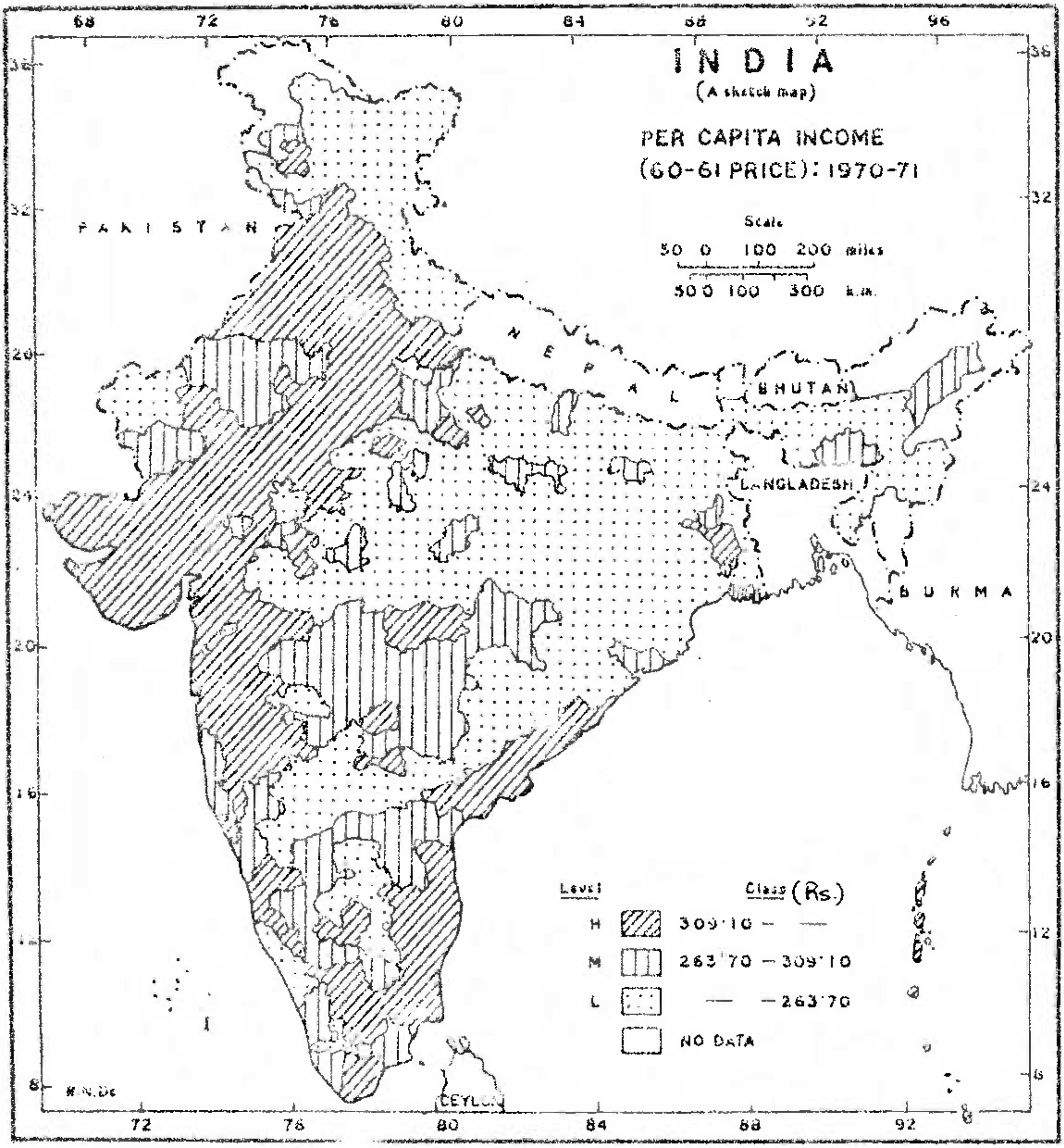

I N D I A
(A sketch map)
PER CAPITA INCOME
(60-61 PRICE): 1970-71
Scale
50 0 100 200 miles
50 0 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class (Rs.)
H 309·10 — —
M 263·70 — 309·10
L — — 263·70
NO DATA

FIGURE - 2·72

(Figures 2.1 and 2.7). This implies that the economic activity in the latter part was more productive yielding a high level of per capita income largely contributed by non-agricultural activity as agricultural activity was largely backward.

The Thanjavur and Krishna-Godavari deltas belong to the high level of per capita income group (Figure 2.7), the income growth being mainly contributed by agricultural activity. Overall economic activity too, was high in these areas (Figure 2.1). The other isolated districts of high level per capita income during the decade also had high level of overall economic activity. The list of progressive districts whose per capita income increased from medium to high level in 1970-71 includes Nizamabad, Hyderabad, Visakapatnam, South Arcot, Mandya, Goa-Daman-Diu and Lucknow. The per capita income of the districts of Howrah and Lakhimpur fell at the end of the decade to medium level from high. The areas Calcutta-Burdwan, Kanyakumari-Madurai-Bangalore and Shimoga-South Kanara have also experienced high level of per capita income. These areas too show a high level of overall economic activity.

2.6.2 <u>Regions with medium level of per capita income</u>

The areas of medium level per capita income occur in three patches — south-central part of Maharashtra, north-central part of southern India and Assam Valley (Figure 2.7). The significant feature of the south-central part of the State of Maharashtra lies in the fact that a relatively high level of per capita income is maintained by this area despite the low level of overall economic activity there. Since economic activity in western India and particularly in the State of Maharashtra is basically explained by non-agricultural activity and the State of Maharashtra has assumed a leading position in terms of State domestic product over the years, medium level of overall economic activity and high level of non-agricultural activity in the western coastal area yielded high level of per capita income and the spatial impact caused by the western coastal area raised the level of per capita income to medium in the south-central part of Maharashtra.

The north-central patch of southern India is situated in the States of Karnataka and Tamil Nadu and in the southern part of the State of Andhra Pradesh. The north-central patch of southern India exhibits medium level of overall economic activity as well as per capita income (Figures 2.1 and 2.7). The districts Quilon, Kurnool and Ongole went up from low to medium, Nellore and Chittor from low to high and Tiruchchirappalli from medium to high level of per capita income in 1970-71 (Figures 2.71 and 2.72). Agricultural and non-agricultural activities were jointly instrumental in raising the level of per capita income.

The Assam Valley is the third pocket of medium level per capita income (Figure 2.7). A trend towards the depletion of per capita income prevailed here. The districts Goalpara, Kamrup, Darrang, Nowgong and Cachar showed this trend (Figures 2.71 and 2.72). Relatively low productivity of economic activity in 1970-71 is indicated when one remembers that overall economic activity in 1970-71 was at the medium level in these districts.

Most of the isolated districts of medium level per capita income were better off in 1970-71 than in 1960-61 (Figures 2.7, 2.71 and 2.72). The level of overall economic activity was at least medium for such districts.

2.6.3 Regions with low level of per capita income

The lower part of the State of Uttar Pradesh, the States of Madhya Pradesh and Bihar, the whole of the State of West Bengal except the Calcutta belt, the State of Orissa and the northern part of the State of Andhra Pradesh constitute the central region of low level of per capita income during the decade (Figure 2.7). The interesting feature here is that the districts in the outer part of the region were favoured with at least the medium level of overall economic activity (Figure 2.1). Thus, while the inner part of the region was not favoured with the minimum level of overall economic activity necessary to raise the level of per capita income, the outer part of the region failed to show a rise in per capita income despite an improvement in overall economic activity. This indicates that economic activity was not sufficiently productive to raise the level of per capita income in the outer part of the region. Therefore, the region of low level per capita income is characterised by both low and medium levels of overall economic activity. Due to the vast backwardness prevailing over the region and limited magnitude of economic activity in the periphery, it was not possible either for the outer part of the region to develop further, or for the inner part to raise its standard of living. It is essentially owing to the fact that no interactions between the economic activities of the two parts of the region took place as there was practically no activity in one part of the region. Moreover, the outer part suffered a leakage of flow of income generated through its own activity to the neighbouring backward areas instead of gaining any significant thrust out of interactions between activities in the two parts of the region.

2.6.4 Synthesis

Let us recall the regions of high level of overall economic activity. There are three such regions — northern, southern and eastern (Figure 2.1). Had there been a minimum level of agricultural activity, the Baroda-Bombay-Poona-Nagpur area which is highly developed in non-agricultural activity would have shown high level of overall economic activity (Figure 2.1). When we inspect the regions of high level per capita income (Figure 2.7), we find that there is a distinct region of high level per capita income located in the north-western part of India. The northern part of the region is essentially well-balanced and full of spatial impacts of economic activity. The northern part is Punjab-Haryana-western Uttar Pradesh. Small industrial and agricultural activities have been instrumental in maintaining high level of per capita income. Mutual interaction through flows of output between sectors have sustained the high level of per capita income. There is wide scope of investment of personal income in productive processes like small factories or agriculture. A tendency to save and invest part of one's income instead of consuming the whole of it is in evidence. Were it not so, the Punjab-Haryana-western Uttar Pradesh area would find it difficult to maintain the high level of per capita income.

The Alwar-Jaipur-Ajmer-Udaipur area between Punjab-Haryana-western Uttar Pradesh and Ahmedabad-Baroda-Bombay-Poona-Nagpur have emerged as a progressive zone of high level per capita income. This is the middle part of the north-western region of high level per capita income. The area mainly belongs to the State of Rajasthan (Figure 2.7). We should note that the area shows medium level of overall economic activity but is favoured with high level of per capita income. Similarly the Ahmedabad-Baroda-Bombay-Poona-Nagpur area, being largely equipped with medium level of overall economic activity and high level of non-agricultural activity shows high level of per capita income Therefore, the presence of areas other than Punjab-Haryana-western Uttar Pradesh in the north-western region of high level per capita income are largely explained by non-agricultural activity. Since we considered only the strength of labour in factories and not the stock of capital and output due to non-availability of districtwise data, the wide variation in industrial productivity of labour over labour-intensive to capital-intensive factories has not been taken into account. It is also to be noted that the industrial production in these areas has not been interrupted by labour disputes, shortage of power etc. in the late sixties when the eastern region of high level overall economic activity (Figure 2.1) was increasingly facing such obstacles to industrial production.

The eastern as well as the southern region of high level overall economic activity (Figure 2.1) failed to yield broad regions of high level per capita income (Figure 2.7). Both the regions of high level overall economic activity faced a setback in industrial production which contributes a significant portion to the domestic products of the States. Only a few districts in the two regions of high level overall economic activity could maintain the high level of per capita income. Thus, the emergence of areas having medium and low levels of per capita income in the southern and eastern regions of high level overall economic activity has been observed (Figures 2.1 and 2.7). That the Thanjavur and Krishna-Godavari deltas could maintain the high level of per capita income is explained by their agricultural activity. Fertile land coupled with sufficient water gave rise to a high yield rate of agricultural production which could support high level of per capita income.

The south-central part of Maharashtra is favoured with medium level of per capita income despite being low in overall economic activity (Figures 2.1 and 2.7). Here it is the spatial impact of the western coastal area that has raised per capita income to medium level. The north-central part of southern India and the Assam Valley experienced medium level of overall economic activity which yielded medium level of per capita income. As against, the central region of low level per capita income could not raise per capita income to a higher level despite the fact that a large part of it was favoured with at least medium level of overall economic activity.

In the above discussion, we find that the vast backward areas having practically no activity did not allow the progressive areas to grow due to the absence of proper interaction between the activities of the two kinds of areas — backward and progressive. The backward areas absorbed, as it were, the flow of income from progressive areas; they could not grow themselves and they did not allow the level of per capita income of progressive areas to go up. It is also observed in the above analysis that a higher level of overall economic activity does not always yield a higher level of per capita income, on the other hand there is evidence of a lower level overall economic activity giving rise to a relatively higher level of per capita income. Thus, the regional variation in the divergence between the levels of overall economic activity and per capita income is clearly seen in the analysis.

CHAPTER 3

Regional Analysis of Labour Pressure in Agricultural Activity

3.1 Introduction

In the course of determining the levels of overall economic activity for the districts of India, we evaluated sectoral indices. We determined the levels of agricultural activity for the spatial units under consideration. The index of agricultural activity depicts the extent of agricultural activity prevailing in the districts concerned. Since the annual growth rate of cropped area fell very rapidly the growing agricultural labour must have posed problems for their absorption in agricultural activity. The annual growth rate of cropped area which during 1951-61 had been 1.62 per cent [20] became 0.46 per cent in the decade 1960-61 to 1970-71 and for 1963-64 to 1971-72 [30] it was 0.29 per cent. In the ensuing analysis we will attempt to construct an index for labour absorbability in agriculture for the districts in 1960-61 and 1970-71. The index is constituted by the variables land per unit labour and the productivity of labour. Using the index for labour absorbability in agriculture we shall find out the levels of labour pressure for spatial units. It will be shown that increased agricultural activity need not necessarily lower the labour pressure on agriculture. We need to detect the regions where this kind of behaviour is present. Then we shall conduct an enquiry into the causal factors contributing to labour pressure. The growth rate of labour pressure may be explained by the growth rate of labour, growth rate of production and growth rate of cropped area over the regions. We shall next obtain the all-India pattern of factor shares of change to the growth rate of production. Growth rate of labour, growth rate of cropped area, growth rate of productivity of land, growth rate of productivity of labour and growth rate of productivity of cropped area per unit labour will be taken as factors affecting the growth rate of production. It is also important to evaluate the effect of inputs on the productivity of land and productivity of labour. We will consider use of fertilizer, rainfall and extent of irrigation as inputs.

3.2 Spatial and Temporal Coverage, Variables and Data Sources

3.2.1 Spatial and temporal coverage

The districts of India have been considered as the spatial units. There are 323 districts taken into account (see Chapter 2, Section 2.2.1). The time points 1960-61 and 1970-71 have been considered. Since in India the wide use of fertilizer started only after the mid-60's and as such district-level fertilizer data are not available for 1960-61, every relationship involving agricultural inputs will relate to the time point 1970-71 only.

3.2.2 Variables

We will define three kinds of variables that will be involved in this chapter. Variables of the first kind are given below.

P_1 : Productivity of land

P_2 : Productivity of labour

P_3 : Cropped area per unit labour

These variables vary over spatial units for two time points — 1960-61 and 1970-71. The second kind of variables refer to the growth rates of different attributes. They are defined below.

G_1 : Growth rate of agricultural production.

G_2 : Growth rate of agricultural labour.

G_3 : Growth rate of cropped area.

G_4 : Growth rate of productivity of land.

G_5 : Growth rate of productivity of labour.

G_6 : Growth rate of cropped area per unit labour.

These variables have been computed over 1960-61 to 1970-71. They vary over spatial units. Variables of the third kind relate to agricultural inputs in 1970-71. They are as follows.

I_1 : Total fertilizer applied in Kg. per hectare of cropped area (N + P + K).

I_2 : Annual rainfall in mm.

I_3 : Extent of irrigation.

Since no reliable data for improved variety of seeds were available for all the districts, they could not be considered here despite their importance. Fertilizer was not much used in 1960-61. For this reason we do not consider I_1, I_2 and I_3 for 1960-61. These variables also vary over spatial units.

3.2.3 Data sources

There are 23 crops taken into account for computation of the agricultural variables. The detailed list of crops and the sources of data relating to production and area have been mentioned in Chapter 2, Section 2.2.3. The average all-India triennium marketing prices centred at 1961-62 for the crops under consideration have been used to evaluate agricultural production over spatial units for 1960-61 and 1970-71. The data source for the extent of irrigation and agricultural labour has been mentioned in Chapter 2, Section 2.2.3. The statistics of fertilizers have been compiled from various reports of Fertilisers Statistics, published by the Fertilisers Association of India, New Delhi. The data for annual rainfall has been collected from various reports of State Statistical Abstract, Economic Review, Handbook of Statistics for every State of India.

3.3 Formulation and Method

3.3.1 Model for index of labour absorbability in agriculture

The extent of labour absorption in agriculture or labour pressure on agriculture depends upon two important factors. They are productivity of labour and cropped area per unit labour. One cannot take any one of these two factors alone to represent the magnitude of labour pressure. If the productivity of labour is considered alone, the scope of extension of production through the extension of cropped area per unit labour will not be taken into account. By means of intensive cultivation with the help of better use of fertilizer and irrigation one can increase the productivity of labour only if the availability of cropped area per unit labour is of reasonable size. On the other hand there is no point in considering only the availability of cropped area per unit labour to indicate labour pressure or labour absorbability. Since land does not uniformly yield a constant volume of production for all spatial units, increased availability of cropped area per unit labour does not necessarily imply a higher level of labour absorption in agriculture or lower level of labour pressure on agriculture. Thus, it is the two factors taken together which indicates the extent of labour pressure on agriculture or labour absorbability in agriculture.

If λ is taken as an indicator of labour absorbability, the λ may be defined by the equation system (3.1).

$$\lambda = F_1 (P_2, P_3) \qquad \ldots. \quad (3.1)$$

where P_2 and P_3 stand for the productivity of labour and cropped area per unit labour respectively. Now, let there exist a function F_2 such that $P_2 = F_2 (P_3)$. We define $F_1(P_2, P_3)$ as follows by the equation (3.2).

$$\lambda = F_1(P_2, P_3) = P_2 + P_3 \frac{dP_2}{dP_3}$$

$$= P_2 + P_3 \frac{dF_2(P_3)}{dP_3} \qquad \ldots \quad (3.2)$$

It is unlikely that productivity of labour would be increasing uniformly at a constant rate with increasing availability of cropped area per unit labour. It is reasonable therefore to expect a non-linear increasing form of the function F_2 rather than a linear increasing one. Here one should bear in mind that a higher value of λ indicates a lower value of labour pressure on agriculture. After estimating λ, we will take a suitable transformation of λ such that the mean of the transformed or revised measure becomes unity. Let the revised form of λ be S. We will use S to find out levels of labour pressure on agriculture for the spatial units.

3.3.2 Procedure for regionalization of labour pressure

For the purpose of identifying the regions under different levels of labour pressure, the index S to be constructed needs to be classified.

We will choose the index for agricultural activity Z_A which has been constructed in Chapter 2 (see Section 2.4.2.1). We will determine the relationship between Z_A and S. Using the class intervals for Z_A and the relationship between Z_A and S we will evaluate the class intervals for S. For regionalization we will consider the weighted average of the values of index of labour absorbability S corresponding to 1960-61 and 1970-71. Agricultural labour in the respective years is used as the weight. The procedure is similar to that which has been followed for regionalization of the index for overall economic activity (see Section 2.3.4). As before we choose three classes — low (L), medium (M) and high (H) for identifying the levels of labour pressure. A higher value of S would indicate a lower level of labour pressure on agriculture.

3.3.3 Procedure for regionalization of growth rate of labour pressure

In order to perform the regional analysis of growth rate of labour pressure we are to take the help of the growth rate of the index of labour absorbability in agriculture defined by the variable G_o. Therefore, we need to classify G_o. After examining the frequency distribution we will choose the class intervals for G_o. Three levels — low (L), medium (M) and high (H) — will be considered for identifying the levels of growth rate of labour pressure. An increase in labour absorbability means a decrease in labour pressure. Since this analysis is intended to explain the levels of growth rate of labour pressure with the help of basic factors relating to growth rate of production (G_1), growth rate of labour (G_2) and growth rate of cropped area (G_3) it would be necessary to further classify them for the purpose of analysing their characteristics explaining labour pressure at the regional level. We will determine the regression equations of G_1 on G_o, G_2 on G_o and G_3 on G_o. Setting the class boundaries of G_o into the regression equations we get the class boundaries for G_1, G_2 and G_3.

3.3.4 Procedure for evaluation of factor shares of change

In order to determine factor shares we follow the procedure given below. Suppose we want to estimate the factor shares of the variables say $Q_1, Q_2, Q_3, \ldots, Q_k$ to explain the attribute Q where Q is a linear function of $Q_1, Q_2, \ldots, Q_k$, given by the equation (3.3)

$$Q = a_o + a_1Q_1 + a_2Q_2 + \ldots + a_kQ_k \qquad \ldots \quad (3.3)$$

The a_i's ($i = 0, \ldots, k$) are coefficients. To judge the relative importance of the explanatory variables we express the equation (3.3) in standardised form. Therefore the standardised form of the equation (3.3) is given in the equation (3.4).

$$q = b_1q_1 + b_2q_2 + \ldots + b_kq_k \qquad \ldots \quad (3.4)$$

The q and q_i's ($i = 1, \ldots, k$) are the standardised forms of Q and Q_i's ($i = 1, \ldots, k$) respectively and b_i's ($i = 1, \ldots, k$) are revised coefficients. Applying the mathematical theorem on total differentials to the equation (3.4), we obtain

$$dq = \frac{\partial q}{\partial q_1} dq_1 + \frac{\partial q}{\partial q_2} dq_2 + \ldots + \frac{\partial q}{\partial q_k} dq_k$$

$$\therefore \quad 1 = \sum_{i=1}^{k} \frac{\partial q}{\partial q_i} \Big/ \frac{dq}{dq_i} = \sum_{i=1}^{k} f_i \qquad \ldots \quad (3.5)$$

$$\text{where} \quad f_i = \frac{\partial q}{\partial q_i} \Big/ \frac{dq}{dq_i}, \qquad i = 1, \ldots, k$$

Therefore, a unit change in q is determined by the aggregation of $\bar{f}_i$'s $(i = 1, \ldots, k)$. f_i's $(i = 1, \ldots, k)$ are the factor shares of contribution by q_i's respectively $(i = 1, \ldots, k)$.

We want to determine factor shares of contribution to growth rate of production (G_1) on the basis of growth rate of labour (G_2), growth rate of cropped area (G_3), growth rate of productivity of land (G_4), growth rate of productivity of labour (G_5) and growth rate of cropped area per unit labour (G_6). So we will determine the linear regression equation of G_1 on G_2, G_3, G_4, G_5 and G_6. The other aspect we want to enquire into is the role of inputs like use of fertiliser, rainfall and extent of irrigation to explain the productivity of land and productivity of labour. For this we carry out similar analysis.

3.4 Estimation and Analysis of Levels of Labour Pressure

3.4.1 Estimation of index for labour absorbability

In order to determine the levels of labour pressure, we are to obtain the explicit expression $\lambda = F_1(P_2, P_3)$. So we are required to estimate the equation $P_2 = F_2(P_3)$. The best statistical estimate of the regression equation of P_2 on P_3 in double log, founded upon 646 observations — i.e., 323 districts for two time points 1960-61 and 1970-71 — is given below by the equation (3.6).

$$\log_e P_2 = \underset{(0.01724)}{6.09446} + \underset{(0.03251)}{0.50053} \log_e P_3 \quad \ldots (3.6)$$ 1/

1/ The alternative regression equation of P_2 on P_3 nearest to the equation (3.6) is given below.

$$P_2 = \underset{(21.67121)}{259.89840} + \underset{(15.97012)}{208.76190} P_3$$

The multiple correlation coefficient and F-statistic are 0.2431 and 206.84 respectively. The multiple correlation for this equation is exceeded by that for equation (3.6) at 5 per cent level of significance. Therefore the equation (3.6) is found to be best.

The multiple correlation coefficient is found to be 0.3082, the F-statistic being 286.96. This ensures that the equation is significant at the 1 per cent level of chance. Moreover, the regression coefficients are significant at the 1 per cent level of chance. One may also note that statistically there is no significant difference here between 0.50053 and 0.50 at the 5 per cent level of chance.

Thus, $P_2 = F_2(P_3)$ is given in by the equation (3.7).

$$P_2 = F_2\,(P_3) = 443.39366P_3^{0.50053} \qquad \ldots \; (3.7)$$

One should note that P_2 is an increasing function of P_3. We evaluate $\frac{dF_2(P_3)}{dP_3}$ and $\frac{d^2F_2(P_3)}{d^2P_3}$ for understanding the nature of the curve in the equation (3.7). They are given in the equation (3.8) and (3.9).

$$0 < \frac{dF_2(P_3)}{dP_3} = 221.93262P_3^{-0.49947} \qquad \ldots \quad (3.8)$$

$$\text{for } P_3 > 0$$

$$0 > \frac{d^2F_2(P_3)}{d^2P_3} = -\,110.84868P_3^{-1.49947} \qquad \ldots \quad (3.9)$$

$$\text{for } P_3 > 0$$

The equation (3.8) ensures that $P_2 = F_2(P_3)$ is increasing and the equation (3.9) says that $\frac{dF_2(P_3)}{dP_3}$ is decreasing. Therefore, $P_2 = F_2(P_3)$ is increasing at a decreasing rate. In other words, we observe that the productivity of labour increases at a decreasing rate as the availability of cropped area per unit labour increases. This is the pattern prevailing in Indian agriculture during 1960-61 to 1970-71. This finding is quite plausible.

Now, we intend to find the explicit form of $\lambda = F_1(P_2, P_3)$ which is given by the equation (3.10).

$$\lambda = F_1(P_2, P_3) = P_2 + P_3 \frac{dF_2(P_3)}{dP_3}$$

$$= P_2 + P_3\ 221.93262P_3^{-0.49947}$$

$$= P_2 + 221.93262P_3^{0.50053} \qquad \ldots (3.10)$$

It is to be noted that λ is not a homogeneous function. The labour absorbability in agriculture in the ith district is given by the equation (3.11).

$$\lambda_i = P_{2i} + 221.93262P_{3i}^{0.50053} \qquad \ldots \quad (3.11)$$

To maintain conformity with activity indices of Chapter 2 and facilitate understanding we want to adjust the mean of λ to unity. The revised index of labour absorbability, say S, is given by the equation (3.12).

$$S_i = \frac{1}{D}\left(P_{2i} + 221.43262P_{3i}^{0.50053}\right) \qquad \ldots \quad (3.12)$$

where $D = \sum_{i=1}^{N} \lambda_i / N$; N = total number of observations. S_i refers to the index value of labour absorbability in agriculture corresponding to the ith district. The mean of S is unity.

3.4.2 Estimation of levels of labour pressure

In order to classify the index of labour absorbability S for determining levels of labour pressure we will take the help of the index for agricultural activity Z_A (see Section 2.4.2.1) so that one can perceive the composition of the levels of agricultural activity and labour pressure in the regions derived on the basis of the levels of labour pressure on agriculture. The regression equation of S on Z_A is given by the equation (3.13).

$$S = \underset{(0.03035)}{0.24613} + \underset{(0.02807)}{0.75216}\, Z_A \qquad \ldots \quad (3.13)$$

The multiple correlation coefficient is found to be 0.53426. Using the equation (3.13) and the class boundaries for Z_A (see Section 2.4.4) we obtain class boundaries for the index of labour absorbability in agriculture. Since higher value of S indicates lower labour pressure on agriculture, class intervals corresponding to low, medium and high levels of S will refer to high, medium and low level of labour pressure on agriculture respectively. Thus, the levels of labour pressure in terms of the class intervals of the index of labour absorbability S is given in the table (3.1). The index values of labour absorbability and the levels of labour pressure for 1960-61 and 1970-71 are given for the districts concerned by the table (3.2) in the Appendix.

3.4.3 <u>Estimation of levels of growth rate of labour pressure and its main factors</u>

To understand the causal role of the basic factors — namely, the growth rate of production (G_1), the growth rate of labour (G_2) and the growth rate of cropped area (G_3) — in explaining the formation of regions under different levels of the growth rate of labour pressure to be expressed in terms of the growth rate of index of labour absorbability (G_o), the classification of G_1, G_2 and G_3 need to be performed on the basis of the regression equations of G_1 on G_o, G_2 on G_o and G_3 on G_o. They are given by the equations (3.14) to (3.16).

$$G_1 = \underset{(1.32730)}{25.22800} + \underset{(0.05080)}{1.42820}\, G_o \qquad \ldots. \quad (3.14)$$

$$R^2 = 0.74909$$

$$G_2 = \underset{(1.74230)}{21.73050} - \underset{(0.06670)}{0.241440}\, G_o \qquad \ldots. \quad (3.15)$$

$$R^2 = 0.04718$$

$$G_3 = \underset{(0.99080)}{5.93330} + \underset{(0.03790)}{0.40900}\, G_o \qquad \ldots. \quad (3.16)$$

$$R^2 = 0.30515$$

All the relationships and parameters are statistically significant at the 5 per cent level of chance. The average value of the growth rate of the index of labour absorbability is 0.3169. With the help of the frequency distribution we have chosen the class intervals for G_o as below - 10, -10 to 10, and above 10 respectively representing high (H), medium (M), and low (L) levels of growth rate of labour pressure. Negative growth rate of index of labour absorbability indicates positive growth rate of labour pressure. Using the class boundaries in the equations (3.14), (3.15) and (3.16) we obtain class intervals for G_1, G_2 and G_3. The class intervals are given in the table (3.1).

Table (3.1) : Classification of levels of different attributes relating to agriculture

Aspects / Levels	Labour Pressure [2]	Percentage growth rate of			
		Labour Pressure [2]	Production	Labour	Cropped area
(0)	(1)	(2)	(3)	(4)	(5)
H (High)	- $S \leq 0.89128$	- $G_o \leq -10$	$39.51 < G_1$ -	$24.14 < G_2$ -	$10.02 < G_3$ -
M (Medium)	$0.89128 < S \leq 1.11392$	$-10 < G_o \leq 10$	$10.95 < G_1 \leq 39.51$	$19.32 < G_2 \leq 24.14$	$1.84 < G_3 \leq 10.02$
L (Low)	$1.11392 < S$ -	$10 < G_o$ -	- $G_1 \leq 10.95$	- $G_2 \leq 19.32$	- $G_3 \leq 1.84$

2/ We say there is high level of labour pressure if the index value of S is low. For classification we have used the index S with the concept of labour pressure. Similarly, the growth rate of the index value of S i.e., G_o has been used to classify the level of the growth rate of **labour pressure.**

3.4.4 Regional analysis of labour pressure with respect to agricultural activity

In this section we shall deal with the regions derived for different levels of labour pressure on the basis of the weighted average of the index values for labour absorbability in 1960-61 and 1970-71 for every district. Agricultural labour in the respective time points is taken as the weight. In the following analysis we shall examine the regions under different levels of agricultural activity. We shall investigate whether greater agricultural activity always indicates lower level of labour pressure on agriculture. It is our hypothesis that higher level of agricultural activity may not be able to lower the labour pressure prevailing in a region.

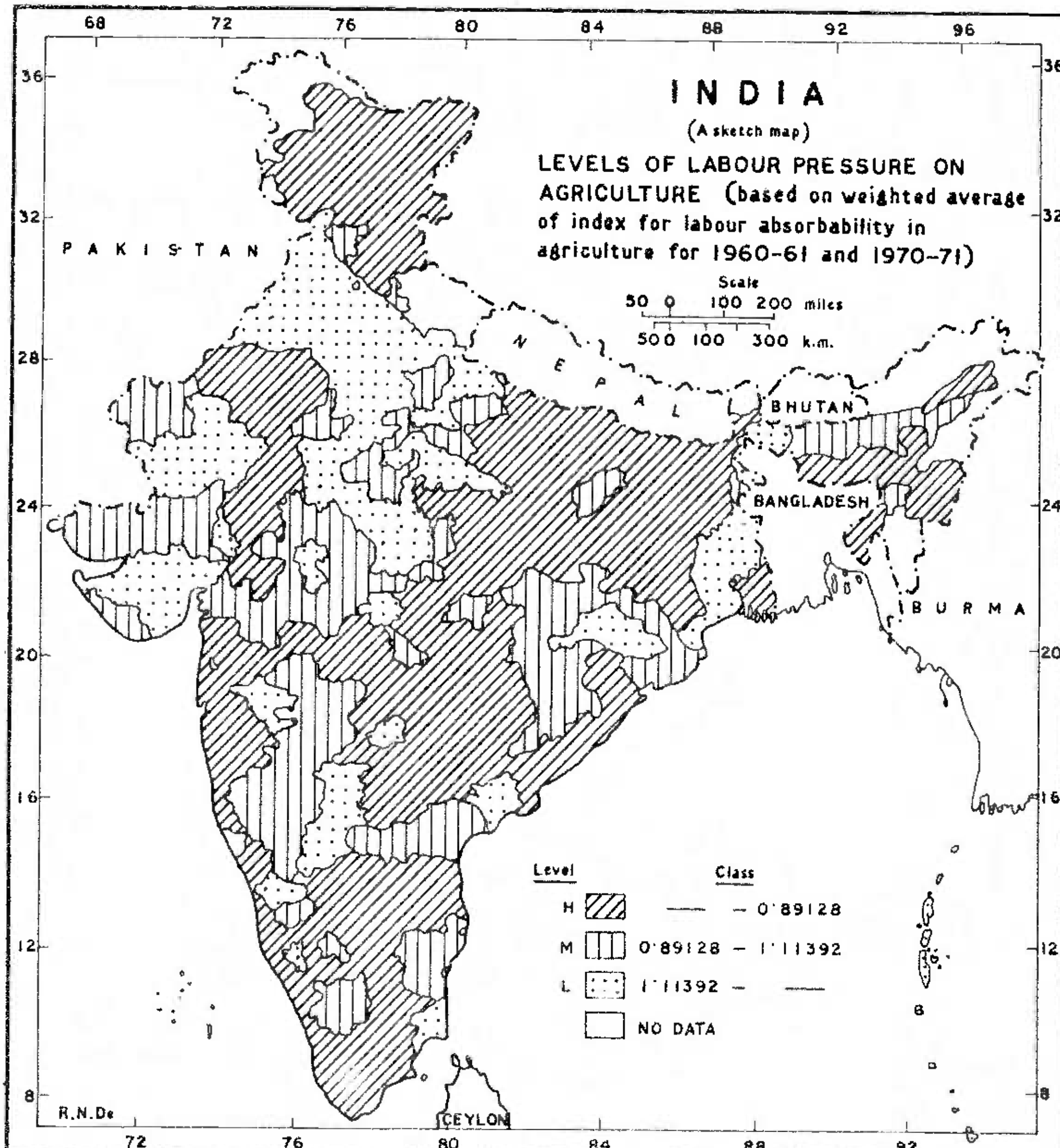
3.4.4.1 Regions with high level of labour pressure

There are three regions of high level of labour pressure during the decade 1960-61 to 1970-71. The first is situated in the extreme northern part of India, the second in the north-west part of India and the third between the western and eastern coasts ranging through central, southern and eastern India (Figure 3.1).

The northern Himalayan region of high level of labour pressure is mainly constituted by the States of Jammu and Kashmir and Himachal Pradesh (Figure 3.1). Both at the beginning and at the end of the decade practically the whole region has been under high level of labour pressure (Figures 3.11 and 3.12). The magnitude of labour pressure has increased over the decade in two districts — Kathua and Poonch. The level of labour pressure was medium in Kathua and low in Poonch in 1960-61 but in 1970-71 it had risen to high for both the districts. It has diminished from high to medium in the district of Mondi in 1970-71. Except for the districts of Anantanag and Srinagar where the levels of agricultural activity were medium and high respectively in 1970-71 and high for both in 1960-61, all other districts in the region have had low level of agricultural activity during the decade (Figures 2.21, 2.22, 3.11 and 3.12).

The eastern part of the State of Rajasthan along the border of the State of Madhya Pradesh gives rise to the western region of high level of labour pressure during the decade (Figure 3.1). While in 1960-61, all districts were under high level of labour pressure, the districts of Jhunjhunu, Sikar, Ajmer, Udaipur and Chittorgarh have been able to reduce the level to medium in 1970-71 (Figures 3.11 and 3.12). The level of agricultural activity in the region was low in 1960-61 but in 1970-71 medium level of agricultural activity has been attained in some part of the region — namely, the districts of Bhilwara, Udaipur and Chittorgarh. Stepping up of agricultural activity in 1970-71 has been able to reduce the magnitude of labour pressure for the districts of Udaipur and Chittorgarh at the end of the decade (Figures 2.21, 2.22, 3.11 and 3.12).

The region between the western and eastern coasts ranging through the central, southern and eastern parts of India is constituted by the western and eastern parts of the State of Maharashtra, the western and south-eastern parts of the State of Karnataka, the area along the coastal line for nearly the whole of the State of Kerala, the western part of the State of Tamil Nadu, the lower and upper parts of the State



INDIA
(A sketch map)
LEVELS OF LABOUR PRESSURE ON AGRICULTURE (based on weighted average of index for labour absorbability in agriculture for 1960-61 and 1970-71)
Scale
50 0 100 200 miles
500 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H — — 0·89128
M 0·89128 — 1·11392
L 1·11392 — —
NO DATA
R.N.De

FIGURE – 3·1

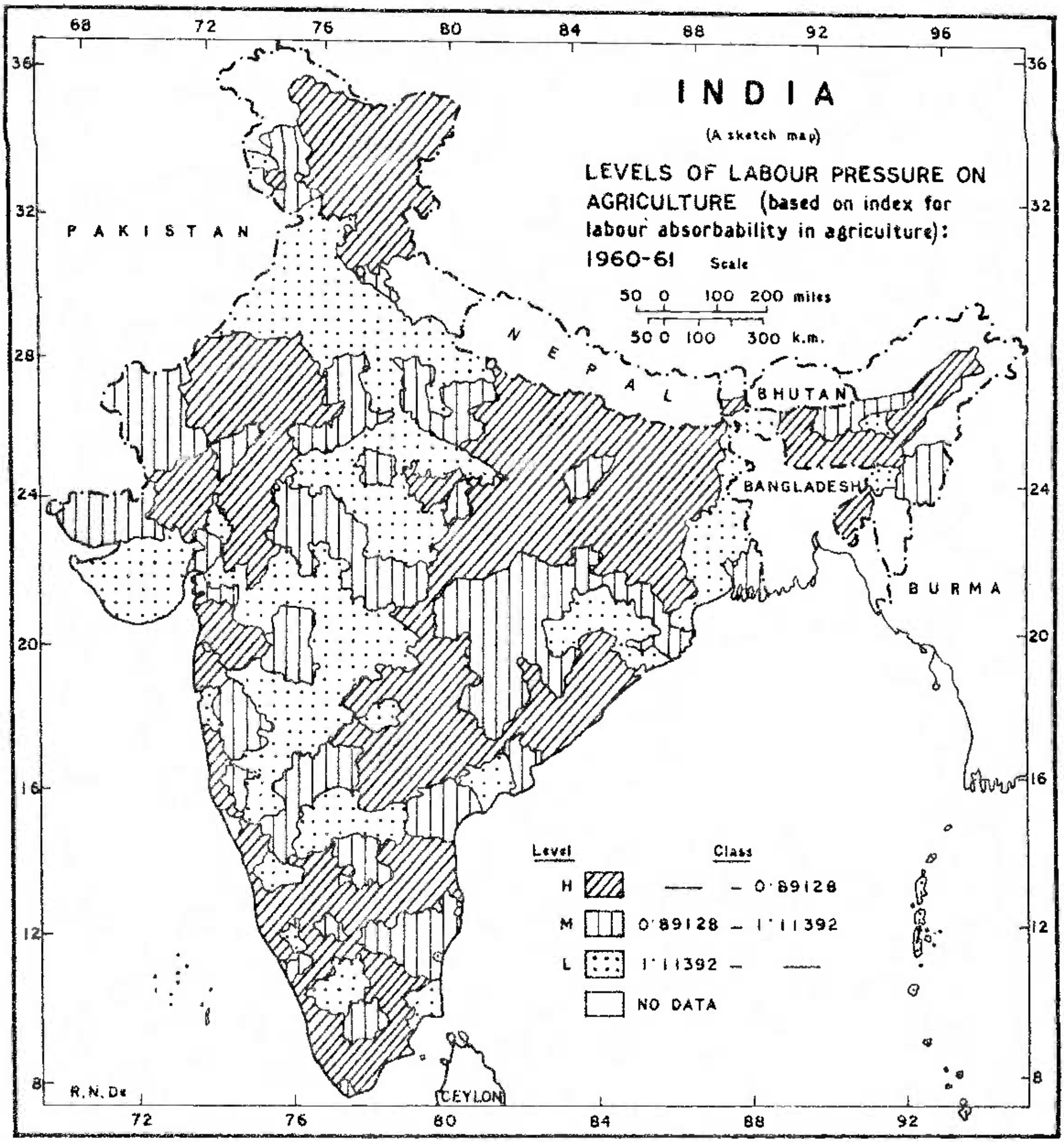

INDIA
(A sketch map)
LEVELS OF LABOUR PRESSURE ON AGRICULTURE (based on index for labour absorbability in agriculture): 1960-61
Scale
50 0 100 200 miles
50 0 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H — - 0·89128
M 0·89128 - 1·11392
L 1·11392 - —
NO DATA
R. N. De
68
72
76
80
84
88
92
96
36
32
28
24
20
16
12
8

FIGURE - 3·11

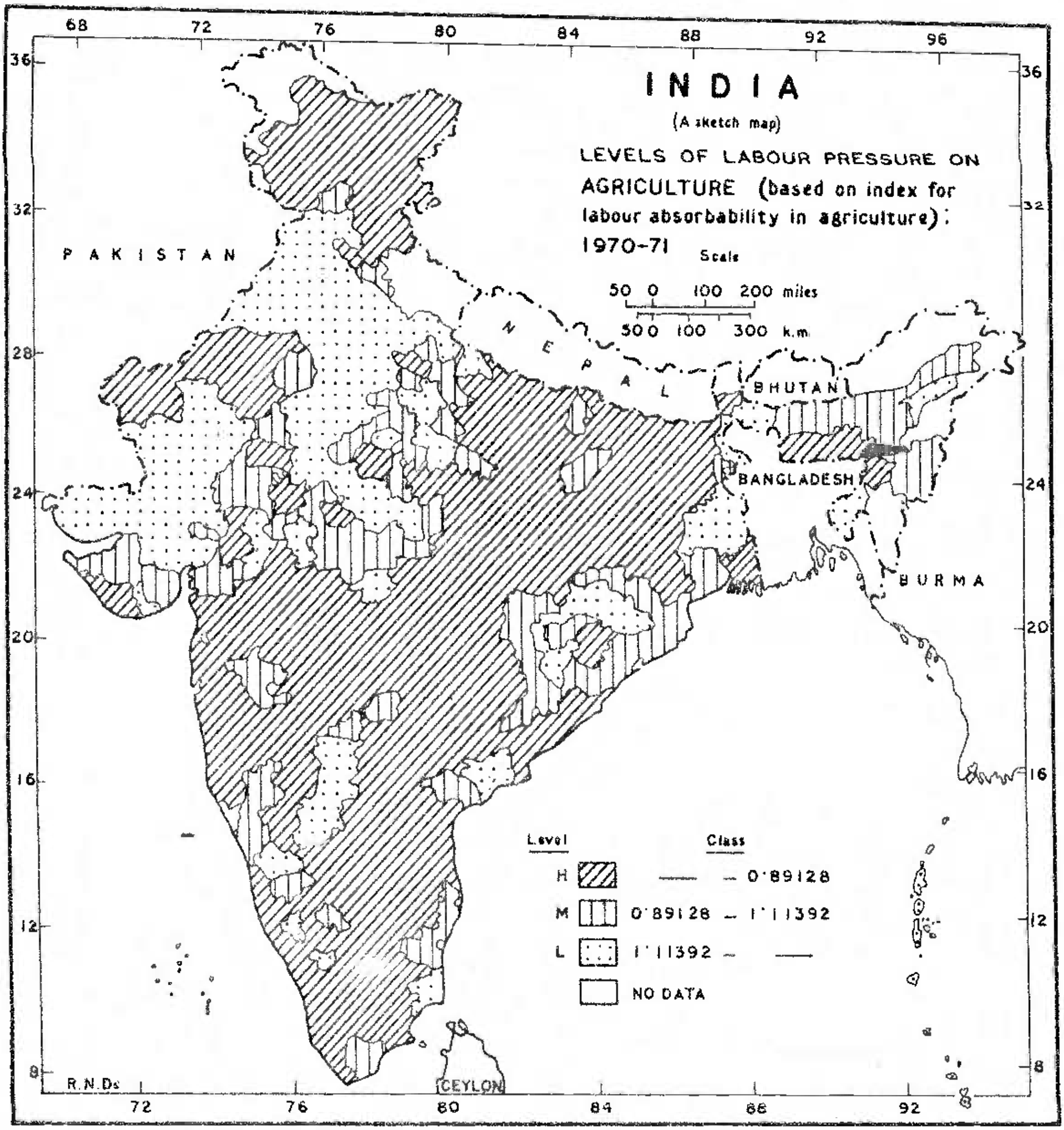

INDIA
(A sketch map)
LEVELS OF LABOUR PRESSURE ON AGRICULTURE (based on index for labour absorbability in agriculture): 1970-71
Scale
50 0 100 200 miles
50 0 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H — 0·89128
M 0·89128 — 1·11392
L 1·11392 —
NO DATA
R.N.Ds
68
72
76
80
84
88
92
96
36
32
28
24
20
16
12
8

FIGURE- 3·12

of Andhra Pradesh, the coastal part of the State of Orissa, the central part of the State of Madhya Pradesh, the eastern part of the State of Uttar Pradesh and the State of Bihar (Figure 3.1).

In the major part of the region, high level of labour pressure on agriculture prevailed at both time points (Figures 3.11 and 3.12). Low or medium level of labour pressure has increased to high level mainly in the area lying along the common border of the States of Maharashtra and Madhya Pradesh in Central India. There are a few more districts of the sort scattered over the States of Andhra Pradesh, Kerala, Tamil Nadu, and Maharashtra. The districts which have achieved a reduction in labour pressure at the end of the decade are North Kanara, Tirunelveli, Ganjam, Deoria and Bidar. It is mainly where the region intersects the southern part of India that the level of agricultural activity has been high for 1960-61 and 1970-71. It has been medium mainly in the eastern coastal part and the eastern part of the State of Uttar Pradesh and the area along the common border of the States of Bihar and West Bengal for 1970-71. The rest of the region has had low level of agricultural activity. Therefore, it is evident that higher level of agricultural activity has not always been able to keep down the level of labour pressure (Figures 3.11, 3.12, 2.21 and 2.22).

The isolated districts or areas of high level of labour pressure are located in eastern India. The degree of labour pressure has worsened in the districts of 24 Parganas and Howrah since the level of agricultural activity has gone down there. In the districts of K and J Hills, Garo Hills and Manipur high level of labour pressure prevailed in 1960-61 as well as in 1970-71. Reduction in labour pressure on agriculture during the decade was possible in the districts of Lakhimpur, Tripura, Mikir Hills and N. C. Hills through an extension of agricultural activity.

In the above analysis, we observe that in the northern Himalayan region and the western region the high labour pressure on agriculture is mainly due to the low level of agricultural activity. But regarding the region between the western and eastern coasts ranging through the central, southern and eastern parts of India, two facts are clear. In the southern part of the region the extent of agricultural activity is generally high while in the eastern coastal part, the eastern part of the State of Uttar Pradesh and the adjoining part between the States of Bihar and West Bengal it is medium, but in both cases the labour pressure is quite high. This means that in the southern part of the region it would be better to transfer the agricultural labour as there is already a high level of agricultural activity while in the second case it might be possible to absorb some part of labour pressure by intensifying agricultural activity (Figures 3.11, 3.12, 2.21 and 2.22).

3.4.4.2 Regions with medium level of labour pressure

There are three regions of medium level of labour pressure during the decade 1960-61 to 1970-71 (Figure 3.1). One of them is located in the west-central part of India and the other two on the western and eastern coasts. Apart from these there are isolated pockets or districts of medium level of labour pressure.

The adjoining portion between the States of Madhya Pradesh and Gujarat gives rise to the western central region of medium level of labour pressure on agriculture (Figure 3.1). Medium level of labour pressure prevailed at both the time points in the districts of Broach, Ratlam, Shajapur, Sehore, Hoshangabad and Jhalawar. Agricultural activity is low in these districts (Figures 2.21 and 2.22). Labour pressure has increased from low to medium level in the districts of Baroda, Dewas, Damoh and Narasinhapur, from low to high level in Dhulia, Dhar, East Nimar and West Nimar and from medium to high level in Mandasaur and Rajgarh (Figures 3.11 and 3.12). Except for the district of Baroda where the extent of agricultural activity has been moderate, it has deteriorated everywhere to low level in 1970-71 or remained stagnant at low level over the decade (Figures 2.21 and 2.22). Therefore it becomes evident to us that labour pressure on agriculture is only moderate despite the poor condition of agricultural activity. This means that the labour problem has not been acute. Simply by intensifying agricultural activity, therefore, it should be possible to reduce the medium level of labour pressure to low. That is, the existing stock of labour does not pose much of a problem.

The central part of the State of Maharashtra is the south-western region of medium level of labour pressure during the decade (Figure 3.1). Every part of the region has faced comparatively greater labour pressure in 1970-71 than in 1960-61 (Figures 3.11 and 3.12). Except for the district of Kolhapur where the extent of agricultural activity has remained unchanged at high level, every district of the region either remained backward in 1970-71 as in 1960-61 or became worse off in 1970-71 in terms of agricultural activity (Figures 2.21 and 2.22). Reduction in labour pressure should be possible if intensive agricultural activity takes place

The upper part of the State of Orissa along with some adjacent districts in the State of Madhya Pradesh gives rise to the east coast region of medium level of labour pressure on agriculture (Figure 3.1). Labour pressure has diminished from medium level to low in the district of Kalahandi, from high to medium in Koraput. In other districts it has either increased or remained unchanged over the decade. The interesting feature of the region is that the level of agricultural activity has remained at medium level for the major part (Figure 2.22). Exceptions: e the district of Puri here it is high f r both the time points and for Raipur, it has increased to high from medium. Thus medium level of agricultural activity is, as we might expect, prevalent for the region of medium level of labour pressure.

There are 42 districts of medium level of labour pressure scattered over different parts of India (Figure 3.1). Labour pressure has diminished over the decade in the districts of Banaskantha, Mehsana, Jaipur, Sirohi, Nilgiris, Etawah, Kutch, Chikmagalur, Sibsagar and Goalpara. In other isolated pockets, it has increased or remained at medium level (Figures 3.11 and 3.12). These districts can be classified into two groups. The districts located in the southern part of India have in general had high level of agricultural activity while those in the northern part have generally had medium level of agricultural activity. This indicates that labour pressure was more acutely felt in the districts located in southern India than those in northern India. Notable examples are the districts of Kangra, Dehradun, Etah, Kanpur, Hardoi, Bareilly, Agra, Sitapur, Budaun, Balaghat, Kamrup, Darrang, Malda etc., in northern India and the districts of Mandya, Chingleput, South Arcot, Guntur, Palghat, Coimbatore etc., in southern India.

3.4.4.3 Regions with low level of labour pressure

There are broadly three regions where the average labour pressure during the decade is low (Figure 3.1). They are the northern region, western region and eastern region. Besides, there are isolated pockets or districts scattered over the country.

The western parts of the States of Uttar Pradesh and Madhya Pradesh, the northern part of the State of Rajasthan, and the States of Punjab and Haryana constitute the northern region of low level of labour pressure (Figure 3.1). The part of the region towards the border of Pakistan has been under low level of labour pressure in 1960-61 as well as 1970-71. Labour pressure has been reduced from medium level to low in the districts of Gurgaon, Delhi, Alwar, Bharatpur, Sawai Madhopur, Tonk and Mainpuri and has risen from low to medium level in the districts of Kota, Shahjahanpur, Jhansi, Banda, Bhind and Raisen at the end of the decade (Figures 3.11 and 3.12). The level of agricultural activity in the region has been generally high. There are exceptions where medium level of agricultural activity has yielded low level of labour pressure. These include the districts of Hamirpur, Kheri, Sagar, Sawai Madhopur and Tonk. The problem of labour has not been serious in these districts. The increase in the level of agricultural activity has not been able to absorb labour in the districts of Kota and Shahjahanpur — on the contrary, the labour pressure has increased. This means that the growth of agricultural labour has been higher than the growth of agricultural activity.

The western region of low level of labour pressure is located at the border of Pakistan near Rann of Kutch in the State of Rajasthan and extends upto the Gulf of Cambay in the State of Gujarat (Figure 3.1). Medium level of agricultural activity has given rise to low level of labour pressure in the districts of Surendranagar, Amreli, Ahmedabad, Pali and Barmer in 1970-71. The districts of Jamnagar, Rajkot and Bhavnagar being poor in agricultural activity have faced increased labour pressure at the end of the decade. By increasing agricultural activity it has been possible to reduce labour pressure in the districts of Kaira, Pal., Barmer, Jodhpur and Jalor.

The eastern area of low level of labour pressure appears mainly in the State of West Bengal (Figure 3.1). Higher level of agricultural activity has successfully kept down the level of labour pressure to low in the region at both the time points. As the extent of agricultural activity has gone down in the districts of Midnapore and Balasore, the labour pressure has increased in 1970-71 — from low level to medium.

The general pattern among the isolated districts of low level of labour pressure was higher level of agricultural activity at both the time points. Since the extent of agricultural activity has decreased in the districts of Ahmednagar and Nizamabad, the magnitude of labour pressure has increased from low level to medium in 1970-71. The reverse pattern prevails in the districts of Ujjain, Indore, Betul and Gulbarga.

It is apparent from the above analysis that in general the high level of agricultural activity could lower the level of labour pressure in the northern and eastern regions. The western region has mainly had medium level of agricultural activity but low level of labour pressure. The problem of labour not being acute there, it has been possible to reduce labour pressure with medium level of agricultural activity.

3.4.4.4 Synthesis

The overall regional analysis indicates that higher level of agricultural activity in the northern part of India has proved capable of reducing the labour pressure on agriculture but in the southern part of India higher level of agricultural activity has on the whole failed to absorb the labour pressure. For an explanation one must look into the structure of agricultural activity for the two parts of the country. In the northern part higher productivity of land as well as labour was responsible for the higher level of agricultural activity whereas in the south the higher magnitude of productivity of land, being accompanied by relatively low magnitude of productivity of labour, was unable to reduce the labour pressure. Thus the problem of labour remained in spite of the higher yield rate in the southern part of India. Since the marginal increase of yield rate decreases with intensification of agricultural cultivation at higher level of productivity of land, the productivity of labour may not be increased further unless transfer of agricultural labour takes place.

Our analysis does not take into account the impact of migration to the regions of low level of labour pressure. It is extremely probable that the agricultural labour belonging to the regions of high level of labour pressure will migrate to the nearest regions of low level of labour pressure unless they are able to obtain employment in some non-agricultural activity. Therefore, the nature of migration and the effect it will have of reducing the labour productivity and wage rate in the regions of low level of labour pressure on agriculture remaining an important area of study.

3.4.5 Regional analysis of levels of growth rate of labour pressure with respect to its main factors.

The regions that will be derived on the basis of different levels of the growth rate of labour pressure will be examined in respect of the growth rates of three basic factors, namely, agricultural production, agric ltural labour and cropped area during 1960-61 to 1970-71. Three levels of growth rates — low, high and medium — will be considered for the following analysis.

3.4.5.1 Regions with high level of growth rate of labour pressure

There are three regions of high level of growth rate of labour pressure for the decade. They are the northern Himalayan region, the western central region and the eastern region (Figure 3.2). Apart from these there are 31 districts scattered over different parts of India.

The extreme northern part of India consisting of the districts of the State of Jammu and Kashmir is seen to have formed the northern Himalayan region of high level of growth rate of labour pressure (Figure 3.2). Though the growth rate of labour has been low, neither production nor cropped area has attained beyond the low level of growth rate during the decade. This has resulted in the high growth rate of labour pressure in the region.

The western central region with high level of growth rate of labour pressure is constituted by the central parts of the States of Maharashtra, Madhya Pradesh, Tamil Nadu and Kerala and the western parts of the States of Karnataka and Andhra Pradesh (Figure 3.2). The eastern part of the region has observed at least medium level of growth rate of labour as well as cropped area while the remaining part of the region has faced in general low growth rates of labour and cropped area. The growth rate of agricultural production has been low throughout the region except in the districts of Guna, Mandsaur, Broach, Mahbubnagar, Kanya Kumari, Palghat, Trichur and Kottayam where it has been medium (Figures 3.2, 3.3, 3.4 and 3.5). Clearly, the higher growth rate of labour has stood in the way of reducing growth rate of labour pressure caused by the higher growth rate of cropped area in the eastern part of the region while in the remaining part of the region low growth rates of labour, production and cropped area have been responsible for the higher growth rate of labour pressure on agriculture.

The eastern region of high level of growth rate of labour pressure is situated in the States of Bihar and West Bengal (Figure 3.2). Figure 3.2 shows that in the districts of Gaya, Hazaribagh and Dhanbad the growth rate of labour has been low. In other parts it has been high. Growth rate of production has been at medium level for the districts of Shahabad, Murshidabad, Burdwan, Midnapore and Balasore. It has been high in the district of Malda, while low level of growth rate of production has prevailed in the remainder of the region (Figure 3.3). The levels of growth rates of cropped area and production have been medium in the districts of Shahabad, Burdwan, Midnapore and Balasore (Figures 3.3 and 3.5). It follows that high level of growth of labour pressure in these four districts has been due to the high level of growth of labour. Otherwise, it has in general been the low growth rates of production and cropped area coupled with high growth rate of labour that has increased the labour pressure. Wherever the labour has not grown appreciably, the higher growth rate of labour pressure has been due to the lower growth rate of production.

There are 31 isolated districts with high level of growth rate of labour pressure during the decade (Figure 3.2). By and large, the districts in the State of Gujarat had low growth rate of labour during the decade (Figure 3.4). The other districts generally suffered from a high growth rate of labour. Growth rate of production was medium in the districts belonging to the State of Uttar Pradesh. Figure 3.3 indicates that it has been high in the districts of Jaisalmer and Cooch Behar. Low growth rate of production has prevailed in the remaining districts. Except for the districts of Kinnaur, Bijner, Rampur, Coorg, East Godavari and Cooch Behar there has been either medium level or low level of growth rate of cropped area during the decade. The analysis makes it clear that wherever there was a low growth rate of labour there was also a low growth rate of production and cropped area (Figures 3.3, 3.4 and 3.5). Elsewhere the growth rate of labour was so high that even in the district experiencing a moderate level of

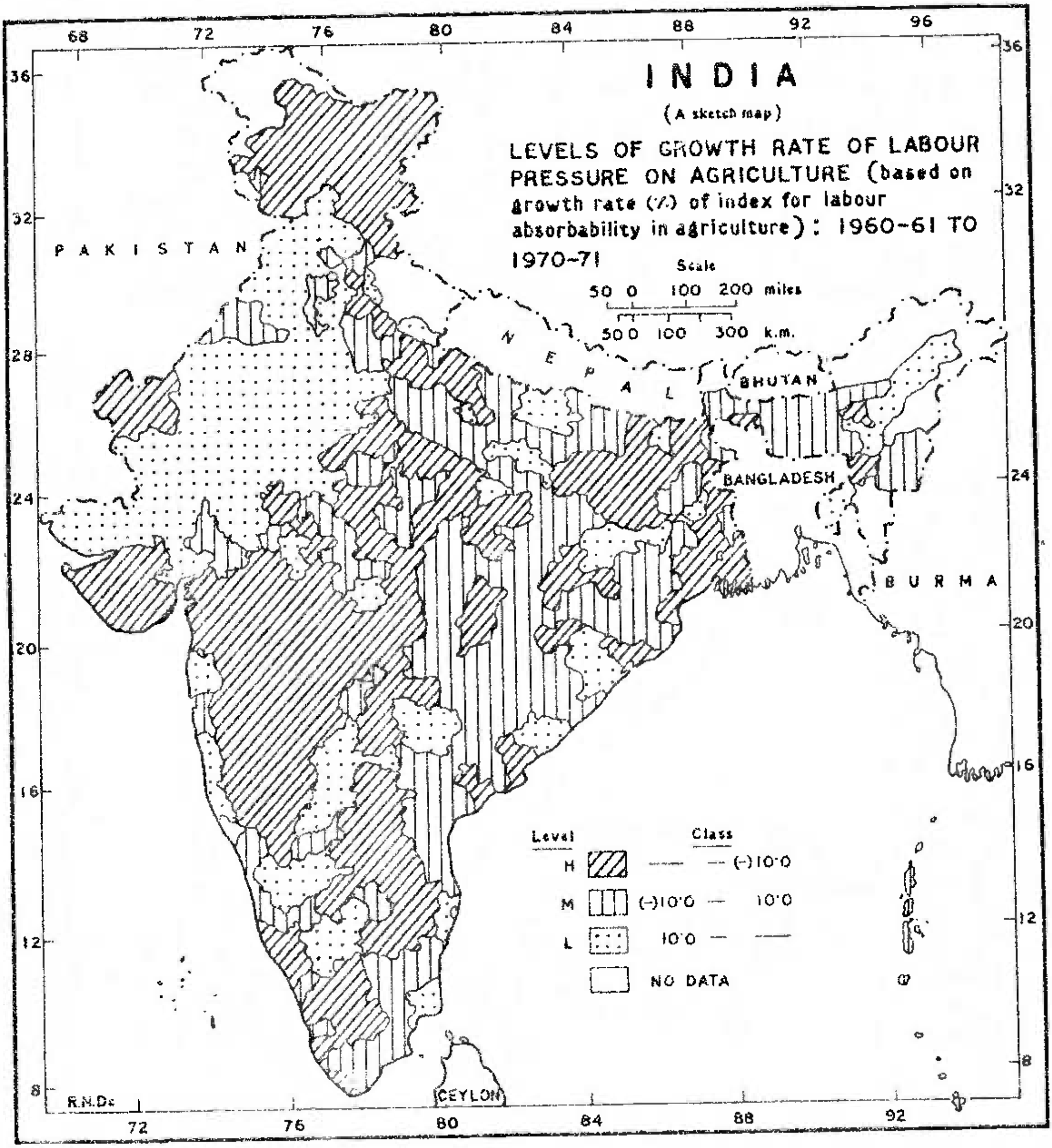

INDIA
(A sketch map)
LEVELS OF GROWTH RATE OF LABOUR PRESSURE ON AGRICULTURE (based on growth rate (%) of index for labour absorbability in agriculture): 1960-61 TO 1970-71
Scale
50 0 100 200 miles
500 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H — (-)10·0
M (-)10·0 — 10·0
L 10·0 —
NO DATA
R.N.De
68 72 76 80 84 88 92 96
36 32 28 24 20 16 12 8

FIGURE-3·2

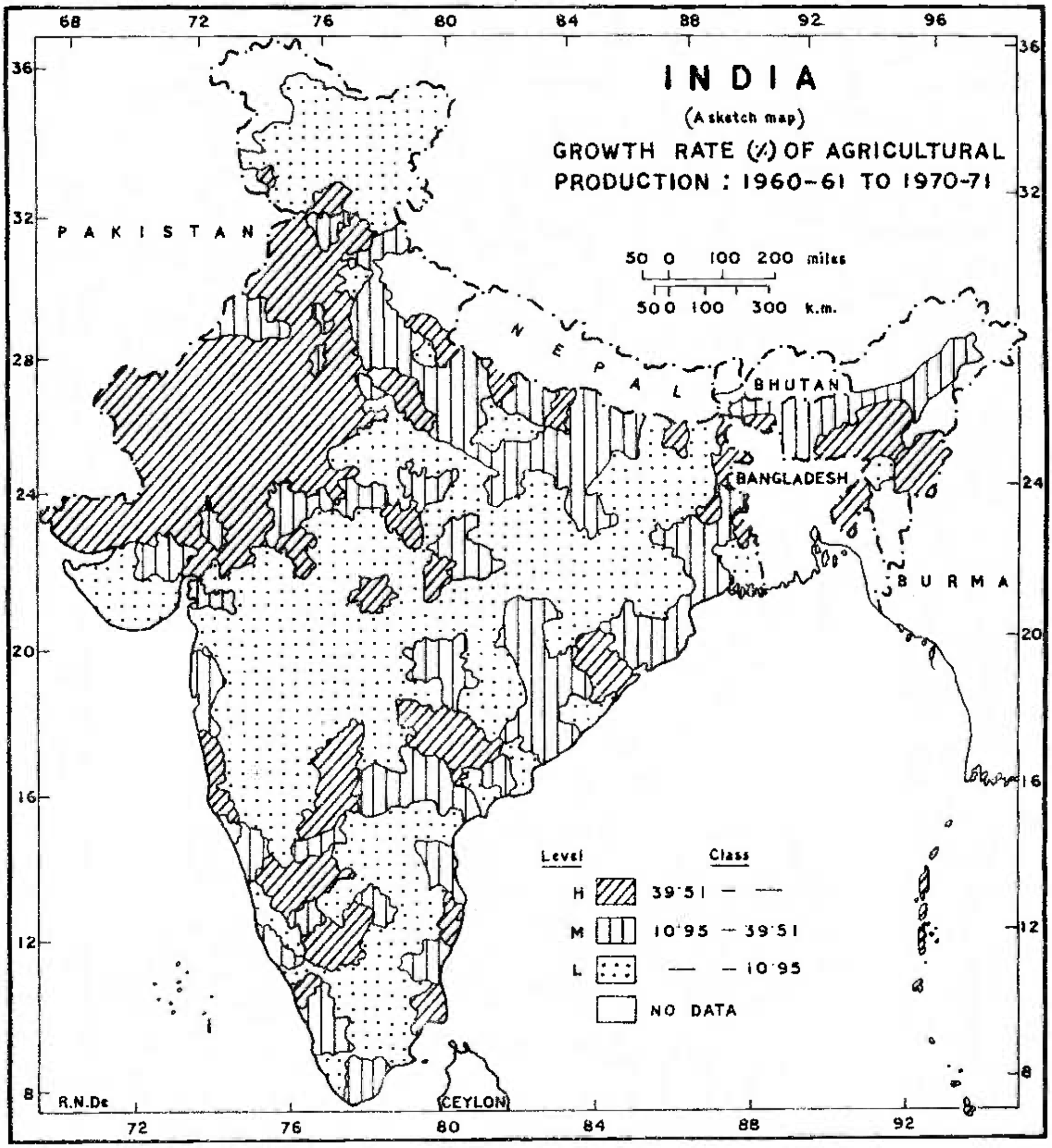

INDIA
(A sketch map)
GROWTH RATE (%) OF AGRICULTURAL PRODUCTION : 1960-61 TO 1970-71
50 0 100 200 miles
50 0 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H 39·51 — —
M 10·95 — 39·51
L — — 10·95
NO DATA
R.N.De

FIGURE-3·3

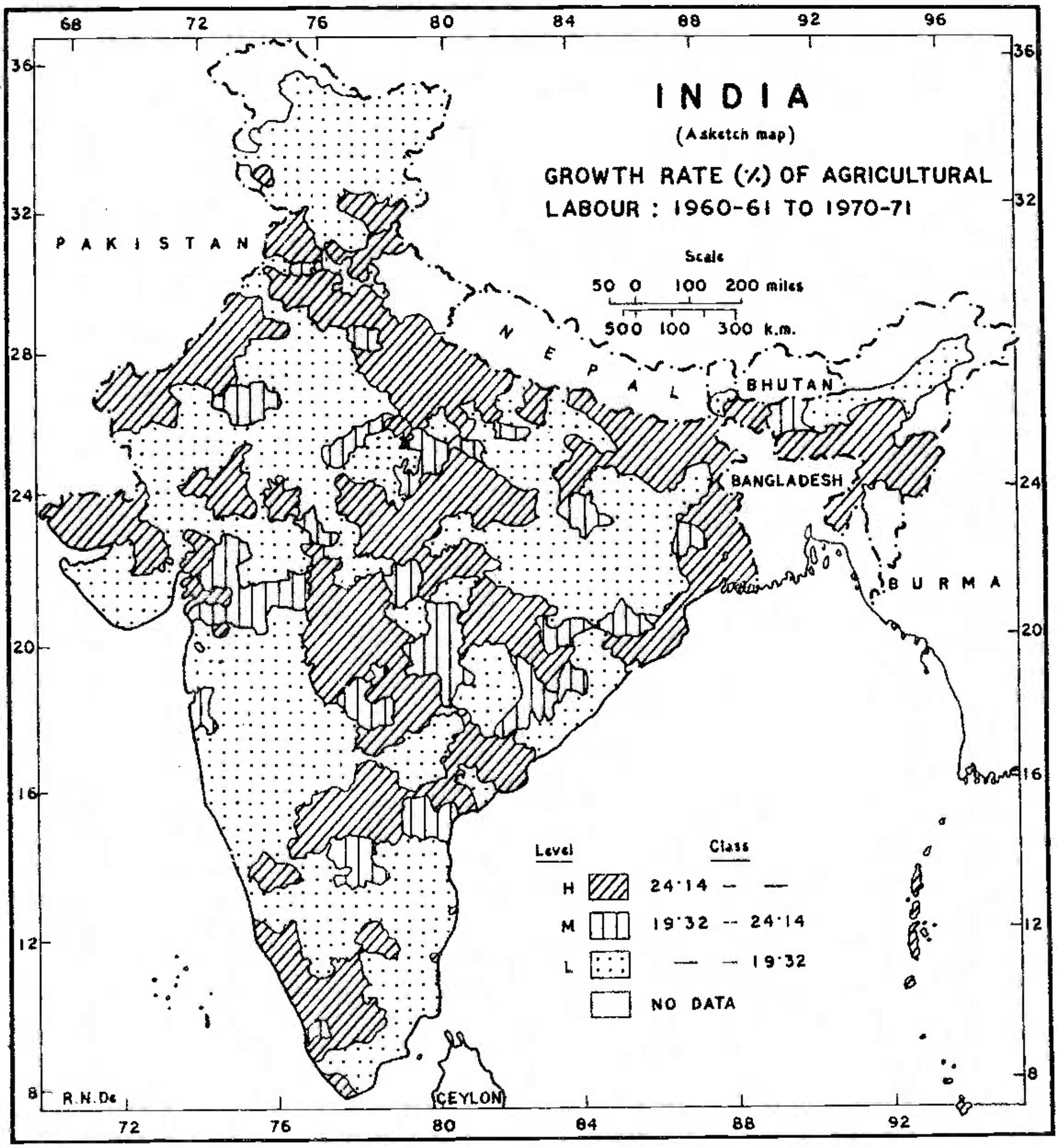

INDIA
(A sketch map)
GROWTH RATE (%) OF AGRICULTURAL
LABOUR : 1960-61 TO 1970-71
Scale
50 0 100 200 miles
500 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H 24·14 — —
M 19·32 — 24·14
L — — 19·32
NO DATA
R.N.De
68
72
76
80
84
88
92
96
36
32
28
24
20
16
12
8

FIGURE – 3·4

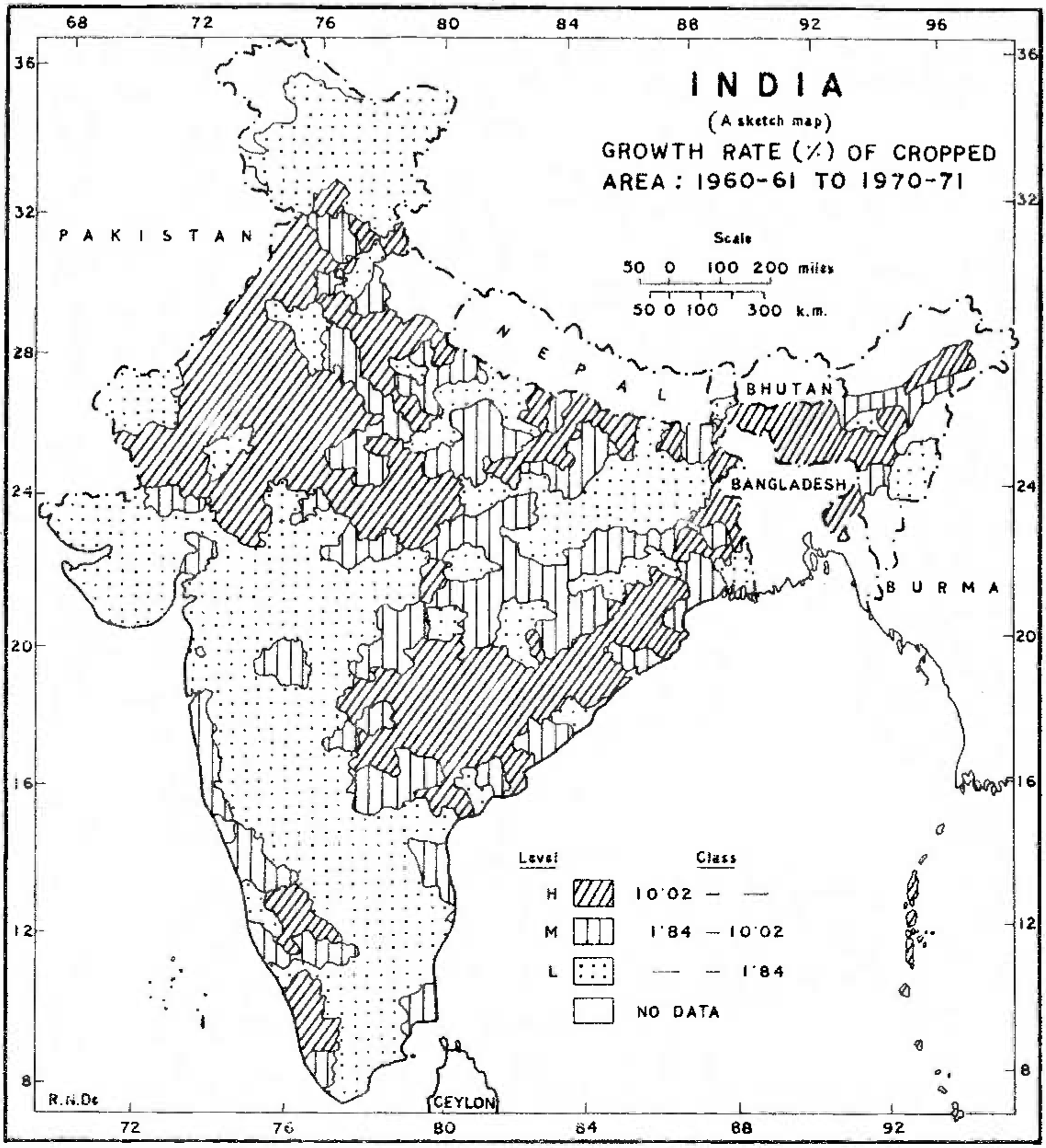

INDIA
(A sketch map)
GROWTH RATE (%) OF CROPPED AREA : 1960-61 TO 1970-71
Scale
50 0 100 200 miles
50 0 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H 10'02 — —
M 1'84 — 10'02
L — — 1'84
NO DATA
R.N.De
68 72 76 80 84 88 92 96
36 32 28 24 20 16 12 8

FIGURE – 3'5

growth rate in either or both of production and cropped area, a high growth rate of labour pressure was observed.

In the above analysis we observe that in the northern Himalayan region although favoured with a low growth rate of labour, suffered from a high growth rate of labour pressure due to low growth rates of production and cropped area. Almost same level of growth rates of labour and cropped area — thus nullifying each other in reducing growth rate of labour pressure — has given rise to the high growth rate of labour pressure in the western central region while in general a low growth rate of production has prevailed there. Excessive growth of labour accompanied by low growth of production and cropped area caused high level growth of labour pressure in the eastern region.

3.4.5.2 Regions with medium level of growth rate of labour pressure

There is a single region of medium level of growth rate of labour pressure spreading over the eastern part of the States of Uttar Pradesh and Madhya Pradesh, over the States of Orissa and Andhra Pradesh and the western part of the States of Bihar and West Bengal (Figure 3.2). Low level of growth rate of labour (Figure 3.4) is in evidence mainly in the eastern part of the State of Uttar Pradesh and in the northern part of the State of Orissa. More specifically, two patterns are observed. The first is of low growth rate of labour combining with medium growth rate of production and at most medium growth rate of cropped area to give rise to medium growth rate of labour pressure. The second pattern is of the following kind : where the growth rate of labour is high, the growth rate of production as well as cropped area has in general reached at least medium level. Thus, medium level of growth rate of labour pressure was achieved during the decade. Examples of districts following the second pattern are Etah, Mainpuri, Farrkhabad, Etawah, Unnao, Ballia, Champaran, Muzzafarpur, Seoni, Cuttack, Kalahandi, W. Godavari, Guntur and Khammam.

There are two isolated pockets and 37 isolated districts with medium level of growth rate of labour pressure (Figure 3.2). One isolated pocket is located in the extreme southern part of India. On the whole the growth rate of labour there has been low. The growth rates of production and cropped area are at best moderate (Figures 3.3, 3.4 and 3.5). The second isolated pocket is situated in the north-eatern hilly area. Except for the districts of Darjeeling, Kamrup and Darrang, this pocket has experienced at least medium level of growth rate of labour. Except for the district of Darjeeling the growth rates of production and cropped area have reached at least medium level during the decade. Among the isolated districts, the districts of Santhal Parganas, Shivpuri, Rajgarh, Sehore, Hoshangabad and South Kanara have shown low levels of growth rates of labour as well as production. In the other districts, the growth rate of labour has been at least medium and the growth rates of production and cropped area have also attained at least medium level.

The above analysis reveals two kinds of districts. The first kind of districts have experienced a low growth rate of labour, and, by and large, medium growth rates of production and cropped area. The second kind of districts have had a high level of growth rate of labour coupled with medium to high levels of growth rates of production and cropped area.

3.4.5.3 Regions with low level of growth rate of labour pressure

There is a single region located at the western part of India which has had a low level of growth rate of labour pressure during the decade (Figure 3.2). Apart from this region, there are 41 districts located scatteredly.

The western region with low level of growth rate of labour pressure is situated in the western parts of the State of Uttar Pradesh and Madhya Pradesh, in the northern part of the State of Gujarat and to the south of the State of Jammu and Kashmir.

Growth rate of labour has been high in the districts of Gurudaspur, Amritsar, Jullundur, Kapurthala, Hoshiarpur, Sangrur, Bhatinda, Karnal, Bikaner, Sirohi, Udaipur, Aligarh, Kutch and Kaira (Figure 3.4). The growth rate of production has been high so as to accommodate the high growth rate of labour. The growth rate of cropped area has also been high. In the other districts of the region, there have been in general high growth rates of production and cropped area and also low growth rate of labour to keep down the growth of labour pressure (Figures 3.3, 3.4 and 3.5).

In the isolated districts, labour growth has been low except in Tripura, Mikir Hills, N. C. Hills, Birbhum, Saharsa, Nainital, Basti, Rewa, Betul, Raichur, Shimoga and Karimnagar where high rate of growth has been achieved (Figures 3.2 and 3.4). Where the volume of labour has grown at a high rate, so has production. On the other hand, where labour growth has been low, growth of production has been at least medium. The extension of cropped area did not bear any discernible relation to the growth of labour or that of production. Except for the districts of Rewa, Ujjain, Indore, Betul, Thana, Bangalore, Chitradurga, Gulbarga, Raichur, Chingleput and Nilgiris where low growth rate of cropped area prevailed all other isolated districts faced an increase of cropped area with at least medium rate of growth.

The above analysis shows that in the upper part of the western region with low level of growth rate of labour pressure, higher growth rates of production and cropped area have succeeded in lowering the growth rate of labour pressure despite the existence of a high growth rate of labour during the decade. The lower part of the region has not had to cope with a rapid growth of labour while the extension of cropped area and increase of production have on the whole progressed at a rapid rate there.

3.4.5.4 Synthesis

In the course of analysing the regions under different levels of growth rate of labour pressure, it has become evident that the growth rate of labour pressure has depended primarily on the growth of labour and the growth of production and to a lesser extent on the direct effect of the growth of cropped area. Since — as can be seen in the next section — the growth of cropped area has considerable effect on the growth of production, different combinations of levels of growth rate of labour and growth rate of production can be related to different levels of growth rate of labour pressure. Low growth of production coupled with moderate to high growth of labour has yielded high growth of labour pressure in the western central region (Figures 3.2, 3.3 and 3.4). Excessive growth of labour accompanied by low growth of production and cropped area has caused high growth of labour pressure in the eastern region. In the upper part of the western region with low level of growth rate of labour pressure, high rates of growth of production, cropped area and labour have prevailed but in the lower part of the western region there has been low growth of labour and high growth of production and at least medium growth of cropped area. As such, high growth rate of production in the western region of low level of growth rate of labour pressure has kept down the national growth rate of labour pressure to medium level during the decade. Thus we observe the variation in regional characteristics to explain different levels of growth rate of labour pressure.

The nature of labour pressure on agriculture and of its growth rate explains to a great extent the formation of regions of different levels of per capita income. Figures 2.7 and 3.7 indicate that the region with high level of per capita income generally has low level of labour pressure on agriculture and low growth rate of labour pressure (Figure 3.2) while on the other hand the regions with low level of per capita income suffer from medium to high level of labour pressure and at least medium level of growth rate of labour pressure. However, the Bombay-Poona-Nagpur area which is favoured with high level of per capita income despite the high level of labour pressure on agriculture is, along with a few other areas, an exception to this. For an explanation we have to look into the concentration pattern of industrial activity, which is an alternative occupation. Agricultural labour can obtain temporary jobs in industry when agricultural activity does not suffice for their subsistence. Hence it is the analysis of the concentration pattern of industrial activity — which we shall carry out in the next Chapter — that will provide the explanation for such exceptions. However, by and large it is evident that higher levels of labour pressure have given rise to lower levels of per capita income.

As the growth of production plays a major role in controlling labour pressure, there is clearly a need for an enquiry into the factor shares of change in the growth rate of production. For this purpose we shall consider in the next section factors such as growth rate of labour, growth rate of cropped area, growth rate of productivity of land, growth rate of productivity of labour and growth rate of cropped area per unit labour.

3.5 Estimation and Analysis of Factor Shares

We shall examine the factor shares in the growth rate of production (G_1). For this we will consider growth rate of labour (G_2), growth rate of cropped area (G_3), growth rate of productivity of land (G_4), growth rate of productivity of labour (G_5) and growth rate of cropped area per unit labour (G_6). Later we shall also enquire into the effects of inputs on productivity of land and that of labour. We shall try to detect the main causal factors contributing to changes in the productivities of land and labour. For this, we will consider the variables representing inputs — total fertiliser applied in Kg. per hectare of cropped area (I_1), annual rainfall in mm (I_2) and extent of irrigation (I_3), which will refer to the time point 1970-71 only.

3.5.1 Factor shares in growth rate of production

Here we will estimate the factor shares contributing to growth of production during the decade. The regression equation of G_1 on G_2, G_3, G_4 and G_5 and G_6 is presented in the equation (3.17).

$$G_1 = \underset{(0.56863)}{-1.07101} - \underset{(0.01643)}{0.00490}\, G_2 + \underset{(0.03214)}{1.18410}\, G_3 + \underset{(0.03816)}{0.69195}\, G_4$$

$$+ \underset{(0.04155)}{0.41409}\, G_5 - \underset{(0.04969)}{0.43630}\, G_6 \qquad \ldots (3.17)$$

The multiple correlation coefficient is 0.98368. It is significant at the 1 per cent level of chance. The intercept parameter is insignificant at the 1 per cent level of chance. This means that the plane approximately passes through the origin. In other words, for zero values of regressors it gives zero value of growth rate of production. The regression coefficient of G_2 is also insignificant at the 5 per cent level of chance. The variation in the growth rate of labour does not, therefore, matter in augmenting or depleting the growth rate of production. So we may ignore the intercept parameter and the regression coefficient relating to the variable G_2. The other regression coefficients in the equation (3.17) are significant at the 1 per cent level of chance. To find out the factor shares of change we are required to express the equation (3.17) in standardised form as given in the equation (3.18)

$$g_1 = -0.00330\,g_2 + 0.53124\,g_3 + 0.51531\,g_4 + 0.36224\,g_5 - 0.20495\,g_6 \quad \ldots \quad (3.18)$$

where g_i's ($i = 1, \ldots, 6$) are the standardised forms of G_i's ($i=1, \ldots, 6$) respectively. Using the properties of total differentials as described in Section 3.3.4, we determine factor shares of change for a unit marginal change in the growth rate of production. They are 44.128, 42.805, 30.091 and −17.024 per cent corresponding to the growth rate of cropped area, growth rate of productivity of land, growth rate of productivity of labour and growth rate of cropped area per unit labour respectively. We have ignored the effect of growth rate of labour because of its insignificant role.

Thus the factor shares of change corresponding to the growth rate of cropped area and growth rate of productivity of land were practically the same. That is, in their contribution to the growth of agricultural production, extension of cropping area and intensive cultivation have been almost equally important during 1960-61 to 1970-71 in Indian agriculture. They jointly accounts approximately 87 per cent in changes the growth rate of production. Surprisingly, the growth in availability of cropped area per unit labour has worked not in favour of but against the increase in agricultural production in India during the decade. This is shown by the fact that the factor share of change corresponding to the growth rate of cropped area per unit labour is −17.02 per cent. So, growth of availability of cropping area per unit labour does not assure a positive growth of production. Again, growth of productivity of labour has been less helpful in promoting production compared to growth of productivity of land and growth of cropped area. The factor share of change by the growth rate of productivity of labour is approximately 30 per cent.

We find that apart from the growth of cropped land, the growth of productivity of land and growth of productivity of labour which jointly account for approximately 73 per cent of the growth rate of production were two important factors to enhance the growth rate of agricultural production. Therefore the object of our next enquiry should be to investigate the role of inputs in the variation of productivity of land and productivity of labour. It is to this that we now turn.

3.5.2 Factor shares for productivity of land

Since data on use of fertilizer relates to just one time point, namely, 1970-71, our enquiry will also refer to the year 1970-71. We shall determine the regression equation of productivity of land (P_1) on total fertilizer applied in Kg. per hectare of cropped area (I_1), annual rainfall in mm (I_2) and extent of irrigation (I_3). It is given by the equation[3/] (3.19)

$$P_1 = \underset{(22.02118)}{139.45990} + \underset{(0.04448)}{4.14349}\, I_1 + \underset{(0.01221)}{0.12369}\, I_2 + \underset{(0.49797)}{5.48346}\, I_3 \qquad \ldots(3.19)$$

The multiple correlation is 0.66497. It is significant at the 1 per cent level of chance. All parameters are significant at the 1 per cent level

3/ The regression equation (3.19) gives a superior fit to the Cobb-Douglas type form which was also attempted. It is given below. The multiple correlation coefficient for the equation (3.19) is strictly greater than that for the Cobb-Douglas type.

$$\log_e P_1 = \underset{(0.31680)}{2.28083} + \underset{(0.02319)}{0.11814}\, \log_e I_1 + \underset{(0.04209)}{0.40622}\, \log_e I_2 + \underset{(0.02616)}{0.24942}\, \log_e I_3$$

$$R^2 = 0.54209$$

of chance. Now we express the equation (3.19) in standardised form for estimating the factor shares of change. This is given by the equation (3.20).

$$p_1 = 0.39637\,\mathcal{I}_1 + 0.37690\,\mathcal{I}_2 + 0.47851\,\mathcal{I}_3 \qquad \ldots (3.20)$$

where p_1, $\mathcal{I}_1$, $\mathcal{I}_2$ and $\mathcal{I}_3$ are the standardised forms of P_1, I_1, I_2 and I_3 respectively. The factor shares of change for $\mathcal{I}_1$, $\mathcal{I}_2$ and $\mathcal{I}_3$ are 0.31664, 0.30109 and 0.38227 respectively. This shows that of the three factors influencing productivity of land, the greatest influence was that of the extent of irrigation, followed by use of fertilizer and rainfall in that order. The contribution of rainfall was practically equivalent to that of fertilizer. The interesting part of the finding is that of the increase in productivity of land approximately 70 per cent was attributable to use of fertilizer and irrigation combined whereas the joint contribution of the use of fertilizer and rainfall was only about 62 per cent. That is, the combination of fertilizer and irrigation was the most effective combination, resulting in maximum change in productivity of land. In the next section we shall investigate the role of inputs on productivity of labour.

3.5.3 Factor shares for productivity of labour

The analysis of the role of inputs on productivity of labour will be performed here. The regression equation of productivity of labour (P_2) on total fertilizer applied in Kg. per hectare of cropped area (I_1), annual rainfall in mm (I_2) and extent of irrigation (I_3) is given by the equation[4/] (3.21).

$$P_2 = \underset{(40.46414)}{376.12120} - \underset{(0.81730)}{1.09091}\, I_1 - \underset{(0.02243)}{0.02863}\, I_2 + \underset{(0.91502)}{8.29010}\, I_3$$

The multiple correlation coefficient is 0.3026. It is significant at the 5 per cent level of chance. The intercept parameter and the regression coefficient of I_3 are significant at the 1 per cent level of chance. The other parameters are insignificant at the 5 per cent level of chance. Therefore it is evident that the productivity of labour depends on the extent of irrigation rather than on the use of fertilizer and rainfall.

3.5.4 Synthesis

Growth rate of production is not dependent upon the growth rate of labour — this is evident from the analysis. The factors influencing the growth rate of production are growth rate of cropped area, growth rate of productivity of land and growth rate of productivity of labour in that order. Thus the formation of regions of different levels of growth rate of labour pressure is primarily explained by the variation in growth rates of labour and production, since the latter accounts for the effect of growth rate of cropped area, being directly influenced by it. While an increase in growth rate of cropped area per unit labour

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4/ The Cobb-Douglas type function has also been estimated. It is given below. The equation (3.21) is superior in the sense that its multiple correlation coefficient exceeds the multiple correlation coefficient of the Cobb-Douglas type function.

$$\log_e P_2 = \underset{(0.43485)}{0.63724} - \underset{(0.03184)}{0.03927}\, \log_e I_1 - \underset{(0.05777)}{0.10119}\, \log_e I_2 + \underset{(0.03591)}{0.19755}\, \log_e I$$

$$R^2 = 0.1598$$

does not assure an increase in growth rate of production in Indian agriculture, growth rates of productivity of land and productivity of labour play important roles in changing the growth rate of production. Of changes in productivity of land, fertilizer accounts for 70 per cent when combined with irrigation and 62 per cent when combined with rainfall. Fertilizer and rainfall have no significant effect in changing the productivity of labour which is mainly explained by the extent of irrigation while 68 per cent of the change in productivity of land is accounted for by rainfall and irrigation together. Moreover, the maximum contribution to change in productivity of land and productivity of labour is that of irrigation. Thus planning for water resources becomes important as production without fertilizer is feasible depending on irrigation and rainfall but not the reverse. Improved varieties of seeds do not perform well without water. Of course, we have not considered the effect of improved variety of seeds in changing productivity of land and productivity of labour and consequently in changing growth of production. Also not considered in this study are the effect of modernised systems of cultivation, institutional problems like ownership, etc.

CHAPTER 4

Regional Analysis of Concentration of Industrial Labour in Secondary Activity

4.1 Introduction

Two important sectors — agriculture and non-agriculture — are considered in order to evaluate the nature of the level of overall economic activity. In Chapter 2 we identified regions as balanced when they experience the same level of activity in both the sectors and imbalanced when the levels of the two sectoral activities are different. There we also observed that the level of income for a region may not always correspond to the level of overall economic activity. It may then be explained by the level of the activity of one of agricultural and non-agricultural sectors. For example, the board area delineated by Baroda-Bombay-Poona-Nagpur attained the high level of per capita income with the help of non-agricultural activity. On the other hand, the high level of per capita income in the region described by Punjab-Haryana-western Uttar Pradesh is explained by both the sectors — agriculture and non-agriculture. There are regions of high level overall economic activity which are also largely balanced in agricultural and non-agricultural activities but the pattern of regions formed is disturbed when their levels of per capita income are taken into account. The southern and eastern regions of high level of overall economic activity are examples of this (Figures 2.1 and 2.7).

In Chapter 3, we have been able to explain this fact to some extent by identifying the major causal factors in relation to the prevailing level of agricultural activity. This fact will be supplemented by observations of a different nature in the present chapter where we propose to investigate the pattern of industrialization over different regions in 1970-71 and also to investigate whether there has taken place any deviation from the traditional pattern of industrial location which might influence the level of secondary activity and consequently that of non-agricultural as well as overall economic activity. Since it is secondary activity and in particular, industrial activity, which acts as a powerful stimulant on tertiary and urban activities, our main concern shall be to analyse the regions which are derived by different levels of secondary activity in 1970-71. The index of secondary activity required for this purpose has been constructed in Chapter 2. The districts have been classified according to three levels of secondary activity — low, medium and high (Figure 2.42). Our intention now is to find out the concentration patterns of labour in all factories excluding household industries, small factories and large factories respectively. Due to the absence of districtwise and factorywise data for capital, industrial labour productivity, capital-output ratio etc., we have been unable to supplement the analysis by identification of the technological variations between regions of same level of concentration of industrial labour. However, in the course of the analysis we shall relate the nature — spatial or technological — of clusters of industries to our analysis with the help of the study carried out by Lakdawala, Alagh and Sharma [18].

As large factories are considered the prime movers of industrialization, we extend our analysis to the identification of the patterns of regional concentration of labour employed in large factories for the different groups of industries. For this we shall derive five disjoint and exclusive groups of industries according to types of product from about 221 industries covered by the Annual Survey of Industries. They are : (i) food processing etc., (ii) basic metals and their products, (iii) textiles and their related products, (iv) chemicals, chemical products and non-metallic mineral products, and (v) miscellaneous products (see Appendix for details). It is to be noted that the industries of electricity and gas, which are very much localised, have not been included in any of the five groups. The above classification will help to understand the industrial mix in a region. Unfortunately, similar data for small factories were not available; nor could data required for characterisation of technological aspects of production in small factories be obtained.

4.2 Spatial and Temporal Coverage, Variables and Data Sources

4.2.1 Spatial and temporal coverage

334 districts have been considered in this study. They are identical with those considered in the study of non-agricultural activity in Chapter 2 (see Section 2.2.1). We shall consider only one time point — 1970-71 — for two reasons : (i) we wish to lay emphasis on the analysis of the patterns of concentration of labour in large factories for different industry groups — a thing which has not been studied before — with district level data for 1970-71, and no comparable data is available for 1960-61, and (ii) there is already

available information on various aspects of the concentration pattern of industrial labour for 1960-61 (Pal [27], Karan [16], Lakdawala, Alagh and Sharma [18]).

4.2.2 Variables

We define the following groups of industrial labour for our consideration :

Group 1 : labour in all factories (except household industries)

Group 2 : labour in small factories 0/

Group 3 : labour in large factories 0/

Group 4 : labour in large factories in the industries of food processing and tobacco products (carbonated and alcoholic drinks included) 1/

Group 5 : labour in large factories in the industries of basic metals and their products 1/

Group 6 : labour in large factories in the industries of textiles and their products 1/

Group 7 : labour in large factories in the industries of chemicals, chemical products and non-metallic mineral products 1/

Group 8 : labour in large factories in the industries other than those in groups 4, 5, 6, 7 and large industries of electricity and gas 1/. Hereafter, labour in miscellaneous large factories.

0/ Large and small factories are defined as follows : if employment of labour by a factory is 100 or more, we say it is a large; otherwise we say it is small. Labour in small factories are compiled by subtracting labour in all large factories from labour in all factories (except household industries).

1/ See Appendix for detailed list of group-wise industries according to the Annual Survey of Industries.

The location factor of labour [8, 26] which measures locational concentration of labour can be of two types. If the location factor of any group of industrial labour is computed with respect to the district's geographical area, we call it absolute location factor. If on the other hand it is computed with respect to some superset of labour to which the group concerned belongs, the location factor is called relative location factor. It is therefore clear that for every group of industrial labour there are two concepts of location factors which require to be examined. Instead of treating them individually we shall aggregate the two kinds of location factors into one locational concentration index for every group of labour defined at the beginning of this section. We define two kinds of location factors for each group of labour by the following variables.

P_i : Absolute location factor[2/] for ith ($i=1, \ldots, 8$) group of labour with respect to district's geographical area.

R_i : Relative location factor[2/] for ith group of labour with respect to total labour ($i = 1, 2$) and with respect to labour in all factories as defined by Group 1 ($i = 3, \ldots, 8$).

2/ P_i's and R_i's are defined as follows :

$$P_i = (a_{ij}/A_j)/\left(\sum_{j=1}^{N} a_{ij} \Big/ \sum_{j=1}^{N} A_j\right) \qquad \text{for } i = 1, \ldots, 8$$

and

$$R_i = (a_{ij} / L_j) / \left(\sum_{j=1}^{N} a_{ij} \Big/ \sum_{j=1}^{N} L_j\right) \quad \text{for } i = 1, 2$$

$$= (a_{ij}/a_{1j})/\left(\sum_{j=1}^{N} a_{ij} \Big/ \sum_{j=1}^{N} a_{1j}\right) \quad \text{for } i = 3, \ldots, 8$$

where a_{ij} : ith group of labour in jth district, ($i=1,\ldots, 8$, $J=1,\ldots,334$).

A_j : geographical area of jth district,

L_j : total labour in agricultural and non-agricultural sectors of jth district.

N : total no. of districts under consideration.

4.2.3 Data sources

The data source for labour in all factories is the Census of India 1971. " Labour in all factories" here is identical with the Census's "manufacturing labour other than household industries". Labour in large factories and labour in large factories of different group of industries are obtained from the Annual Survey of Industries, 1971 (unpublished). Labour in small factories is obtained by subtracting labour in large factories from labour in all factories.

4.3 Method

4.3.1 Procedure for derivation of concentration index

Since we want to understand the pattern of concentration of different industrial activities we have taken two concepts of location factors — absolute and relative. Instead of dealing with the two concepts separately, we think it would be helpful for analysing the pattern if we combine them into a single index. Using each group of labour as defined in Section 4.2.2, we shall obtain a concentration index depicting the concentration pattern of the concerned industrial activity over the districts. For this, we make use of the aggregation procedure described in Chapter 2 after suitable transformation of location factors.

4.3.2 Procedure of classification and regionalization

The concentration indices for the eight groups of labour need to be classified for regionalization. In Chapter 2 we derived the index for secondary activity — Z_S. We are now interested in analysing the economic regions derived on the basis of the index for secondary activity using the concentration indices of labour in all factories (Group 1), labour in small factories (Group 2) and labour in large factories (Group 3). Therefore, the concentration indices of labour for Groups 1, 2, and 3 are to be classified on the basis of the regression equations of concentration indices of labour for Groups 1, 2 and 3 on the index for secondary activity. Again, Group 3 consists of Groups 4, 5, 6, 7 and 8. Therefore, the concentration indices of labour for Groups 4, 5, 6, 7 and 8 are to be classified on the basis of the regression equations of the concentration indices of labour for Groups 4, 5, 6, 7 and 8 on the concentration index of labour for Group 3.

4.4 Estimation

4.4.1 Estimation of concentration indices

The correlation coefficients between P_i and R_i for $i = 1, \ldots, 8$ based on 334 observations are given by 0.47080, 0.47719, 0.05607, 0.14177, 0.08278, 0.16525, 0.03431 and 0.02256 respectively. These poor correlation coefficients are due to the skewed nature of the distribution of the absolute location factors. After applying logarithmic transformation on P_i we obtain improved correlation coefficients. Let us define the transformed versions of P_i by Q_i ($i = 1, \ldots, 8$) where $Q_i = \log_e(10P_i+1)$. The correlation coefficients between Q_i and R_i ($i = 1, \ldots, 8$) are 0.88001, 0.89388, 0.48063, 0.54071, 0.55221, 0.67831, 0.45197 and 0.27302 respectively. Let C_i denote the concentration index obtained after aggregation for the ith group of labour ($i = 1, \ldots, 8$). C_i's are given by the equations (4.1) to (4.8).

$$C_1 = \underset{(0.96954)}{0.31087}\, Q_1 + \underset{(0.96954)}{0.45670}\, R_1 \text{ 3/} \qquad \ldots (4.1)$$

$$C_2 = \underset{(0.97311)}{0.29781}\, Q_2 + \underset{(0.97311)}{0.46385}\, R_2 \qquad \ldots (4.2)$$

$$C_3 = \underset{(0.86042)}{0.39321}\, Q_3 + \underset{(0.86042)}{0.51797}\, R_3 \qquad \ldots (4.3)$$

$$C_4 = \underset{(0.87770)}{0.52637}\, Q_4 + \underset{(0.87770)}{0.31188}\, R_4 \qquad \ldots (4.4)$$

$$C_5 = \underset{(0.88097)}{0.54580}\, Q_5 + \underset{(0.88097)}{0.61451}\, R_5 \qquad \ldots (4.5)$$

$$C_6 = \underset{(0.91606)}{0.51775}\, Q_6 + \underset{(0.91606)}{0.75788}\, R_6 \qquad \ldots (4.6)$$

$$C_7 = \underset{(0.85205)}{0.58988}\, Q_7 + \underset{(0.85205)}{0.38063}\, R_7 \qquad \ldots (4.7)$$

$$C_8 = \underset{(0.79782)}{0.69782}\, Q_8 + \underset{(0.79782)}{0.26089}\, R_8 \qquad \ldots (4.8)$$

It may be noted that the above aggregations have been done according to the aggregation method described in Section 2.3.2 of Chapter 2. For two variables, equal and unequal systems of aggregation yield identical index values. The mean values of C_i's ($i = 1, \ldots, 8$) are unity.

4.4.2 Classification of concentration indices

As all location factors, more specifically all concentration indices, relate to secondary activity, the class intervals for the index of secondary activity obtained in Chapter 2 are used to get the class intervals for the concentration indices C_i's ($i = 1, \ldots, 8$). As

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3/ Figures within brackets indicate the correlation coefficients between the concentration index and the relevant constituent variables.

described in Section 4.3.2, we obtain the regression equations of C_1, C_2 and C_3 on the index of secondary activity — Z_S, and the regression equations of C_4, C_5, C_6, C_7 and C_8 on C_3. They are given by the equations (4.9) to (4.16).

$$C_1 = \underset{(0.06147)}{-0.54943} + \underset{(0.05556)}{1.49345}\, Z_S \quad \text{4/} \qquad \ldots (4.9)$$

$$R^2 = 0.69106$$

$$C_2 = \underset{(0.07297)}{-0.29521} + \underset{(0.06595)}{1.24402}\, Z_S \qquad \ldots (4.10)$$

$$R^2 = 0.52417$$

$$C_3 = \underset{(0.08582)}{-1.08216} + \underset{(0.07757)}{2.03257}\, Z_S \qquad \ldots (4.11)$$

$$R^2 = 0.68008$$

$$C_4 = \underset{(0.10086)}{0.36057} + \underset{(0.06991)}{0.65946}\, C_3 \qquad \ldots (4.12)$$

$$R^2 = 0.21599$$

$$C_5 = \underset{(0.08752)}{0.10716} + \underset{(0.06066)}{0.88620}\, C_3 \qquad \ldots (4.13)$$

$$R^2 = 0.39790$$

$$C_6 = \underset{(0.10220)}{0.33876} + \underset{(0.07083)}{0.64713}\, C_3 \qquad \ldots (4.14)$$

$$R^2 = 0.20535$$

$$C_7 = \underset{(0.11132)}{0.26626} + \underset{(0.07715)}{0.76292}\, C_3 \qquad \ldots (4.15)$$

$$R^2 = 0.23238$$

$$C_8 = \underset{(0.13018)}{0.18831} + \underset{(0.09022)}{0.78950}\, C_3 \qquad \ldots (4.16)$$

$$R^2 = 0.19162$$

4/ Z_S denotes the index of secondary activity constructed in Chapter 2.

All the multiple correlation coefficients are significant at least at the 5 per cent level of chance. Putting the boundary values of class intervals for the index of secondary activity Z_S in the equations (4.9), (4.10) and (4.11), we get the boundary values of class intervals for the concentration indices C_1, C_2 and C_3. Again, putting the boundary values of class intervals for the concentration index C_3 in the equations (4.12), (4.13), (4.14), (4.15) and (4.16), we obtain the class intervals for the concentration indices C_4 to C_8. The class intervals for the three levels — low, medium and high — thus obtained are given in the table (4.1). The values of concentration indices along levels for districts are given in the table (4.2) in the Appendix.

In the next section we shall derive economic regions on the basis of the index for secondary activity. Three levels — low, medium and high — are considered for regionalization. For every region of secondary activity we analyse the levels of concentration of (i) labour in all factories, (ii) labour in small factories, and (iii) labour in large factories.

Table (4.1) : Class intervals for the concentration indices C_1 to C_8

Levels	CLASS INTERVALS			
	C_1	2	C_3	C_4
(0)	(1)	(2)	(3)	(4)
L (low)	- $C_1 \leq 0.75397$	- $C_2 \leq 0.79050$	- $C_3 \leq 0.69177$	- $C_4 \leq 0.81676$
M (medium)	$0.75397 < C_1 \leq 1.13406$	$0.79050 < C_2 \leq 1.10711$	$0.69177 < C_3 \leq 1.20906$	$0.81676 < C_4 \leq 1.15789$
H (high)	$1.13406 < C_1$ -	$1.10711 < C_2$ -	$1.20906 < C_3$ -	$1.15789 < C_4$ -

Continued.

Levels	CLASS INTERVALS			
	C_5	C_6	C_7	C_8
(0)	(5)	(6)	(7)	(8)
L (low)	- $C_5 \leq 0.72020$	- $C_6 \leq 0.78642$	- $C_7 \leq 0.79403$	- $C_8 \leq 0.73446$
M (medium)	$0.72020 < C_5 \leq 1.17862$	$0.78642 < C_6 \leq 1.12118$	$0.79403 < C_7 \leq 1.18868$	$0.73446 < C_8 \leq 1.14286$
H (high)	$1.17862 < C_5$ -	$1.12118 < C_6$ -	$1.18868 < C_7$ -	$1.14286 < C_8$ -

4.5 Regional Analysis of Secondary Activity with respect to Overall, Small and Large Factory Labour

There are about 107 lakhs of labour engaged in manufacturing activities (excluding household industries) in India in 1970-71. Of these, about 31 lakhs are engaged in the large factories, each of which provides employment to at least 100 labours. This accounts for only 29 per cent of all industrial labour in India. The remaining 76 lakhs or 71 per cent of industrial labour are engaged in manufacturing industries other than household having less than 100 labour which are termed here as small factories. In this section we shall observe the combinations of levels of concentration indices for overall industrial labour, small factory labour and large factory labour for every economic region with respect to three levels — high, medium and low — for the year 1970-71. In the course of our analysis we also test whether there has emerged any new leading non-traditional principal manufacturing region in 1970-71. It is also our purpose to identify the growing areas and, of course, the nature of emergence. It may be noted that for the year 1970-71 the total industrial labour in the districts of high and medium levels of secondary activity is respectively 82.20 lakhs and 10.71 lakhs whereas the total industrial labour in India is 107.06 lakhs. There are 27.4 lakhs and 14.9 lakhs respectively of labour in large factories.

4.5.1 Regions with high level of secondary activity

There are three distinct economic regions of high level of secondary activity in 1970-71. One of them is situated in the north-western region, the others in the south-western region and the eastern region of India (Figure 2.42). There are also 32 districts appearing as small pockets or isolated districts.

The area north of the State of Rajasthan, south of the Himalayan districts and west of the State of Uttar Pradesh constitutes the north-western region of high level of secondary activity in 1970-71. The districts Kathua, Mondi, Mahasu and Sirmur have low level of concentration of industrial labour and the districts Hissar, Nainital and Pilibhit medium level. All other districts exhibit high level of concentration of overall industrial labour (Figure 4.1, Table 4.2 in the Appendix). Evidently this region has emerged as an important manufacturing region in 1970-71. It may be noted that Karan [16] did not show this region as a principal manufacturing region in 1960 in his study based on industrial labour. The major part of the region has high level of concentration of labour in small as well as large factories (Figures 4.2 and 4.3). This suggests that the region is a leading one in both large and small industrial activities. The region's share in national employment is 10.57 per cent in case of total industrial labour, 9.17 per cent for labour in large factories and 11.12 per cent for labour in small factories. It is important to note that 75.18 per cent of the region's total industrial labour are engaged in small factories. It is also noteworthy that the region has appeared as a leading diversified industrial area without any major public sector investment. Government patronage has, however, been active in promoting agricultural activity, which in turn has stimulated the growth of small industrial activity. Transfer of income from the agricultural sector to the industrial sector has been important here. Thus the prospering agricultural activity has enabled the region to grow in industrial activity without any significant investment by the Government in the industrial sector.

The south-western region of high level of secondary activity in 1970-71 is situated in the southernparts of the States of Gujarat and Tamil Nadu and in the western parts of the States of Maharashtra, Karnataka and Kerala (Figure 4.1, Table 4.2 in the Appendix). Three parts of the region are highly industrially concentrated : Ahmedabad-Baroda, Bombay-Poona and Madurai-Coimbatore-Bangalore (Figure 4.1). Compared to 1960-61 [16, 27], each of the three parts has extended its width in 1970-71. The Ahmedabad-Baroda sub-region extends, in 1970-71 upto th coastal part of the State of Gujarat, Bombay-Poona to the south of the State of Maharashtra, and Madura-Coimbatore-Bangalore upto the States of Kerala and south of the State of Tamil Nadu. In 1960-61 they appeared disjointly whereas in 1970-71 the three parts seem to be connected by medium level of concentration of industrial labour (Figure 4.1). Geographical proximity to the three parts has been instrumental in uplifting the broad areas between them. In these districts lying in between , medium level of concentration of labour in small and large factories generally prevails. It is, of course, true that the three patches of high level of industrial concentration are also highly concentrated with both small and large industrial activities with only a few exceptions (Figures 4.2 and 4.3).

The south-western region of high level of secondary activity has 39.35 per cent of total industrial labour in the country. The region's

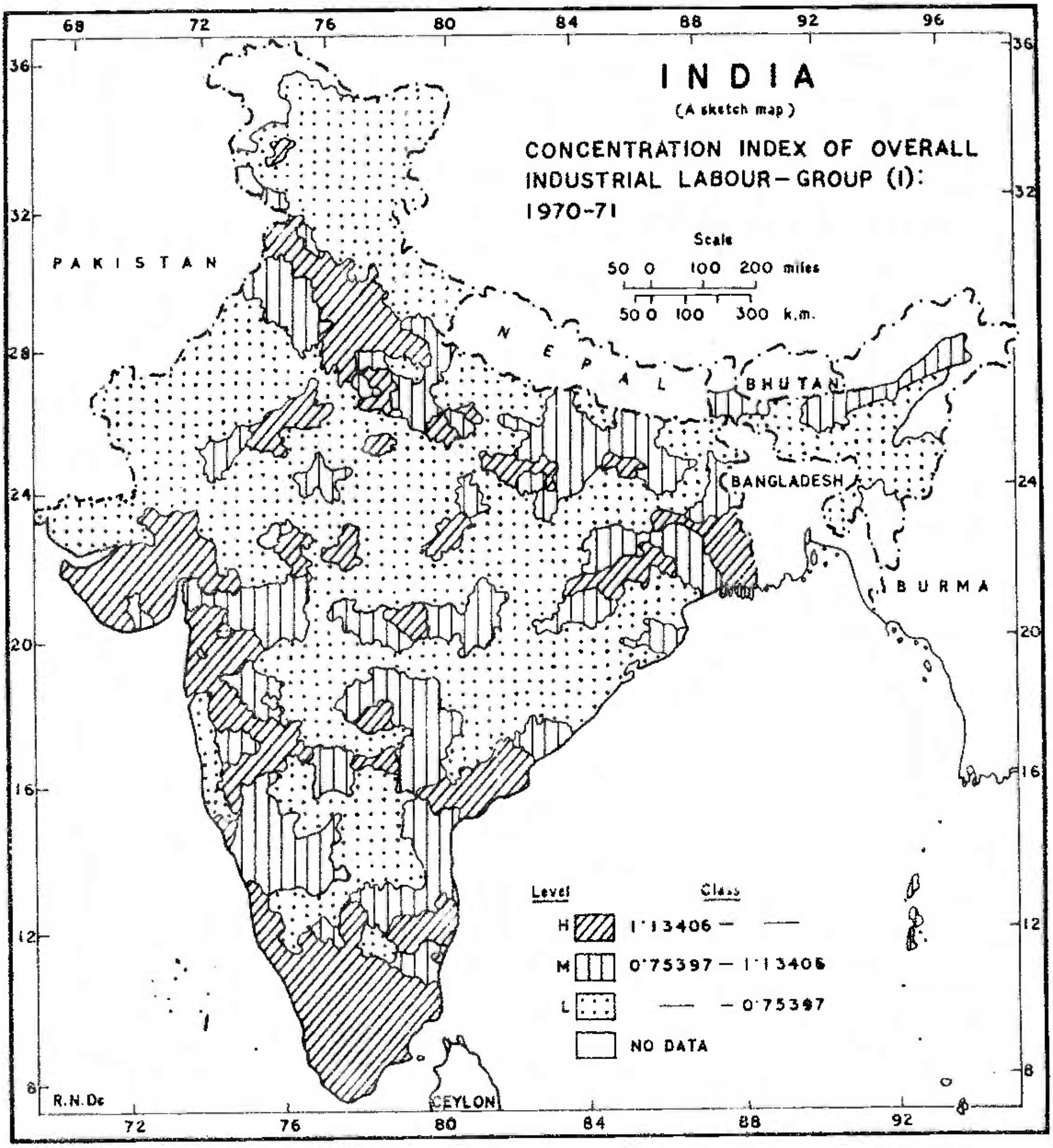
INDIA
(A sketch map)
CONCENTRATION INDEX OF OVERALL INDUSTRIAL LABOUR-GROUP (I): 1970-71
Scale
50 0 100 200 miles
50 0 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H 1·13406 —
M 0·75397 — 1·13406
L — 0·75397
NO DATA
R.N.De
68
72
76
80
84
88
92
96
36
32
28
24
20
16
12
8

FIGURE – 4·1

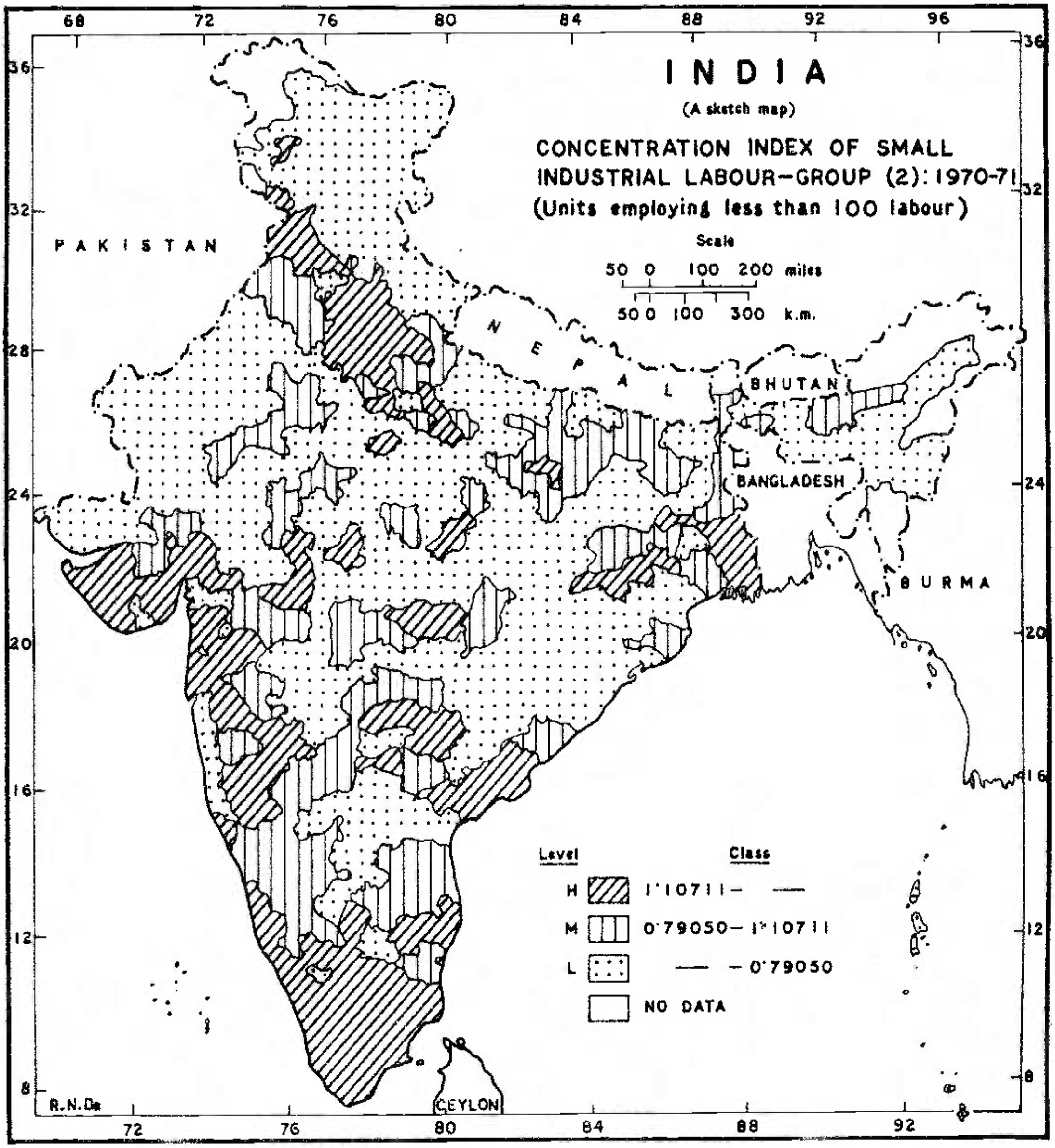
INDIA
(A sketch map)
CONCENTRATION INDEX OF SMALL INDUSTRIAL LABOUR-GROUP (2): 1970-71
(Units employing less than 100 labour)
Scale
50 0 100 200 miles
50 0 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H 1·10711 — —
M 0·79050 — 1·10711
L — — 0·79050
NO DATA
R.N.De

FIGURE - 4·2

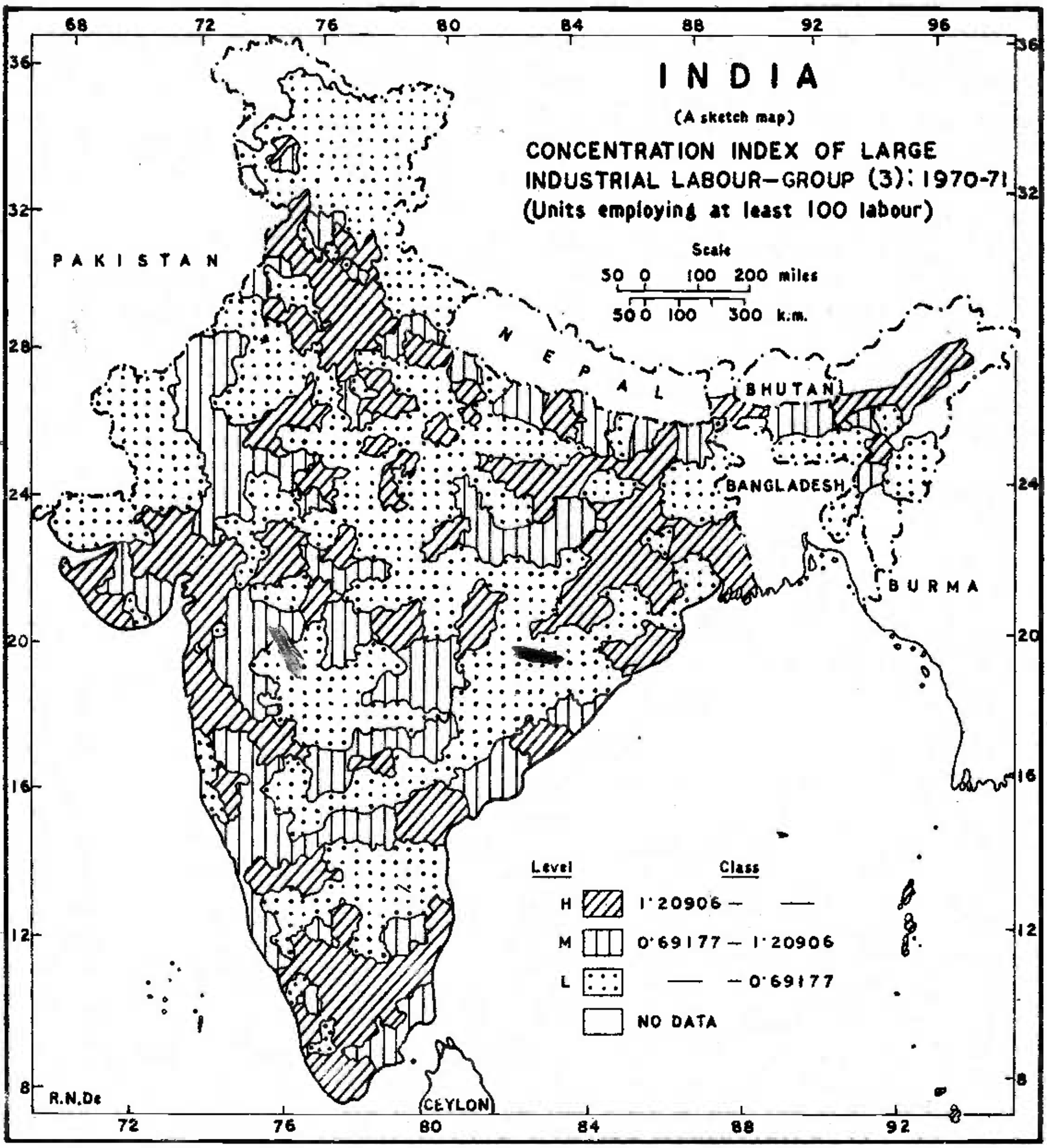
INDIA
(A sketch map)
CONCENTRATION INDEX OF LARGE INDUSTRIAL LABOUR-GROUP (3): 1970-71
(Units employing at least 100 labour)
Scale
50 0 100 200 miles
50 0 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H 1·20906 — —
M 0·69177 — 1·20906
L — — 0·69177
NO DATA
R.N.De
68
72
76
80
84
88
92
96
36
32
28
24
20
16
12
8

FIGURE- 4·3

shares of labour in large and small factories are 42.15 per cent and 38.24 per cent respectively. 30.63 per cent of the region's total industrial labour are engaged in large factories. The Ahmedabad-Baroda area is traditionally cotton textile-based. Diversification of industries has also taken place there. Spatial clusters of industries predominate over technological clusters despite the fact that the area possesses chemical industries, machinery industries etc. But the Bombay-Poona area possesses both technological clusters and spatial clusters of industries as a result of which industrial complexes have successfully formed. This also strengthened the integration of the industrial base. Modern technology has raised productivity. But the area covered by Madurai-Coimbatore-Bangalore have relatively less technological clusters in comparison to spatial clusters of industries. Diversification of industries is evident in these areas but it is not to the extent prevailing in the Bombay-Poona area.

The eastern region of high level of secondary activity is constituted mainly by central Bihar and southern West Bengal (Figure 2.42). In otherwords, it is mainly the union of Choto Nagpur area and Calcutta-Hooghly area. In overall industrial concentration the Choto Nagpur area remains low in 1970-71 (Figure 4.1) as it was in 1960-61 [16]. But the Calcutta-Hooghly area retains high level of concentration of overall industrial labour in 1970-71. This level holds good for the areas for labour in large as well as small factories whereas the Choto Nagpur area is highly concentrated with large industrial activity backward in small industrial activity (Figures 4.2 and 4.3). The region's share of total industrial labour is 16.58 per cent of the country's total, while for large and small factory labour its shares are 23.59 per cent and 13.78 per cent respectively. The inclination towards large factories in the region is evident from the fact that 40.69 per cent of the region's industrial labour is engaged in large factories. The volume of small factory labour in the region is 10.5 lakhs accounting for 59.31 per cent of the region's total industrial labour. The mineral and metal industries, having a highly capital-intensive structure, did not allow small factories to grow significantly because the industries in Choto Nagpur are mainly resource-based. Since the output of the industries are used throughout the nation in other industries which produce goods for final demand, there is no tendency to form any industrial complex or to yield high level of concentration of overall industrial labour in the absence of urban complexes. But the Calcutta-Hooghly area is marked by the both spatial and technological clusters of industries. Jute textiles and jute machinery, tea processing and tea machinery are technological clusters whereas diversified engineering industries have formed spatial clusters. Supply of iron and steel from nearby Choto Nagpur area has induced the formation of diversified engineer... trial region.

We now come to the isolated pockets or districts of high level of secondary activity in 1970-71. The districts Bhilawara, Jhansi, Sibsagar, Cachar and Puri have low concentration of industrial labour (Figure 4.1). The districts Srinagar, Jaipur, Ajmer, Kanpur, Lucknow, Gwalior, Ujjain, Indore, Sehore, Jabalpur, Nagpur, E. Godavari, W. Godavari, Krishna and Guntur are favoured with high level of concentration of industrial labour (Figure 4.1). For other isolated districts of high level secondary activity the level of concentration of industrial labour is medium. The concentration of small factory labour is low in the districts of Lucknow, Jalpaiguri, Lakhimpur and Ongole and high in the 13 districts Srinagar, Jaipur, Kanpur, Gwalior, Ujjain, Indore, Sehore, Jabalpur, Nagpur, E. Godavari, W. Godavari, Krishna and Guntur (Figure 4.2). So far as the concentration of large factory labour is concerned, high level is associated with all the districts except Pali, Bhilawara, Cachar, E. Godavari, W. Godavari and Krishna in all of which it is medium. Therefore it is clear that though a large number of districts are privileged with high concentration of large industrial activity, the possibilities of intensifying or extending the concentration of small industrial activity are, in most of the districts, yet to be explored (Figures 4.1, 4.2 and 4.3).

Dominance of large industrial activity is due to the huge public sector investments. These investments are made in order to utilise the natural resources of the surrounding areas of the districts concerned. Isolated districts in the State of Madhya Pradesh have shown high level of concentration of labour in large factories because of iron and steel, electrical machinery and fertilizer industries. The agro-based industries have uplifted the level of isolated pockets in the States of Uttar Pradesh and Andhra Pradesh. Sugar and food processing in Uttar Pradesh and tobacco and sugar in Andhra Pradesh are examples of such industries. In the isolated districts of Andhra Pradesh, too, there have been public sector investments. Since the isolated industrial districts are mainly resource-based, no regions have formed in the absence of spatial and technological clusters of industries.

From the analysis of high level of secondary activity it becomes apparent that except for the north-western region and the Calcutta-Hooghly area where the concentrations of both small and large industrial activity are high, the size of a region is sometimes moderately and sometimes drastically reduced as soon as the aspect of concentration of small industrial activity is taken into account. In the Choto Nagpur area the level of concentration of small industrial activities is essentially poor despite the fact that the area has the advantage of high concentration of large industrial activity. A similar situation prevails in the south-western region. The region yields three disjoint areas as we take into account of small industrial concentration. As for the isolated districts, most of them exhibit the same characteristics. Another point we observe is that the major areas of industrial activity in 1970-71 are, by and large, the traditional major areas, the important exception being the Punjab-Haryana-western Uttar Pradesh area which became one of the principal manufacturing areas in the country. Prospering agricultural activity has helped the area of Punjab-Haryana-western Uttar Pradesh to grow in industrial activity — particularly small industrial activity..

While a number of industrial complexes have helped to form a strong diversified industrial region in the Bombay-Poona area, a few dominant industries characterize the industrial landscape in the Ahmedabad-Baroda, Madurai-Coimbatore-Bangalore and Calcutta-Hooghly areas where complex formation is far from complete. Such industrial areas are distinguished by highly specialized and localized industries to which others are functionally linked. On the other hand a number of spatial clusters have generated a large technological cluster with diversified industrial base in the Bombay-Poona area.

4.5.2 Regions with medium level of secondary activity

There are two economic regions of medium level of secondary activity in 1970-71. Each of them consists of more than one patch. One region appears in western India and the other in north-eastern India (Figure 2.42).

The region in western India consists of three patches — western Rajasthan, western central India and the south-central part of southern India (Figure 2.42). There are 33 districts in this region. In the 13 districts Ferozepur, Sangrur, Bundi, W. Nimar, Dhulia, Jalgaon, Amravati, Bhandra, Karimnagar, Nellore, Chittor, Bellary and Kolar, the concentration of overall industrial labour attains medium level, and in the single district Sangli, high level. Other parts of the region have remained backward, exhibiting low level of concentration of industrial labour (Figure 4.1). The pattern of medium level of concentration of industrial labour has not changed significantly in 1970-71 [16]. Medium level of concentration of labour in small factories is present in the districts of Ferozepur, Sangrur, Bundi, Mandsaur, Dhulia, Jalgaon, Akola, Amravati, Bellary, Bijapur, Kolar, Nellore, and Chittor, and high level in the districts of West Nimar, Bhandra, Sangli and Karimnagar (Figure 4.1). Low level of concentration of labour in large factories prevails in the districts of Sangrur, Ganganagar, Mandsaur, West Nimar, Aurangabad, Bhandra, Bijapur, Kolar, Raichur, Nellore, Chittor, Anantapur and Karimnagar and high level in the districts of Panchmahal, Dhar and East Nimar (Figure 4.3). Medium level is associated with the remaining districts in the region. We observe in this analysis that in some parts of the region, districts with medium level of concentration of overall industrial labour exhibit medium level of concentration of labour in small as well as large factories. It is also clear that the backward districts of low level of concentration of overall industrial labour possess medium level of concentration of large industrial activity in general. These observations reflect the phenomenon that in the major part of the region, large industrial activity and small industrial activity have appeared as complementary to each other.

The region had 3.42 lakhs of industrial labour in 1970-71 of whom 15.36 per cent were engaged in large factories and 84.64 per cent in small factories. The region's share of total industrial labour in the country is only 3.83 per cent.

The north-eastern economic region of medium level of secondary activity consists of three patches - the northern parts of the States of Uttar Pradesh and Bihar, the eastern part of the State of Madhya Pradesh and the eastern part of the State of Orissa along the southern part of the State of West Bengal (Figure 2.42). Here, as in the western region, there are 33 districts. Low concentration of overall industrial labour as well as of small factory labour (Figures 4.1 and 4.3) prevails in 16 districts. They are Bharatpur, Kheri, Sitapur, Hardoi, Bahraich, Gonda, Bara Banki, Basti, Shahdol, Surguja, Champaran, Saharsa, Purnea, Palamau, Keonjhar and Mayurbhanj. Except for the districts Mainpuri and Bulandshahr where low and high levels respectively of concentration of small factory labour are present, the other districts of the region exhibit medium level of concentration of all industrial labour as well as of labour in small factories. Medium level of concentration of all industrial labour and of labour in small factories and low level of concentration of labour in large factories is seen in the districts of Shahjahanpur, Etah, Hardoi, Unnao, Faizabad, Azamgarh, Jaunpur, Ghazipur, Muzaffarpur, Murshidabad, Birbhum, Midnapore and Purulia (Figures 4.1, 4.2 and 4.3). It is clear, therefore, that small industrial activity occurs as a substitute for large industrial activity in the major part of the region. It may be noted that the pattern of concentration of overall industrial labour has not much changed in 1970-71 from the traditional pattern /27/.

The region's share in the country's total industrial labour is only 1.80 per cent, accounting for 1.93 lakh of total industrial labour of whom 10 per cent are engaged in the large factories and 90 per cent in the small factories.

Among the 12 isolated districts of medium level of secondary activity, the districts Jammu, Hoshiarpur, Simla and Kamrup exhibit medium level concentration of overall industrial labour in 1970-71 (Figures 2.42 and 4.1, Table 4.2). Low level of concentration of labour in large factories prevails in the districts of Jammu, Hoshiarpur, Simla, Mohendragarh, Ganjam and Hassan. Among these, the districts Hassan and Simla have medium level of concentration of labour in small factories, and Jammu and Hoshiarpur, high level (Figure 4.2). Medium level of concentration of labour in large factories and low level of concentration of labour in small factories prevail in the districts of Anantanag, Kangra, Goalpara, Nowgong and Srikakulam. This analysis, too, suggests that large and small industrial activity on the whole appear as mutually substituting activities in the districts of medium level of secondary activity.

The isolated districts account for 1.18 per cent or equivalently 1.26 lakhs of total industrial labour of whom 13.41 per cent are employed in the large factories and 86.59 per cent in the small factories.

From the analysis of economic regions and isolated districts of medium level of secondary activity two facts are immediately evident. Firstly, there is not much deviation in the pattern of concentration of industries. Secondly, small industrial activity and large industrial activity appear as mutual substitutes. Only in a few districts in the States of Maharashtra and Karnataka are both kinds of activity present to the extent of medium level of concentration.

4.5.3 Synthesis

We have not found it necessary to undertake any analysis of the economic region of low level of secondary activity in view of the fact that the vast area under the region does not possess any significant industrial activity (Figure 2.42). However, it is to be noted that the share of industrial labour for the region of low level of secondary activity is quantitatively more than that for the regions and isolated districts of medium level of secondary activity. About 13.15 per cent of the country's industrial labour is engaged in the region of low level as against 10.01 per cent in the regions and isolated districts of medium level. But the difference between the total geographical areas of the districts belonging to the two levels is very great.

Another significant feature concerns the combination of large and small industrial activities. Small and large industries appear jointly in the regions of high level of secondary activity except in in the Choto Nagpur area where large factories appear significantly. In the regions of medium level of secondary activity, small industrial activity has appeared as a substitute for large industrial activity or vice versa in 1970-71. In case of the districts of low concentration of industrial labour large industries are significantly absent and the small and medium industries are sparsely distributed mainly catering to the local needs and are primarily traditional household types.

4.6 Regional Analysis of Five Groups of Large Industrial Activity

We shall now examine the concentration patterns of large factories of different groups of industries — there being evidence of high regional concentration — and characterize the industrial regions. We have partitioned all industries into five disjoint groups. They are (i) food processing and tobacco products (carbonated and alcoholic drinks included), (ii) basic metals and their products, (iii) textiles and their products, (iv) chemicals, chemical products and non-metallic mineral products, and (v) miscellaneous products other than those as described in (i) to (iv) and the industries of gas and electricity. For each group we also try to investigate whether there has taken place any significant change in the pattern of manufacturing regions by examining the concentration pattern of labour employed in the large factories. Three levels have been considered for regionalization. They are low, medium and high.

4.6.1 Regional analysis of concentration pattern of large industrial activity : food processing, tobacco products etc.

The large factories in the industries of food processing and tobacco products etc., account for 13.61 per cent of labour in all large factories in India in 1970-71. There are 4.17 lakhs of labour engaged in the large factories of food processing and tobacco products. 85.75 per cent of labour in this group is very much localised, coming under regions or areas of high level of concentration. 3.58 lakh labour is is accounted for by these regions or areas. Since 1.40 per cent of labour in this industry group is located unorganisedly, we do not perform any sort of analysis for the regions with low level of concentration of labour in this group.

There are two regions of high concentration of labour employed in the large factories of food processing and tobacco products etc., in 1970-71. One of them is situated in northern Uttar Pradesh and northern Bihar and the other in the extreme south of India (Figure 4.4). Apart from these two broad regions there are five small areas respectively located in the Gulfs of Cambay and Kutch, the western coastal part of the State of Maharashtra, the eastern coastal part of the State of Andhra Pradesh, the southern part of West Bengal and the north-eastern hilly part of the State of Assam. The industry has grown on the basis of locally available raw materials.

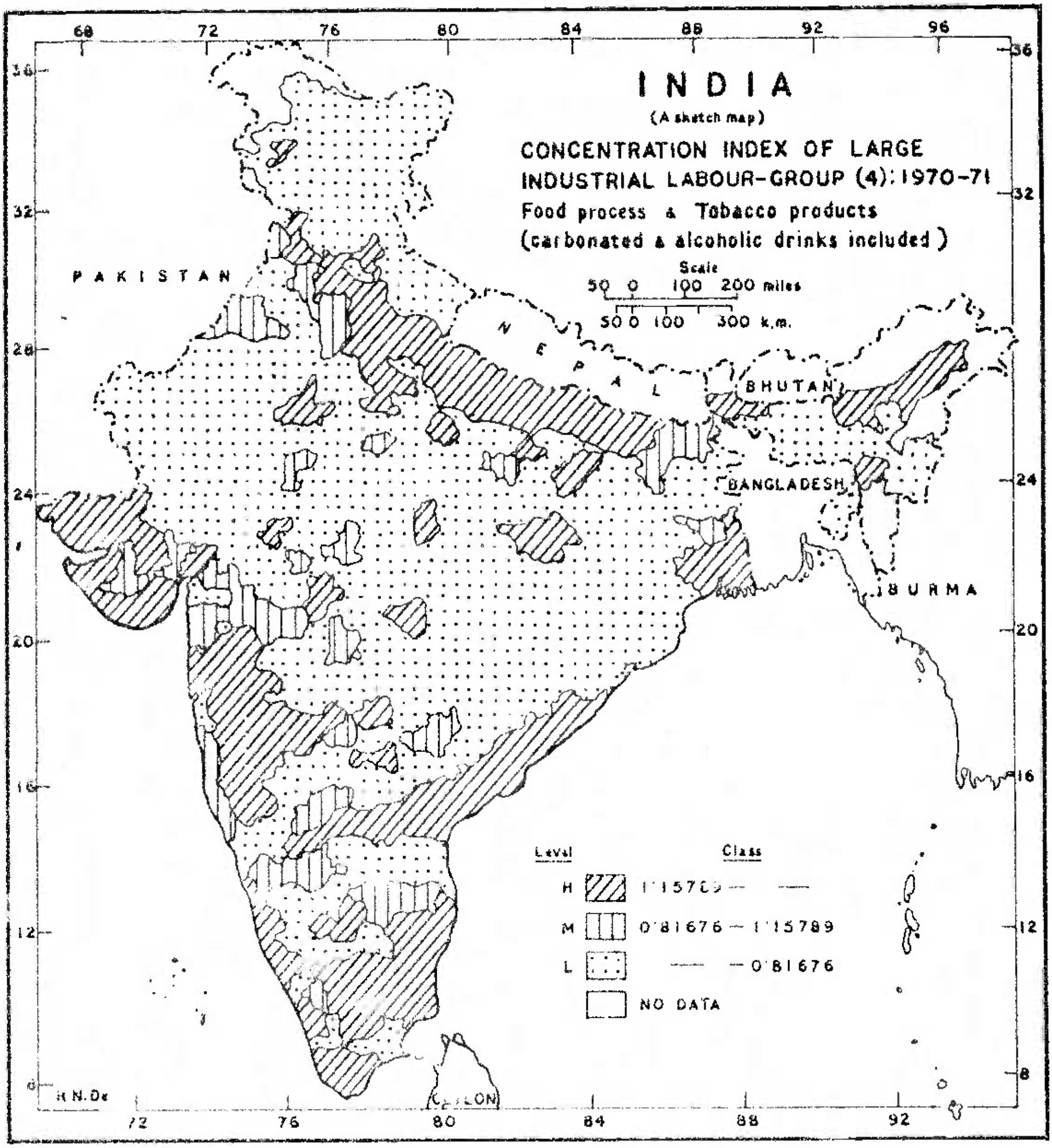
INDIA
(A sketch map)
CONCENTRATION INDEX OF LARGE INDUSTRIAL LABOUR-GROUP (4): 1970-71
Food process & Tobacco products
(carbonated & alcoholic drinks included)
Scale
50 0 100 200 miles
50 0 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H 1·15789 —
M 0·81676 — 1·15789
L — 0·81676
NO DATA
H.N.De

FIGURE – 4·4

The northern region of high concentration of labour in the large factories of food processing and tobacco products etc. is situated in the northern parts of the States of Uttar Pradesh and Bihar. This region accounts for 18.96 per cent or 79,000 of large factory labour in this industry group. This region is the third largest in the group in terms of labour employed. Sugar processing, alcoholic products and foodgrain processing industries are important in the region; these are wholly agro-based.

The largest region in terms of labour in large factories of food processing and tobacco products industries is the southern region which is situated along the coastal line in the southern parts of the States of Tamil Nadu and Kerala (Figure 4.4). In this region there is 1.12 lakh large factory labour engaged in the industries concerned, so that the region accounts for 26.79 per cent of all labour in the large factories of food processing and tobacco products etc. The important industries are connected with cashewnut and arecanut processing, canning and preservation of food items.

The western coastal area in the western part of the State of Maharashtra supports 8.40 per cent of large factory labour in the industries of food processing and tobacco products etc. 35,000 of such labour are engaged in this area. The important industries are connected with sugar, bakery, tobacco etc. The share of the western Gulf area is very nominal -- it accounts for just 2.11 per cent. The north-eastern hilly area which is essentially a tea-based area is located in the State of Assam. It accounts for 23,000 or 5.62 per cent of labour in the group. The eastern area of high concentration of labour in the group is located in the southern part of the State of West Bengal. The main industries are bakery and tea processing. This area accounts for 14,000 — only 3.31 per cent — of labour in the group. The second largest share of labour in this group goes to the eastern coastal area of Andhra Pradesh. The main industries are connected with tobacco products. Labour employed is 86,000 which is 20.56 per cent of all labour in the group. The share of labour of the isolated districts of high concentration is 9.29 per cent or 39,000. The isolated districts of Darjeeling, Jalpaiguri, Darrang, Lakhimpur, Sibsagar and Nowgong are important in tea processing and hold a significant share of labour in this group. There are small areas or isolated districts of medium level concentration of large factory labour in the industries of food processing and tobacco (Figure 4.4). Only 15,000 of such labour is engaged in these districts. This is equivalent to a share of 3.56 per cent in the group. From the above analysis it is clear that no significant change in formation of new region has taken place [16].

4.6.2 Regional analysis of concentration pattern of large industrial activity : basic metals and their products

The large factories in the industries of basic metals and their products account for 31.20 per cent (9.57 lakh) of the total labour engaged in large factories in 1970-71. Broadly speaking, there are four regions of high concentration of large factory labour in the industries of basic metals and their products. They are situated in the north-west, south, west and east of India (Figure 4.5). There are also two areas of medium level concentration. One is located in the south-east and

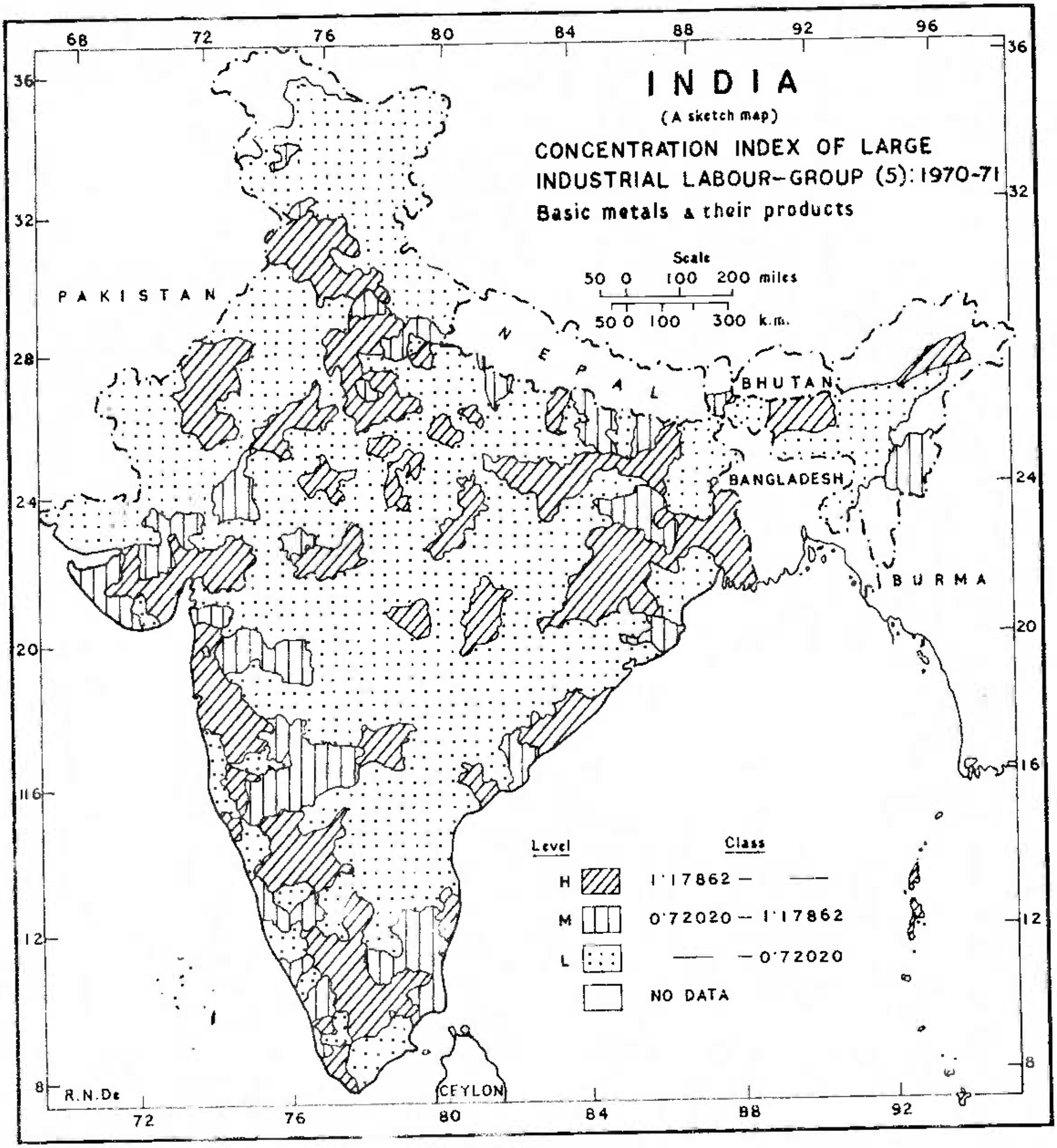
INDIA
(A sketch map)
CONCENTRATION INDEX OF LARGE INDUSTRIAL LABOUR-GROUP (5): 1970-71
Basic metals & their products
Scale
50 0 100 200 miles
50 0 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H
1·17862 — ——
M
0·72020 — 1·17862
L
—— — 0·72020
NO DATA
R.N.De
68
72
76
80
84
88
92
96
36
32
28
24
20
16
12
8

FIGURE - 4·5

the other in the south-west of India. In addition, there are isolated districts of high as well as medium concentration of labour in this group.

The north-western region of high concentration of labour employed in large factories of basic metals and their products is situated in the north-western parts of the States of Uttar Pradesh and Punjab (Figure 4.5). This region has 77,000 of its labour employed in such industries. It thus accounts for 8.06 per cent of all large factory labour in the industry group of basic metals and their products. The region possesses diversified engineering industries.

The southern region of high concentration is located in the western part of the State of Tamil Nadu and the southern part of the State arnataka (Figure 4.5). 65,000 of all large factory labour in the industries of basic metals and their products belong to this region. The region's share of such labour thus comes to 6.83 per cent. This region is essentially the Madurai-Coimbatore-Bangalore-Mysore area which possesses diversified heavy engineering industries.

The western region of high concentration is situated in Central Gujarat and the western coastal part of the State of Maharashtra. This region is essentially the union of two traditional sub-regions — Ahmedabad-Baroda and Bombay-Poona (Figure 4.5). In 1970-71 too, the two traditional sub-regions have appeared disjointly. The western region supports 24.12 per cent of large factory labour in the industry group, which amounts to 2.31 lakhs. It is the second largest region in the group in terms of labour employed. The region produces a wide range of engineering products including machinery of various kinds, which has made technological cluster formation possible.

The eastern region of high concentration of labour employed in large factories of basic metals and their products is situated in the west-central part of the State of West Bengal, the northern parts of Orissa and South Bihar and the eastern part of the State of Uttar Pradesh. This is the largest region for the industry group concerned in terms of labour employed. It has 3.46 lakh labour employed which is 36.19 per cent of total large factory labour in the group. Asansol, Durgapur, Rourkela, Bokaro and Jamshedpur are the main locations for the large factories of basic metals and their products. The parts of the region belonging to Bihar and Orissa are purely resource-based and their products are used all over India, particularly by the parts of the region belonging to the eastern part of Uttar Pradesh and the southern part of West Bengal, where growth of diversified engineering products has as a result been made possible.

There are 28 districts located scatteredly which have high concentration of labour employed in large factories of basic metals and their products. These districts include several important locations for the industry under the public sector. These are Gwalior-Indore-Sehore, Nagpur-Durg, Lucknow-Kanpur, Ajmer, Hyderabad, Madras-Chingleput and Visakapatnam. 1.95 lakh large factory labour in the industry group is accounted for by the isolated districts — a proportion of 20.35 per cent.

There are 40 districts appearing isolatedly or forming small areas which have medium concentration of large factories of basic metals and

and their products. For these districts, the total labour employed in these factories is about 31,000 in this group. The districts appear alongside the regions or pockets of high level concentration for this industry group. Thus, a dependence is implied. Apart from a few old industries, the large industries in these isolated districts were set up during the plan periods. Although the districts have not yet formed industrial regions, they possess region-forming elements in them and are capable of developing regional clusters.

4.6.3 Regional analysis of concentration pattern of large industrial activity : textiles and their products

The large factories in the industries of textiles and their products provide employment to 8.67 lakh labour. This group accounts for 28.27 per cent of total labour in large factories. There are three regions — north-western region, southern region and western region of high concentration of large factory labour for this industry group (Figure 4.6). In addition there is a small area of high concentration. Only 34 districts of high concentration have appeared scatteredly or forming very small areas in 1970-71.

The north-western region of high concentration appears mainly in the States of Punjab and Haryana. Some adjoining districts of neighbouring States are also part of the region (Figure 4.6). The region employs labour numbering 63,000 in the large factories of textiles and their products. It thus accounts for 7.26 per cent of all labour so employed. Among the individual industries, the woollen industry is the leading one in the region.

The southern region of high concentration is located in the extreme southern part of India and is known as the Madurai-Coimbatore-Bangalore region. 14.03 per cent of large factory labour in the industry group is accounted for by the region, which employs 1.22 lakhs of such labour. Cotton and synthetic textiles are the main items of production. Cotton textiles industries are historically associated with the region.

The western region of high concentration of large factory labour in the industries of textiles and their products is located in the southern part of the State of Gujarat, the Bombay-Poona area and the western and central parts of the State of Karnataka. This is the largest region in terms of employment of labour for this industry group. 3.62 lakhs or 41.82 per cent of all labour in the group belong to this region. Synthetic and cotton textiles are the main products of the industries in the group.

The eastern area of high concentration is located in the Calcutta-Hooghly area (Figure 4.6). The main industries are jute and cotton textiles. This is the second largest region in terms of volume of labour employed for this industry group. The proportion of total labour in large factories of textiles and their products belonging to this region is 17.84 per cent. The volume of employment of such labour is 1.55 lakhs.

There are 34 isolated districts of high concentration of large factory labour in the industries of textiles and their product. The main industries are cotton textiles. The proportion of such labour in these districts is 16.61 per cent and the volume is 1.44 lakhs.

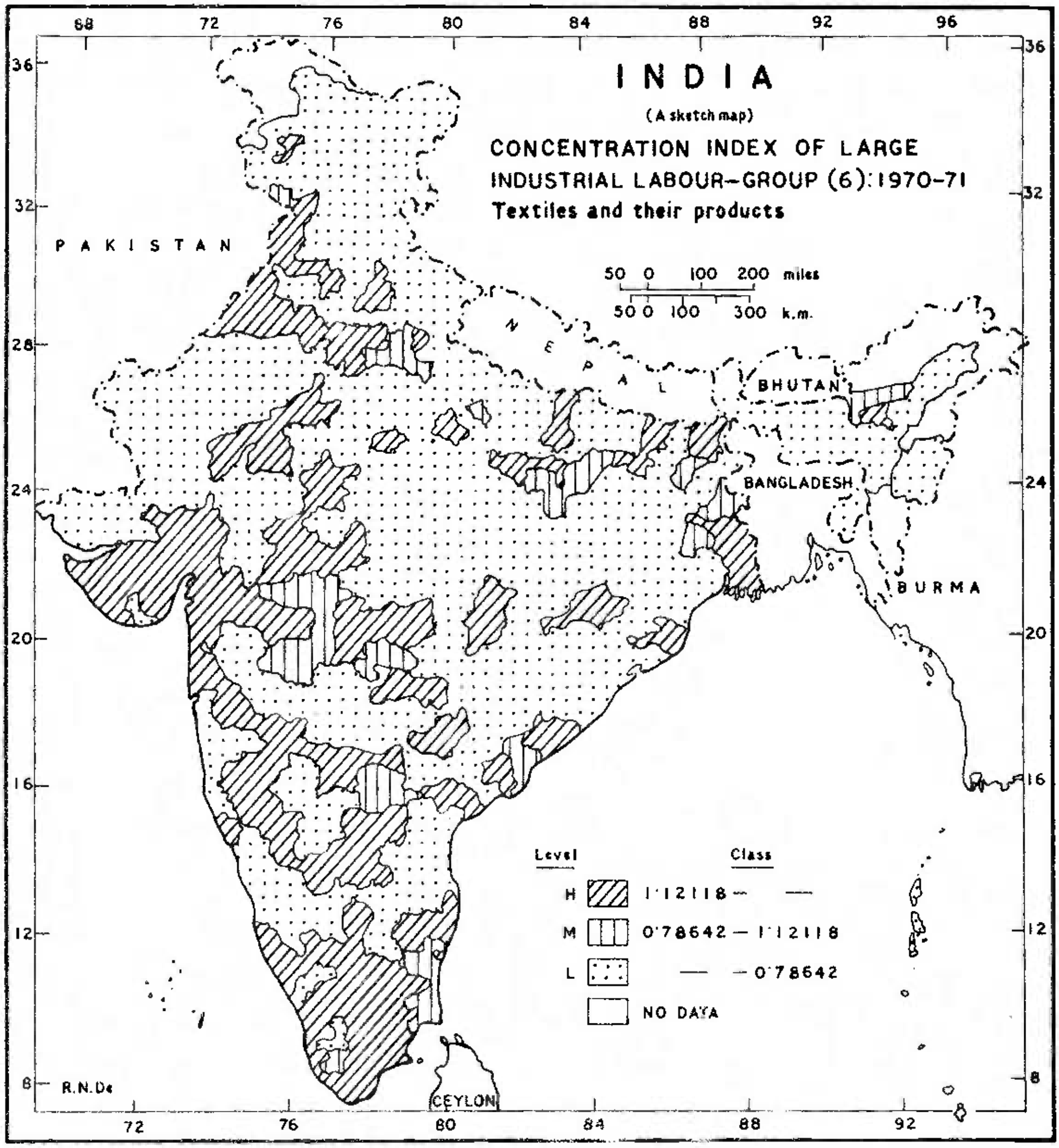
INDIA
(A sketch map)
CONCENTRATION INDEX OF LARGE
INDUSTRIAL LABOUR-GROUP (6): 1970-71
Textiles and their products
50 0 100 200 miles
50 0 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H 1·12118 — —
M 0·78642 — 1·12118
L — — 0·78642
NO DATA
R.N.De
68
72
76
80
84
88
92
96
36
32
28
24
20
16
12
8

FIGURE - 4·6

12,000 labour is engaged in the large factories of textiles and their products in the isolated districts or small pockets of medium concentration (Figure 4.6). This amounts to only 1.39 per cent of total volume of large factory labour in this industry group. The isolated districts or pockets of medium concentration have appeared as connecting patches between two disjoint areas or regions of high concentration for this industry group. It is evident that there is going to form a single region of high concentration ranging from South India to North India via Western India (Figure 4.6). Over the decade, a tendency towards spread of industries as opposed to localisation has been in evidence. Through the setting up of cotton industries in the cotton-growing areas, traditional concentration patterns are gradually loosening. The large factories in the industries of cotton and jute textiles have maintained the traditional regional pattern while small factories in the industries have undergone dispersion though maintaining links with the larger ones for input supply.

4.6.4 Regional analysis of concentration pattern of large industrial activity : chemicals, chemical products and non-metallic mineral products

The large factories of chemicals etc., provided employment to 3.17 lakhs of labour in 1970-71. The share of this industry group in total labour employed in large factories is 10.32 per cent. There are four regions and one small area of high concentration of large factory labour in the industries of chemicals, chemical products and non-metallic mineral products. They are the north-central region, the southern region, the western region, the eastern region and the central area (Figure 4.7).

The western region is the largest manufacturing region in the sense of having the largest proportion of labour engaged therein.

The north-central region of high concentration is constituted by the districts along the border of the States of Madhya Pradesh and Rajasthan, western Uttar Pradesh, and northern Punjab and Haryana (Figure 4.7). The region's volume and proportion of large factory labour in the industry group concerned are 33,000 and 10.33 per cent respectively.

The southern region of high concentration of labour employed in large factories of chemicals etc., is located mainly in the States of Tamil Nadu and Kerala (Figure 4.7). The region's share of labour in this industry group is 41,000 or 12.94 per cent of all such labour.

The western region of high concentration of labour employed in large factories of chemicals, chemical products and non-metallic mineral products is the union, as it were, of the Ahmedabad-Baroda area and the Bombay-Poona area. It is the largest region for manufacturing chemicals and chemical products etc. Specific industries located here are those of medicine, cosmetics, paints and glassware. The region accounts for 1.04 lakhs or 32.89 per cent of all large factory labour in the industry group.

The eastern region of high concentration of large factory labour for this group of industries is located in the north of the States of Orissa, the southern part of the State of Bihar, the eastern part of the State of Uttar Pradesh and Calcutta-Hooghly area (Figure 4.7). This region is the second largest region for this industry group in terms of labour employed. The region's volume and proportion of labour in the

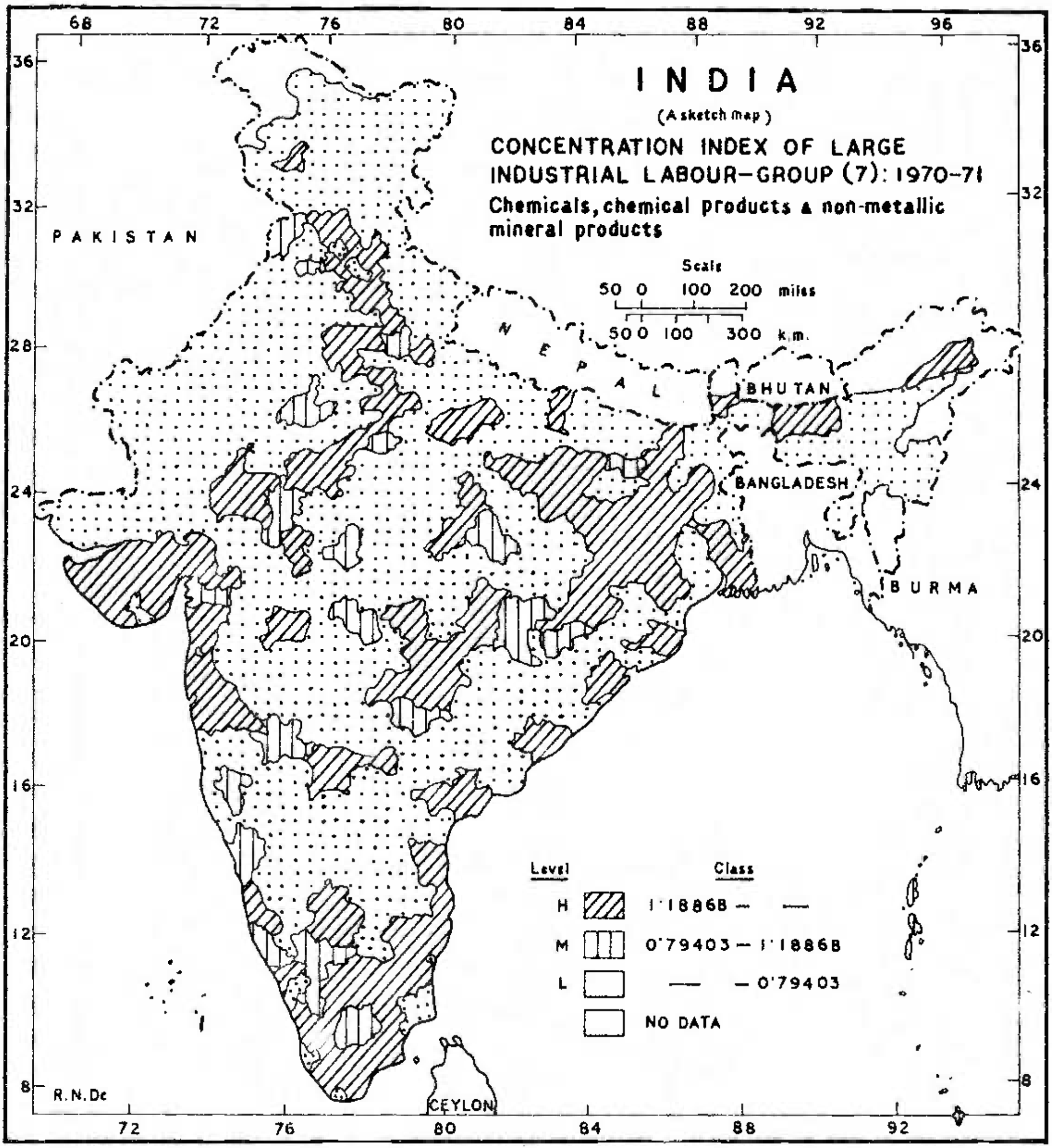
INDIA
(A sketch map)
CONCENTRATION INDEX OF LARGE INDUSTRIAL LABOUR-GROUP (7): 1970-71
Chemicals, chemical products & non-metallic mineral products
Scale
50 0 100 200 miles
50 0 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H
1·18868 —
M
0·79403 — 1·18868
L
— 0·79403
NO DATA
R.N.De

FIGURE – 4·7

industry group are 80,000 and 25.19 per cent respectively.

The central area of high concentration is located in the broad area of the States of Maharashtra, Madhya Pradesh and Andhra Pradesh. It has only 4,500 of large factory labour employed in this industry group.

There are 28 isolated districts of high concentration of labour employed in large factories in the industries of chemicals, chemical products etc. Their total employment of such labour is 44,500 or 14.04 per cent of the all-India figure.

The districts with medium concentration of labour employed in large factories of chemicals etc., are located alongside the regions of high concentration. Their contribution in terms of volume of labour is very insignificant, amounting to only 6,000 or slightly less than 2 per cent of total labour in the industry group (Figure 4.7).

The chemical industry has experienced rapid growth in the Bombay-Poona and Ahmedabad-Baroda areas in producing fine chemicals and medicines In Choto Nagpur there are heavy chemicals and fertiliser industries and non-metallic mineral products. The Madurai-Coimbatore-Bangalore area attracted lighter chemicals and dyestuffs related to the cotton textile industry which has grown historically in the region, besides manufacturing paints and varnishes based on local oilseeds and soaps based on vegetable oils.

4.6.5 Regional analysis of concentration pattern of large industrial activity: miscellaneous products

The miscellaneous industries are those of wood, cork, paper, paper products, printing, publishing and allied works, leather, fur, rubber products etc. The labour employed in large factories for this group is 2.1 lakhs or only 6.84 per cent of all large factory labour. There are four regions — the northern region, the southern region, the western region and the north-eastern region — of high concentration for this group of industries(Figure 4.8). Apart from these regions there are small areas and isolated districts of high concentration. The Calcutta-Hooghly areais the leading one. The shares of the other small areas are negligible.

The northern region of high concentration is situated in the northern part of the State of Punjab, Central Haryana and western Uttar Pradesh (Figure 4.8). The region's share of large factory labour in this industry group is 20,000 or 9.51 per cent. Important industries are letter press printing, publishing, leather works, ply woods etc.

The southern region of high concentration is located in the southern parts of the States of Karnataka, Tamil Nadu and Kerala (Figure 4.8). It has 39,000 of the total labour employed in large factories for this group of industries — a share of 18.69 per cent. The important industries are letter press printing, publishing, tanneries and leather products beside others. It is the third largest region in terms of size of labour for this group of large industries.

The western region of high concentration consists of the union of two principal manufacturing areas : Ahmedabad-Baroda and Bombay-Poona.

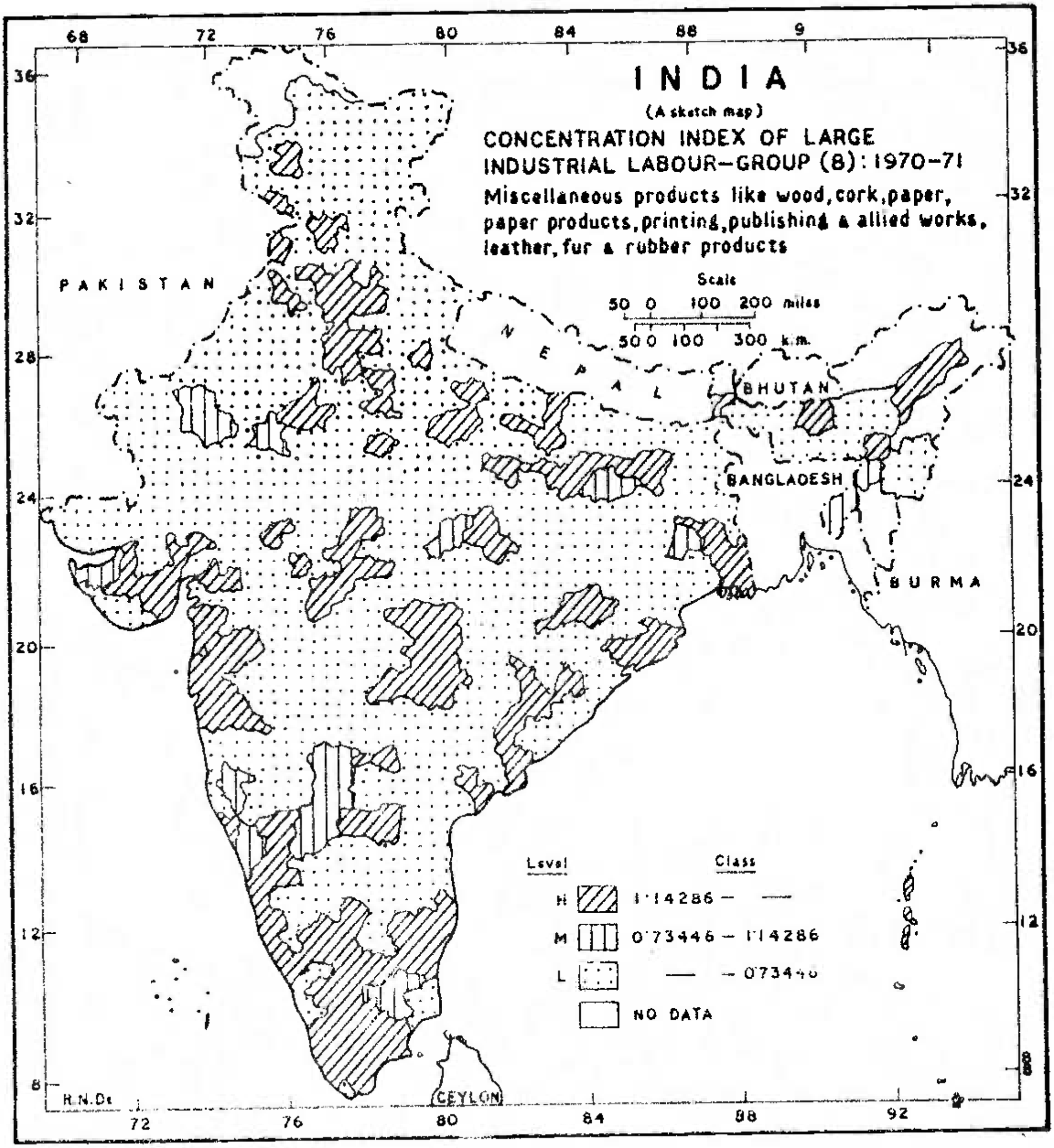
INDIA
(A sketch map)
CONCENTRATION INDEX OF LARGE INDUSTRIAL LABOUR-GROUP (8): 1970-71
Miscellaneous products like wood, cork, paper, paper products, printing, publishing & allied works, leather, fur & rubber products
Scale
50 0 100 200 miles
50 0 100 300 k.m.
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
CEYLON
Level
Class
H
1·14286 —
M
0·73446 — 1·14286
L
— 0·73446
NO DATA
R.N.De

FIGURE-4·8

It is the second largest region in terms of labour employed for this group of industries — the volume and proportion of labour employed being 42,000 and 20.06 per cent respectively. Printing, publishing and rubber products are the major industries.

The north-eastern region of high concentration of large factory labour for this group of industries is located in Central Bihar and eastern Uttar Pradesh (Figure 4.8). The region's employment of such labour is 17,000 or only 8.08 per cent of the all India total.

The largest share among the regions and areas of high concentration for this industry group is that of the eastern area, which is essentially the Calcutta-Hooghly area. Its volume of employment of large factory labour for the industry group concerned is 45,000 or 21.56 per cent of all such labour. The important industries are paper, paper products, leather, printing and publishing, tyres and tubes, miscellaneous rubber products including rubber foot wear.

The isolated districts or small areas of high concentration accounts for about 35,000 of all labour in the group — a share of 18 per cent. There are practically no regions of medium level concentration of large factory labour in this group of industries. The isolated districts of medium concentration — 14 in number — account for only 5,000 of such labour. This is equivalent to a share of 2.27 per cent for the isolated districts.

4.6.6 Synthesis

The analysis in this chapter brings to light some important facts. In regionalization by level of secondary activity or concentration of large or small factories or concentration of large factories of any group of industries, it is observed that the districts of medium level generally appear in close proximity to the high level regions. This suggests that it has been possible to sustain the medium level in these districts because of the interdependence between the industries in the medium level regions and those in the high level regions. Without the ties between them the medium level regions or areas would not grow. In fact, one can think of the medium level regions as extensions of the high level regions with the concentration of activity gradually falling off. This kind of extension has been greatly in evidence in 1970-71, that is after completion of the Third Five Year Plan. A decentralisation process is thus reflected. The traditional spatial clusters of industries are rather less helpful in bringing about decentralisation than the technological clusters of industries which optimize the transportation cost and strengthen the integration between as well as within the high regions. Let us take the example of the Bombay-Poona area. This area possesses the greatest number of technological interdependence clusters of industries [18] together with spatial clusters of industries. The spatial impact of the area has given a boost to the western coastal area ranging upto Nagpur. Moreover, the high level of technology operating in the industries of the area has yielded a high level of industrial productivity. This suggests that though the area concerned is backward in agricultural activity the high level of per capita income in the area is explained by the high level of non-agricultural activity, particularly the high level of industrial activity. The area has the most diversified industrial activity. The Ahmedabad-Baroda area, the Madurai-Coimbatore-Bangalore area, the Madras-Chingleput area and the Calcutta-Hooghly area also have diversified industrial activity including spatial and technological clusters of industries but not to the same extent. These areas possess not only resource-based industries but also spatial as well as technological clusters of industries. This is in sharp contrast to the region delineated by South Bihar and North Orissa which has mainly resource-based industries with products having nation-wide demand and consequently faces no prospect of extension in the slow pace of growth of technological interdependence between industries.

From this study it is also evident that prospering agricultural activity can help a region to grow in industrial activity as well. The Punjab-Haryana-Western Uttar Pradesh region — aided by Government patronage — experienced a galloping growth in agricultural activity in the sixties. Now this region has also grown rapidly into a leading manufacturing region despite the fact that no major public sector investments took place in the industries of the region. Small factories have grown using the surplus of income from the agricultural sector. Diversified engineering goods are produced in small factories. Unlike other leading areas of industrial activity, the Punjab-Haryana-western Uttar Pradesh region has a high proportion of labour engaged in small factories.

Another fact is also evident from the figures of concentration of labour every leading region of industrial activity shows a high level of concentration in all the five groups of large factories for which intensification, integration and extension of industrial activity have been possible. Unless a region possesses diversified industrial activity, intensification, integration and extension do not take place. This is evident from the following example. The North Uttar Pradesh and the eastern coastal part of the State of Andhra Pradesh are not favoured with high level concentration of labour employed in overall industrial activity although they are having high concentration of large factory labour in the industries of food processing, tobacco products etc. The reason is that the industries are mainly resource-based and are not diversified.

We conclude this chapter with a few observations : Public sector investments, in isolation, do not lead to formation of regions. Such investments do not usually form industrial complexes. Even when they form small complexes, the purpose of uplifting the economic condition of the area is not realized because the industries are very capital-intensive and resource-based with products having nation-wide demand; consequently no region formation occurs. On the other hand, the policy of setting up industries which are not resource based, in isolation, does not solve the problem of backwardness of a region either. For it is difficult for these industries to grow in the absence of any interaction. This is clear from the fact that the total industrial labour in the region of low level secondary activity is more than that in the regions of medium level secondary activity. This has been possible because the industries in the region of low level secondary activity have grown in isolation. The other constraint on the extension of regions, in general, is that industrial towns are not well-integrated by functional linkages, rather the metropolises are connected with individual industrial towns by extending their spatial functional linkage.

CHAPTER 5

Two-Stage Aggregation of Variables
An Alternative Method of Aggregation

5.1 Introduction

In aggregating variables there are two systems — unequal weighting system [17] and equal weighting system [26]. When one decides to aggregate certain variables into an index, it is necessarily with some object in view. That is, one decides a priori what the index will indicate. An order among the representations of the variables into the index to be constructed is decided upon according to some a priori economic considerations or objectives. By representations of the variables into the index we mean the associations between the variables and the index. Representation values obtained by the two methods which do not fulfil the a priori objectives cannot be accepted. Even if the a priori order among the representations of the variables is maintained by any of the two methods, representation values relating to some variables for the unequal weighting system and to all variables for the equal weighting system would be low and thus unacceptable in case of a dispersed correlation matrix where there are very high as well as very low values of correlation coefficients.

So, when the two methods cannot yield results which satisfy the a priori objectives and the condition that the representation values are not low, we would propose a two-stage use of the equal weighting system by judicious choice of subgroups of the variables. In the first stage indices for the subgroups are derived using the system of equal weighting and in the second stage the indices are aggregated into a final index by the same method. Now one can evaluate the associations between the variables and the final index. The associations are the representations of the variables into the final index. The use of the unequal weighting system in the two stages of aggregation may not achieve the desired goal as the representations of the variables in each of the stages remain unequal. Thus, the equal weighting system can regulate the representations of the variables more effectively than the unequal weighting system.

In this chapter, we shall prove

(i) some general results relating to the equal weighting systems,

(ii) some general results relating to the two-stage use of the equal weighting system where we shall consider two subgroups.

We shall further propose — for certain types of correlation matrix — sufficient and necessary conditions for total representation by the two-stage method exceeding that by single stage use of the equal weighting system. We shall also give a sufficient condition in the case of the general correlation matrix. Lastly, we shall illustrate the proposed method with an example.

5.2 Determination of results

Let x_i $(i = 1, \ldots, n)$ be n (> 2) standardised variables with the associated correlation matrix $R_{n,n} = ((r_{ij}))_{n,n}$, $r_{ij} = 1$ for $i = j = 1, \ldots, n$ and $0 \leq r_{ij} < 1$ for $i \neq j = 1, \ldots, n$ where r_{ij} stands for the correlation coefficient between x_i and x_j. Replication of variable is not entertained for which $r_{ij} < 1$ for $i \neq j = 1, \ldots, n$.

Now we define

(i) $$R_{n,n} = \left[\begin{array}{c|c} \dfrac{R_{11_{k,k}}}{R_{21_{n-k,k}}} & \dfrac{R_{12_{k,n-k}}}{R_{22_{n-k,n-k}}} \end{array}\right]_{n,n}$$

for some $1 \leq k < n$

where $R_{11} = ((r_{ij}))_{k,k}$ for $1 \leq i,\ j \leq k$;

$R'_{21} = R_{12} = ((r_{ij}))_{k,n-k}$ for $1 \leq i \leq k$ and $k < j \leq n$;

and $R_{22} = ((r_{ij}))_{n-k,n-k}$ for $k < i,\ j \leq n$.

(ii) $Q_{n,n}$ = the matrix obtained by (a) deleting k^{th} row of $R_{n,n}$; (b) subtracting k^{th} row of $R_{n,n}$ from other rows of $R_{n,n}$; and (c) introducing an unit vector of order n as the first row of $Q_{n,n}$ (unit vector is defined by V'_n in (V)).

$$= ((q_{ij}))_{n,n}$$

$$= \left[\begin{array}{c|c} \dfrac{Q_{11_{k,k}}}{Q_{21_{n-k,k}}} & \dfrac{Q_{12_{k,n-k}}}{Q_{22_{n-k,n-k}}} \end{array}\right]_{n,n}$$

where $Q_{11} = ((q_{ij}))_{k,k}$ for $1 \leq i,\ j \leq k$;.

$Q'_{21} = Q_{12} = ((q_{ij}))_{k,n-k}$ for $i \leq j \leq k$ and $k < j \leq n$;

and $Q_{22} = ((q_{ij}))_{n-k,n-k}$ for $k < i,\ j \leq n$.

(iii) $S_{n,n}$ = the matrix obtained by (a) deleting n^{th} row of $R_{n,n}$; (b) subtracting n^{th} row of $R_{n,n}$ from other rows of $R_{n,n}$; and (c) introducing an unit vector of order n as the $(k+1)^{th}$ row of $S_{n,n}$

$$=((s_{ij}))_{n,n}$$

$$= \left[\begin{array}{c|c} \dfrac{S_{11_{k,k}}}{S_{21_{n-k,k}}} & \dfrac{S_{12_{k,n-k}}}{S_{22_{n-k,n-k}}} \end{array} \right]_{n,n}$$

where $S_{11} = ((s_{ij}))_{k,k}$ for $1 \leq i, \; j \leq k$;

$S'_{21} = S_{12} = ((s_{ij}))_{k,n-k}$ for $1 \leq i \leq k$ and $k < j \leq n$;

and $S_{22} = ((s_{ij}))_{n-k\ n-k}$ for $k < i, \; j \leq n$.

(iv) $R^T_{n,n}$ = the matrix obtained by subtracting k^{th} row of $R_{n,n}$ from other rows of $R_{n,n}$.

(v) $V'_n = (1, \ldots, 1)_{1,n}$, and

(vi) $e'_n(j) = (0, 0, \ldots, 1, \ldots, 0, 0)_{1,n}$ where unity occurs in j^{th} position.

Here two groups are considered — one with first k variables and the other with remaining (n-k) variables. Let I, I_1, I_2 and I_3 be four indices derived from n variables, first k variables, last (n-k) variables and from I_1 and I_2 respectively using the equal weighting system. They are given by the following equations.

$$I = \sum_{i=1}^{n} \alpha_i x_i, \quad \rightarrow \quad \sum_{i=1}^{n} \alpha_i = 1$$

with $0 \leq \text{Corr.}(x_i, I) = \text{Corr.}(x_j, I) = r = s(I) < 1$

for $1 \leq i \neq j \leq n$

and

$$I_1 = \sum_{i=1}^{k} W_i x_i, \quad \rightarrow \quad \sum_{i=1}^{k} W_i = 1$$

with $0 \leq \text{Corr.}(x_i, I_1) = \text{Corr.}(x_j, I_1) = r_1 = s(I_1) < 1$

for $1 \leq i \neq j \leq k$

and

$$I_2 = \sum_{i=k+1}^{n} W_i x_i, \quad \rightarrow \quad \sum_{i=k+1}^{n} W_i = 1$$

with $0 \leq \text{Corr.}(x_i, I_2) = \text{Corr.}(x_j, I_2) = r_2 = s(I_2) < 1$

for $k < i \neq j \leq n$

lastly

$$I_3 = \lambda_1 \frac{I_1}{r_1} + \lambda_2 \frac{I_2}{r_2} \quad \rightarrow \quad \lambda_1 + \lambda_2 = 1 \quad \text{and } \lambda_1 = \lambda_2 = \frac{1}{2}$$

with $r_3 = \text{Corr.}(I_3, I_1) = \text{Corr.}(I_3, I_2)$

$$= \sqrt{\frac{1}{2}\left(1 + \sum_{i=1}^{k} \sum_{j=k+1}^{k} W_i W_j r_{ij} / r_1 r_2\right)} = s(I_3) < 1$$

where $(\alpha_1, \ldots, \alpha_n) = e_n'(1)\,(Q^{-1})' = e_n'(k+1)\,(S^{-1})'$;

and $(W_1, \ldots, W_k) = e_k'(1)\,(Q_{11}^{-1})'$;

and $(W_{k+1}, \ldots, W_n) = e_{n-k}'(1)\,(S_{22}^{-1})'$;

and $s(I)$, $s(I_1)$, $s(I_2)$, $s(I_3)$ are standard deviations of I, I_1, I_2 and I_3 respectively.

Proposition 1. $r^2 = \frac{|R|}{|Q|} = \frac{|R|}{|S|}$

Proof. In the equal weighting system,

$$\alpha_1 r_{k1} + \alpha_2 r_{k2} + \ldots + \alpha_n r_{kn} = r^2 \quad \text{for any } 1 \leq k \leq n$$

$$\text{i.e., } r^2 = \frac{r_{k1} \cdot \text{Cofactor of } q_{11} \text{ in } Q}{|Q|} + \frac{r_{k2} \cdot \text{Cofactor of } q_{12} \text{ in } Q}{|Q|}$$

$$+ \ldots + \frac{r_{kn} \cdot \text{Cofactor of } q_{1n} \text{ in } Q}{|Q|}$$

$$= \frac{r_{k1} \cdot \text{Cofactor of } r_{k1} \text{ in } R^T}{|Q|} + \frac{r_{k2} \cdot \text{Cofactor of } r_{k2} \text{ in } R^T}{|Q|}$$

$$+ \ldots + \frac{r_{kn} \cdot \text{Cofactor of } r_{kn} \text{ in } R^T}{|Q|}$$

$$= \frac{|R^T|}{|Q|}$$

But note that $|R^T| = |R|$ as $|R^T|$ is obtained by one elementary operation on R as defined. Therefore, $r^2 = \frac{|R|}{|Q|}$ and similarly $r^2 = \frac{|R|}{|S|}$. Thus $|Q| = |S|$.

Corollary 1. R being correlation matrix with $r_{ij} < 1$ for $1 \leq i \neq j \leq n$, $|R| > 0$, therefore $r^2 > 0$; r^2 tends to unity as $|Q|$ decreases to $|R| > 0$.

Proposition 2. $r_1 \geq r$, $r_2 \geq r$, $r_3 > r$ and Corr $(I_3, I) > r$.

Proof. $\text{Corr}\,(I_1, I) = \text{Cov}\left(\frac{I_1}{r_1}, \frac{I}{r}\right) = \frac{1}{r_1}\,\text{Corr}\left(\sum_{i=1}^{k} W_i x_i, \frac{I}{r}\right)$

$$= \frac{1}{r_1} \sum_{i=1}^{k} W_i\,\text{Corr}(x_i, I) = \frac{1}{r_1} \sum_{i=1}^{k} W_i r$$

$$= \frac{r}{r_1}, \quad \text{since } \sum_{i=1}^{k} W_i = 1.$$

Similarly, $\operatorname{Corr}(I_2, I) = \dfrac{r}{r_2}$

Since $\operatorname{Corr}(I_1, I) \leq 1$ and $\operatorname{Corr}(I_2, I) \leq 1$

therefore $r_1 \geq r$ and $r_2 \geq r$

$$\text{Now, } \operatorname{Corr}(I_3, I) = \operatorname{Cov}\left(\frac{I_3}{r_3}, \frac{I}{r}\right) = \frac{1}{r_3} \operatorname{Cov}\left(I_3, \frac{I}{r}\right)$$

$$= \frac{1}{r_3} \operatorname{Cov}\left(\frac{\lambda_1 I_1}{r_1} + \frac{\lambda_2 I_2}{r_2}, \frac{I}{r}\right), \quad \lambda_1 + \lambda_2 = 1$$

$$= \frac{1}{r_3}\left(\lambda_1 \operatorname{Corr}(I_1, I) + \lambda_2 \operatorname{Corr}(I_2, I)\right)$$

$$= \frac{r}{r_3}\left(\frac{\lambda_1}{r_1} + \frac{\lambda_2}{r_2}\right)$$

Since $r_1 < 1$ and $r_2 < 1$

therefore $\dfrac{\lambda_1}{r_1 r_3} > \lambda_1$ nd $\dfrac{\lambda_2}{r_2 r_3} > \lambda_2$

$$\text{so, } \frac{\lambda_1}{r_1 r_3} + \frac{\lambda_2}{r_2 r_3} > \lambda_1 + \lambda_2 = 1$$

$$\therefore \quad \operatorname{Corr}(I_3, I)/r = \frac{\lambda_1}{r_1 r_3} + \frac{\lambda_2}{r_2 r_3} > 1$$

therefore, $\operatorname{Corr}(I_3, I) > r$.

$$\text{Again, } \frac{\lambda_1}{r_1} + \frac{\lambda_2}{r_2} > \lambda_1 + \lambda_2 = 1$$

$$\text{i.e., } \frac{r}{r_3}\left(\frac{\lambda_1}{r_1} + \frac{\lambda_2}{r_2}\right) > \frac{r}{r_3}$$

$$\therefore \quad 1 \geq \operatorname{Corr}(I_3, I) = \frac{r}{r_3}\left(\frac{\lambda_1}{r_1} + \frac{\lambda_2}{r_2}\right) > \frac{r}{r_3}$$

$$\therefore \quad r_3 > r.$$

Proofs are so designed that it holds good for more than two subgroups.

<u>Proposition 3</u>. $|R + g.V_n' V_n'| = |R| + g\,|Q|$ for any scalar g.

<u>Proof</u>. $|R + g.V_n V_n'| = |R^T + g.(e_n(k), \ldots, e_n(k))|$ for any k.

$$= |R^T| + g\,|Q_{11}|$$

$$= |R| + g\,|Q_{11}|.$$

<u>Proposition 4</u>. If $R_{12} = R_{21}' = c.V_k V_{n-k}'$ for $0 \leq c < 1$

$$\text{then } \alpha_i = W_i \frac{r_2^2 - c}{r_1^2 + r_2^2 - 2c}, \quad \text{for } i \leq k$$

$$= W_i \frac{r_1^2 - c}{r_1^2 + r_2^2 - 2c}, \quad \text{for } k < i \leq n.$$

<u>Proof</u>. For $i \leq k$

$$\alpha_i = \frac{|Q^{1i}|}{|Q|} = \frac{|Q_{11}^{1i}|\ |Q_{22} - Q_{21}^{\cdot i}(Q_{11}^{1i})^{-1} Q_{12}^{1\cdot}|}{|Q_{11}|\ |Q_{22} - Q_{21}(Q_{11})^{-1} Q_{12}|}$$

$$= W_i \frac{|Q_{22} - Q_{21}^{\cdot i}(Q_{11}^{1i})^{-1} Q_{12}^{1\cdot}|}{|Q_{22} - Q_{21}(Q_{11})^{-1} Q_{12}|}$$

where Q^{ij} denotes the matrix obtained by deleting i^{th} row and j^{th} column of the matrix Q;

$Q^{\cdot j}$ denotes the matrix obtained by deleting j^{th} column of the matrix Q ;

and $Q^{i\cdot}$ denotes the matrix obtained by deleting i^{th} row of the matrix Q.

If $R_{12} = c.V_k V'_{n-k}$ then

(i) $Q_{12} = e_k(1)\ V'_{n-k}$

(ii) $Q^{1.}_{12} = ((0))_{k-1,n-k}$

(iii) $Q_{21} = V_{n-k}(c.V'_k - R'_{11}(k))$, $R'_{11}(k)$ being k^{th} row of R_{11}

and (iv) $Q_{22} = R_{22} - c.V_{n-k}\ V'_{n-k}$

therefore $|Q_{22}| = |R_{22} - cV_{n-k}\ V'_{n-k}|$

$= |R_{22}| - c\ |S_{22}|$ [due to proposition 3]

$= |S_{22}|\ \left(\frac{|R_{22}|}{|S_{22}|} - c\right)$

$= |S_{22}|\ (r_2^2 - c)$ [due to proposition 1]

Therefore, $Q_{21}(Q_{11})^{-1}Q_{12} = Q_{21}(Q_{11})^{-1}\ e_k(1)\ V'_{n-k}$

$= Q_{21}\ U_k\ V'_{n-k}$ where $U_k = (W_1, \ldots, W_k)'$

$= (Q_{11})^{-1}\ e_k(1)$

[according to the equal weighting system]

$= V_{n-k}\ (c.V'_k - R'_{11}(k))\ U_k V'_{n-k}$

$= V_{n-k}\ (cV'_k\ U_k - R'_{11}(k)\ U_k)V'_{n-k}$

since $V'_k U_k = 1$

$= V_{n-k}(c-r_1^2)V'_{n-k}$

since $R'_{11}(k)\ U_k = r_1^2$

[according to the equal weighting system)

$= (c - r_1^2)V_{n-k}\ V'_{n-k}$

And finally,

$$|Q_{22} - Q_{21}(Q_{11})^{-1} Q_{12}| = |R_{22} - c\, V_{n-k}V'_{n-k} - (c-r_1^2)V_{n-k}V'_{n-k}|$$

$$= |R_{22} + (r_1^2 - 2c)V_{n-k}V'_{n-k}|$$

$$= |R_{22}| + (r_1^2 - 2c)|S_{22}| \text{ [due to proposition 3]}$$

$$= |S_{22}| \left(\frac{|R_{22}|}{|S_{22}|} + (r_1^2 - 2c) \right)$$

$$= |S_{22}| \; (r_1^2 + r_2^2 - 2c) \text{ [due to proposition 1]}$$

For $i \leq k$,

$$\alpha_i = W_i \frac{|Q_{22} - Q_{21}^{\cdot i} \; (Q_{11}^{1i})^{-1} \; Q_{12}^{1\cdot}|}{|Q_{22} - Q_{21}(Q_{11})^{-1} \; Q_{12}|}$$

$$= W_i \frac{|Q_{22}|}{|Q_{22} - Q_{21}(Q_{11})^{-1} \; Q_{12}|} \quad \text{since } Q_{12}^{1\cdot} = ((0))_{k-1,n-k}$$

$$= W_i \frac{|S_{22}| \; (r_2^2 - c)}{|S_{22}| \; (r_1^2 + r_2^2 - 2c)} = W_i \frac{(r_2^2 - c)}{(r_1^2 + r_2^2 - 2c)} .$$

Similarly, for $k < i \leq n$, $\quad \alpha_i = W_i \dfrac{(r_1^2 - c)}{(r_1^2 + r_2^2 - 2c)}$

<u>Corollary 2</u>. $(r_1^2 + r_2^2 - 2c) > 0$ where $R_{12} = R'_{21} = cV_kV'_{n-k}$

$0 \leq c < 1$

<u>Proof</u>. From proposition 1 and corollary 1,

$$|Q| > 0 \quad \text{for all} \quad r < 1$$

and $|Q_{11}| > 0$ for all $r_1 < 1$

and $|S_{22}| > 0$ for all $r_2 < 1$

$$|Q| = |Q_{11}|\,|Q_{22} - Q_{21}(Q_{11})^{-1} Q_{12}| > 0 \quad \text{since } r < 1.$$

Therefore $|Q_{22} - Q_{21}(Q_{11})^{-1} Q_{12}| > 0$ since $|Q_{11}| > 0$

i.e., $|S_{22}|\,(r_1^2 + r_2^2 - 2c) > 0$ [due to proposition 4]

$\therefore$ $(r_1^2 + r_2^2 - 2c) > 0$ since $|S_{22}| > 0$

<u>Corollary 3</u>. $r^2 = \dfrac{r_1^2\, r_2^2 - c^2}{(r_1^2 + r_2^2 - 2c)}$ for $R_{12} = R_{21}' = cV_k V_{n-k}'$

$0 \leq c < 1$

<u>Proof</u>. Note that $r^2 = \alpha_1 + r_{12}\,\alpha_2 + \dots + r_{1k}\,\alpha_k + c(\alpha_{k+1} + \dots + \alpha_n)$

$$= \frac{(r_2^2 - c)}{(r_1^2 + r_2^2 - 2c)}\,(W_1 + r_{12}W_2 + \dots + r_{1k}W_k)$$

$$+ \frac{c.(r_1^2 - c)}{(r_1^2 + r_2^2 - 2c)}\,(W_{k+1} + \dots + W_n)$$

$$= \frac{r_1^2(r_2^2 - c)}{(r_1^2 + r_2^2 - 2c)} + \frac{c(r_1^2 - c)}{(r_1^2 + r_2^2 - 2c)};$$

since $\sum_{i=1}^{k} W_i r_{1i} = r_1^2$ and $\sum_{k+1}^{n} W_i = 1$

$$= \frac{r_1^2\, r_2^2 - c}{r_1^2 + r_2^2 - 2c}$$

<u>Corollary 4.</u> $r^2 \geq 0$ if and only if $c \leq r_1 r_2$

where $R_{12} = R_{21}' = cV_k V_{n-k}'$, $0 \leq c < 1$

and $r < 1$

<u>Proof.</u> From corollary 3,

$$r^2 = \frac{r_1^2 r_2^2 - c}{r_1^2 + r_2^2 - 2c} = \frac{(r_1 r_2 - c)(r_1 r_2 + c)}{(r_1^2 + r_2^2 - 2c)}$$

since $(r_1^2 + r_2^2 - 2c) > 0$ and $(r_1 r_2 + c) > 0$

$r^2 \geq 0$ if and only if $c \leq r_1 r_2$

<u>Proposition 5.</u> $\sum_{i=1}^{n} (\text{Corr}^2(X_i, I_3) - r^2) > 0$ if and only if

either $r_1^2 > r_2^2$

and $(r_1^2 - (n-k)r_2^2) > \frac{2c}{(r_1 + r_2)} (kr_1 - (n-k)r_2)$

or $r_2^2 > r_1^2$

and $(kr_1^2 - (n-k)r_2^2) < \frac{2c}{(r_1 + r_2)} (kr_1 - (n-k)r_2)$

where $R_{12} = R_{21}' = cV_k V_{n-k}'$ $0 \leq c < 1$

<u>Proof.</u> Note that

$$r_3^2 = \frac{1}{2} \left(\frac{\sum_{i=1}^{k} \sum_{j=k+1}^{n} W_i W_j r_{ij}}{r_1 r_2}\right) = \frac{1}{2} \left(1 + \frac{c}{r_1 r_2}\right) > 0$$

since $r_{ij} = c$ for $i = 1, \ldots, k$

$j = k+1, \ldots, n$

$$= \frac{1}{2} \frac{r_1 r_2 + c}{r_1 r_2}.$$

Again,

$$\mathrm{Corr}(x_i, I_3) = \frac{r_1 \lambda_1}{r_3} + \frac{\lambda_2}{r_3} \mathrm{Corr}(x_i, I_2) \quad \text{for } i \leq k \quad ,$$

$$= \frac{1}{2r_3}\left(r_1 + \frac{c}{r_2}\right), \text{ since } \mathrm{Corr}(x_i, I_2) = \sum_{j=k+1}^{n} r_{ij} W_j = c$$

$$= \frac{1}{2r_3}\left(\frac{r_1 r_2 + c}{r_2}\right) = r_1 r_3$$

Similarly for $k < i \leq n$, $\mathrm{Corr}(x_i, I_3) = r_2 r_3$

Therefore, $\sum_{i=1}^{n} (\mathrm{Corr}^2(x_i, I_3) - r^2)$

$$= \sum_{i=1}^{k} \left(r_1^2 r_3^2 - \frac{r_1^2 r_2^2 - c^2}{r_1^2 + r_2^2 - 2c}\right) + \sum_{i=k+1}^{n} \left(r_2^2 r_3^2 - \frac{r_1^2 r_2^2 - c^2}{r_1^2 + r_2^2 - 2c}\right)$$

$$= kr_3^2\left(r_1^2 - \frac{2r_1 r_2 (r_1 r_2 - c)}{r_1^2 + r_2^2 - 2c}\right) + (n-k) r_3^2 \left(r_2^2 - \frac{2r_1 r_2 (r_1 r_2 - c)}{r_1^2 + r_2^2 - 2c}\right)$$

$$= r_3^2 \; \frac{kr_1(r_1 - r_2)\{r_1(r_1 + r_2) - 2c\} + (n-k) r_2 (r_2 - r_1)\{r_2(r_1 + r_2) - 2c\}}{(r_1^2 + r_2^2 - 2c)}$$

$$= \frac{r_3^2 (r_1^2 - r_2^2)}{r_1^2 + r_2^2 - 2c} \left\{ (kr_1^2 - (n-k) r_2^2) - \frac{2c}{(r_1 + r_2)}(kr_1 - (n-k) r_2) \right\}$$

Note that $(r_1^2 + r_2^2 - 2c) > 0$ from corollary 2,

and $r_3^2 > 0$.

So, $\sum_{i=1}^{n} (\mathrm{Corr}^2(x_i, I_3) - r^2) > 0$ if and only if

either $r_1^2 > r_2^2$ and $(kr_1^2 - (n-k) r_2^2) > \frac{2c}{(r_1 + r_2)} (kr_1 - (n-k) r_2)$

or $r_1^2 < r_2^2$ and $(kr_1^2 - (n-k) r_2^2) < \frac{2c}{(r_1 + r_2)} (kr_1 - (n-k) r_2)$.

<u>Corollary 5</u>. $\sum_{i=1}^{n} (\mathrm{Corr}^2(x_i, I_3) - r^2) > 0$ if and only if

$$\frac{r_1^2}{r_2^2} \notin \left(1, \frac{n-k}{n}\right) \text{ or } \left(\frac{n-k}{k}, 1\right)$$

whichever is applicable, where $R_{12} = R'_{21} = ((0))_{k,n-k}$.

<u>Proof</u>. $R_{12} = R'_{21} = ((0))_{k,n-k} \iff c = 0$

Therefore $\sum_{i=1}^{n} (\mathrm{Corr}^2(x_i, I_3) - r^2) > 0$ if and only if

either $\frac{r_1^2}{r_2^2} > 1$ and $\frac{r_1^2}{r_2^2} > \frac{n-k}{k}$ [due to proposition 5]

i.e. either $\frac{r_1^2}{r_2^2} > \max(1, \frac{n-k}{k})$

or $\frac{r_1^2}{r_2^2} < 1$ and $\frac{r_1^2}{r_2^2} < \frac{n-k}{k}$

i.e. $\frac{r_1^2}{r_2^2} < \min(1, \frac{n-k}{k})$

Combining two results,

$$\sum_{i=1}^{n} (\mathrm{Corr}^2(x_i, I_3) - r^2) > 0 \quad \text{iff}$$

$\frac{r_1^2}{r_2^2} \notin \left(1, \frac{n-k}{k}\right)$ or $\left(\frac{n-k}{k}, 1\right)$ whichever is applicable.

<u>Corollary 6.</u> $\sum_{i=1}^{n} (\mathrm{Corr}^2(x_i, I_3) - r^2) > 0$ if and only if

$$\frac{r_1^2}{r_2^2} \notin \left(1, \left(\sqrt{\frac{2c}{r_2}} - 1\right)^2\right) \quad \text{or} \quad \left(\left(\sqrt{\frac{2c}{r_2}} - 1\right)^2, 1\right)$$

where $R_{12} = R'_{21} = cV_k V'_{n-k}$ and $k = n-k = \frac{n}{2}$, $0 \leq c < 1$

<u>Proof.</u> From proposition 5, we have, if $k = n-k = \frac{n}{2}$,

$$\sum_{i=1}^{n} (\mathrm{Corr}^2(x_i, I_3) - r^2) > 0 \quad \text{iff}$$

$$\text{either} \quad \frac{r_1^2}{r_2^2} > 1 \quad \text{and} \quad (r_1 + r_2)^2 > 2c$$

$$\text{or} \quad \frac{r_1^2}{r_2^2} < 1 \quad \text{and} \quad (r_1 + r_2)^2 < 2c$$

Now, $(r_1+r_2)^2 \gtrless 2c$ iff $\frac{r_1^2}{r_2^2} \gtrless \left(\sqrt{\frac{2c}{r_2}} - 1\right)^2$ since $0 \leq c < 1$ and $0 < r_2$

Therefore $\frac{r_1^2}{r_2^2} > 1$ and $(r_1 + r_2)^2 > 2c$ iff

$$\frac{r_1^2}{r_2^2} > \max\left(1, \left(\sqrt{\frac{2c}{r_2}} - 1\right)^2\right); \text{and} \quad \frac{r_1^2}{r_2^2} < 1 \quad \text{and} \quad (r_1+r_2)^2 < 2c \quad \text{iff}$$

$$\frac{r_1^2}{r_2^2} < \min\left(1, \left(\sqrt{\frac{2c}{r_2}} - 1\right)^2\right)$$

Together says that $\sum_{i=1}^{n} (\mathrm{Corr}(x_i, I_3)^2 - r^2) > 0$ iff

$$\frac{r_1^2}{r_2^2} \notin \left(1, \left(\sqrt{\frac{2c}{r_2}} - 1\right)^2\right)$$

or $\left(\left(\sqrt{\frac{2c}{r_2}} - 1\right)^2, 1\right)$ whichever is applicable.

<u>Corollary 7.</u> $\sum_{i=1}^{n} (\mathrm{Corr}(x_i, I_3)^2 - r^2) > 0$ iff $r_1^2 \neq r_2^2$

when $R_{12} = R_{21}' = ((0))_{k,n-k}$

<u>Proof.</u> Putting c=0 in corollary 6, proof becomes obvious.

<u>Proposition 6.</u> $r^2 > 0$ attains maximum value under

$$R_{12} = R_{21}' = cV_kV_{n-k}' \quad \text{iff}$$

$$c = \min(r_1^2, r_2^2), \; r_1^2 \neq r_2^2.$$

<u>Proof.</u> From corollary 3,

$$r^2 = \frac{r_1^2 r_2^2 - c^2}{r_1^2 + r_2^2 - 2c}$$

$$\frac{dr^2}{dc} = \frac{-2c(r_1^2 + r_2^2 - 2c) + 2(r_1^2 r_2^2 - c^2)}{(r_1^2 + r_2^2 - 2c)^2}$$

$$\frac{dr^2}{dc} = 0 \iff c^2 - c(r_1^2 + r_2^2) + r_1^2 r_2^2 = 0 \iff c = r_1^2 \text{ and/or } c = r_2^2.$$

But r does not exist if $c = r_1^2 = r_2^2$.

From corollary 4,

$c < r_1 r_2$ for $r > 0$

Therefore if $c = r_1^2$ then $r_1 < r_2$

and if $c = r_2^2$ then $r_2 < r_1$

So, $c = \min(r_1^2, r_2^2)$

Now,

$$\frac{d^2r^2}{dc^2} = 2\,\frac{(2c-(r_1^2+r_2^2))(r_1^2+r_2^2-2c)^2 + 4(r_1^2+r_2^2-2c)(c^2-c(r_1^2+r_2^2)+r_1^2r_2^2)}{(r_1^2 + r_2^2 - 2c)^4}$$

Without loss of generality we may assume $r_1 < r_2$

then $c = r_1^2$ as which $\frac{dr^2}{dc} = 0$

$$\left.\frac{d^2r^2}{dc^2}\right|_{c=r_1^2} = \frac{2(2r_1^2 - (r_1^2 + r_2^2))\,(r_1^2 + r_2^2 - 2r_1^2)^2}{(r_1^2 + r_2^2 - 2r_1^2)^4}$$

$$= \frac{2(r_1^2-r_2^2)(r_2^2-r_1^2)^2}{(r_2^2 - r_1^2)^4} = \frac{-2(r_2^2 - r_1^2)^3}{(r_2^2 - r_1^2)^4} = \frac{-2}{(r_2^2 - r_1^2)} < 0$$

<u>Proposition 7</u>. A sufficient condition for $\sum_{i=1}^{n} (\mathrm{Corr}(x_i, I_3) - r) > 0$ is

$$\frac{1}{n}\left[kr_1 + (n-k)r_2 + \sum_{i=1}^{k} \mathrm{Corr}(x_i, I_2) + \sum_{i=k+1}^{n} \mathrm{Corr}(x_i, I_1)\right] - 1 \geq \mathrm{Corr}(I_1, I_2)$$

for any correlation matrix R with $0 \leq r_{ij} < 1$ for $1 \leq i \neq j \leq n$

<u>Proof</u>. $\mathrm{Corr}(x_i, I_3) = \frac{1}{2r_3}\{ r_1 + \mathrm{Corr}(x_i, I_2)\}$ for $i \leq k$

$$= \frac{1}{2r_3}\{r_2 + \mathrm{Corr}(x_i, I\ )\} \quad \text{for } i > k$$

Therefore, $\sum_{i=1}^{n} \mathrm{Corr}(x_i,\ I_3) - nr$

$$= \frac{1}{2r_3}\left[kr_1 + \sum_{i=1}^{k} \mathrm{Corr}(x_i, I_2) + (n-k)r_2 + \sum_{i=k+1}^{n} \mathrm{Corr}(x_i, I_1)\right] - nr$$

$$> \frac{1}{2r_3}\left[kr_1 + \sum_{i=1}^{k} \mathrm{Corr}(x_i, I_3) + (n-k)r_2 + \sum_{k+1}^{n} \mathrm{Corr}(x_i, I_1) - 2nr_3^2\right]$$

[due to proposition 2]

≥ 0

$$\text{if } \left[kr_1 + \sum_{i=1}^{k} \mathrm{Corr}(x_i, I_3) + (n-k)r_2 + \sum_{k+1}^{n} \mathrm{Corr}(x_i, I_1) - 2nr_3^2\right] \geq 0$$

$$\text{i.e. } \frac{1}{n}\left[kr_1 + (n-k)r_2 + \sum_{i=1}^{k} \mathrm{Corr}(x_i, I_2) + \sum_{i=k+1}^{n} \mathrm{Corr}(x_i, I_1)\right] - 1 \geq \mathrm{Corr}(I_1, I_2)$$

since $2r_3^2 = 1 + \mathrm{Corr}(I_1, I_2)$.

The objective of the proposition 7 is to state that the family of correlation matrix satisfying the sufficient condition yields better results in two stages of aggregation.

5.3 Illustration

The correlation matrix displayed in the table (5.1), is obtained from the study undertaken in Chapter 2. It is based upon 668 observations of variables relating to the secondary sector as 334 districts and two points of time are taken into account. The variables concerned are as follows :

X_1 : Density of labour in secondary sector per sq. km.

X_2 : Share of labour in secondary sector per thousand of total labour.

X_3 : Share of labour in large factories per thousand of labour in secondary sector.

X_4 : Average size of labour of large factory in thousands.

X_5 : Density of labour in large factories per hundred sq. km.

and

X_6 : Density of large factories per thousand sq. km.

Here large factories are those which employ at least 100 labour. The variables are transformed to near-normal distributions so as to reduce the skewness of the original distributions. All are found to be lognormally distributed with different parameters. The transformed forms of X_i's, denoted by Y_i's, are given below :

$$Y_i = \ln(X_i+1) \quad \text{for } i = 1, 2, 3; \qquad Y_4 = \ln(10X_4+1);$$

$$Y_5 = \ln(X_5+1) \quad \text{and} \quad Y_6 = \ln(10X_5+1).$$

The correlation matrix among Y_i's thus obtained is given in the table (5.1).

Table (5.1) : Correlation matrix between variables Y_1 to Y_6

	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6
Y_1	1.00000	0.73028	0.45327	0.39591	0.78317	0.84132
Y_2		1.00000	0.38263	0.33585	0.60268	0.63520
Y_3			1.00000	0.87500	0.87409	0.76147
Y_4				1.00000	0.77084	0.54094
Y_5					1.00000	0.94346
Y_6						1.00000

The value of r, the correlation coefficient between I and Y_i $(i = 1, \ldots, 6)$, is found to be only 0.61294 which is low although significant. The vector $(\alpha_1, \alpha_2, \ldots, \alpha_6)$ happens to be (0.03191, 0.18533, -0.46742, 1.89187, -3.63173, 2.99004). Now we want to obtain two subgroups such that (i) $D = \sum_{i=1}^{6} (\mathrm{Corr}^2(Y_i, I_3) - 0.61294^2)/6$ $= \sum_{i=1}^{6} (\mathrm{Corr}^2(Y_i, I_3) - 0.37570)/6$ is high; (ii) the difference between maximum and minimum among correlation coefficients (Y_i, I_3) $(i = 1, \ldots, 6)$ should preferably be small so as to minimize inclination towards any particular variable; (iii) the solution should be compatible with the notion that the variables relating to large factories would be highly correlated with the index to be constructed. Two acceptable groupings : (a) (Y_1, Y_2, Y_3, Y_4) and (Y_5, Y_6), (b) (Y_1, Y_2, Y_6) and (Y_3, Y_4, Y_5), are determined after examining the correlation matrix. It is obvious from the analysis, as presented in the table (5.2), that the two groupings, though differing marginally, are practically equivalent. It is to be noted that if the unequal weighting system were operated on all variables directly, the resulting index — call it I_k — in spite of being the best possible index in the sense that it explains maximum variance, may not be acceptable as the difference between maxima and minima among correlation coefficients (I_k, Y_i), $(i = 1, \ldots, 6)$, i.e., (0.82494, 0.70817, 0.86074, 0.76896, 0.98326, 0.93615) is 0.27509 whereas for grouping 1 and grouping 2 as given in the table (5.2) it turns out to be 0.24305 and 0.21581 respectively.

Table (5.2) : The behaviour of two groupings of variables Y_1 to Y_6

Groupings	Subgroup 1 W_i's relating to I_1	r_1	Subgroup 2 W_i's relating to I_2	r_2	r_3	$Corr(I_3,Y_i)$ $i=1,\ldots,6$	D (i)	Maxima minus minima (ii)	Interpretational advantages (iii)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Grouping 1	(0.21498, 0.32269, 0.12146, 0.34087) Corresponding to (Y_1,Y_2, Y_3, Y_4)	0.80040	(0.5, 0.5) Corresponding to (Y_5, Y_6)	0.98576	0.97049	0.83688, 0.73585 0.83978, 0.75517, 0.97890, 0.93445	0.3491	0.24305	Variables on large industries are emphasised, it is indeed necessary for measuring the country's potential.
Grouping 2	(0.13881, 0.45172, 0.40947) Corresponding to (Y_1,Y_2,Y_6)	0.90177	(0.07976, 0.45996, 0.46028) Corresponding to (Y_3,Y_4,Y_5)	0.94051	0.92198	0.82274, 0.75566, 0.83934 0.76754, 0.97147, 0.91792	0.3456	0.21581	Two groupings are practically equivalent

CHAPTER 6

Summary and Conclusions

6.1 Introduction

The economic regions derived in this study show a distinct regional pattern although there are variations at the level of individual activity. In this Chapter we shall relate the different findings for the different economic regions of overall economic activity. In this way we shall arrive at a specific line of logic to explain the characteristics of each region. However, due to non-availability of relevant explanatory data our analysis cannot go beyond certain limits. Moreover, apart from those data which could be taken into account had they been available, there are aspects which have not been considered in the study. For example, we have refrained from analysing causal factors behind the growth of tertiary and urban activities, our analysis of the concentration pattern of industrial activity having been conducted with the notion that it is industrial activity which influences tertiary and urban activity. Factors other than industrial activity have not been taken into consideration. Again, the land ownership pattern, social obligations and other institutional problems which might affect the extent of labour pressure on agriculture have also not been considered.

6.2 Summary

Having noted these limitations, we shall now put together the analyes carried out in the previous chapters. The Punjab-Haryana-Western Uttar Pradesh region is a balanced region having high levels of agricultural and non-agricultural activities and consequently high level of overall economic activity. This region has also enjoyed high level of per capita income and low level of labour pressure on agriculture during the decade 1960-61 to 1970-71. There has been an overall improvement in the levels of different activities and of labour pressure on agriculture by which the relatively backward districts have been able to improve their levels of different activities. The high level of concentration of industrial activity and particularly the high level of concentration of small industrial activity prevails there. The prosperity resulting from the growth of agricultural activity has enabled small industrial activity to grow without the help of substantial public sector investments, by transferring agricultural income to small industrial activity. So, besides agriculture, there have been created alternative occupations. This has strengthened the economic stability of the region, which has emerged as a leading manufacturing region in the later part of the decade. Diversified engineering and woollen textiles industries, along with food processing industries, are the dominant industries in the region. Along with spatial clusters, technological clusters of industries have made the network of industries integrated.

The southern region formed by the States of Tamil Nadu and Kerala has a high level of overall economic activity as well as high levels of agricultural and non-agricultural activities. The interesting feature is that this region could not get rid of the high level of labour pressure on agriculture in spite of being agriculturally well-developed. It is in fact the excessive labour pressure on agriculture that has stood in the way of forming a region of high level of per capita income in the later part of the decade. In this region there occur some isolated pockets of high level per capita income. It is non-agricultural activity, particularly industrial activity, which has sustained the high level of per capita income in these isolated pockets. The Madras-Chingleput area, the Madurai-Coimbatore-Nilgiri area and the Tirunelvel-Kanyakumari area are such pockets. An important exception, however, is the Thanjavur delta, which is favoured with low level of labour pressure on agriculture and has high level of per capita income. But on the whole it is evident that a higher level of agricultural activity need not necessarily give rise to a lower level of labour pressure. Although this region has shown a higher yield rate in 1970-71, it has failed to raise the level of productivity of labour in contrast to the Punjab-Haryana-western Uttar Pradesh region which has succeeded in boosting its yield rate and productivity of labour. This clearly indicates that agricultural labour in the southern region should be gradually transferred to non-agricultural sector simultaneously with intensification of cultivation so as to yield a further rise in productivity of labour.

The prevailing labour pressure on agriculture has had another impact on districts growing in industrial or non-agricultural activity which has prevented them from registering a high level of per capita income. Excess labour in agriculture has, in the absence of interactions between the agricultural and non-agricultural sectors, pulled down the growth of these districts in overall economic activity. This excess labour has not significantly affected the districts which are traditionally well-developed and possess sophisticated technology based industries. The districts Madras, Chingleput, Madurai, Coimbatore etc., belong to this category. Technological clusters of industries have grown rapidly in the areas of Madras-Chingleput, Madurai-Coimbatore etc. Diversified industries are located in the southern region. This region is inclined towards large industrial activity rather than small industrial activity. However, the spread of small industrial concentration is more than that of large industrial concentration.

The eastern region of high level overall economic activity is simply the south of West Bengal. Unlike the two other regions of high level overall economic activity, this region has experienced a growing imbalance between the levels of agricultural and non-agricultural activity. The high level of labour pressure on agriculture in 1970-71 has disrupted the region in place of which we obtain a very small area which is favoured with high level of per capita income due to its high level of non-agricultural activity. The small area is the Calcutta-Hooghly-Burdwan area. Thus, the increasing labour pressure on agriculture has acted to lower the level of per capita income in the eastern region. Growth of non-agricultural activity in the region has been very much centralised. Excepting the districts of Calcutta, Howrah, Hooghly, Burdwan and 24 Parganas the region has not experienced any significant spread of non-agricultural activity during the decade. Both large and small industrial activity flourish in the region. Diversified engineering industries along with basic metals industries are the predominant industries. Jute and cotton textiles and tea processing are traditional industries which still employ a significant proportion of industrial labour.

During the decade the above-mentioned regions have not been able to extend their boundaries significantly; the activities, however, have been intensified. There are some isolated pockets of high level overall economic activity. They are either traditional pockets or have emerged during the Second and Third Five Year Plans. These pockets are largely resource-based. But they have been unable to form regions during the decade precisely because they have grown using local resources. The resource products have nation-wide demand. Of course, a medium level of industrial activity has developed mainly in the areas adjoining the pockets of high level of overall economic activity. This suggests that decentralisation of industrial activity has been taking place so that isolated pockets have been surrounded by growing technologically dependent industries and consequently functional linkages between resource-based industries and final or intermediate goods producing industries have gradually been established in the form of industrial complexes. However, the pace of growth does not seem to be adequate for this.

The western coastal area delineated by Ahmedabad-Baroda-Bombay-Poona-Nagpur would have manifested itself as a region of high level of overall economic activity, had it been favoured with a higher level of agricultural activity. The region largely represents medium level of overall economic activity despite the fact that it shows high level of non-agricultural activity. This interesting finding is related to the fact that the region registers the high level of per capita income although it is not free from the high level of labour pressure on agriculture which has moreover been increasing over the decade. The explanation lies in the observation that the region possesses the maximum number of technological clusters of industries along with the traditional clusters and also accounts for a large proportion of the country's industrial output and labour — signifying a high degree of integration in industrial growth. Consequently, industrial growth provides alternative casual occupations in non-agricultural activity by means of which the region has grown into a region of high level per capita income. The region therefore, though not a balanced one, has emerged as a developed region. This provides an instance of an industrially unbalanced region — growing and becoming a developed region without much support from agriculture. Agriculturally surplus areas have provided the region with the required agricultural inputs. The region in this respect resembles those countries in the world which are exceptionally industrially developed and get their agricultural inputs by importing from other countries in exchange for industrial goods. Thus, within an economy region formation — in terms of high level per capita income — depending only on one of the two kinds of activities — agricultural and non-agricultural — is possible. However, this observation refers to the average per capita income of the districts in the region. Since non-agricultural income is here predominant over agricultural income, the average per capita income has registered high level. But if one were to study the distribution pattern of individuals' income within and between districts of the region we anticipate that there will be a wider disparity compared to that in a balanced region.

That the spatial linkages between two developed regions boost the growth of activities in the areas lying in between the two developed regions is evident from the following facts concerning regions of high level overall economic activity plus one region of high level non-agricultural activity. They are : Punjab-Haryana-Western Uttar Pradesh, the South of West Bengal, Tamil Nadu-Kerala and Ahmedabad-Baroda-Bombay-Poona-Nagpur. Medium level areas of overall economic activity have grown in between these regions. No direct area has emerged between the Punjab-Haryana-Western Uttar Pradesh region and the Tamil Nadu-Kerala region because of their wide locational separation and spatial linkage between these two regions is effected via the other two regions. Railways and improved road transport systems have accelerated the growth of medium level areas At the beginning of the decade the areas were not as connected as in 1970-71. Most of the isolated pockets of high level overall economic activity have appeared in the areas of medium level overall economic activity. Now consider the medium level area Alwar-Jaipur-Ajmer-Udaipur appearing between the two developed regions Punjab-Haryana-western Uttar Pradesh and Ahmedabad-Baroda-Bombay-Poona-Nagpur. This area has grown during the sixties. Both agricultural and non-agricultural activity have grown rapidly in relation to their levels in 1960-61. This area has a low level of labour pressure on agriculture and consequently has been able to raise the level of per capita income to high in 1970-71 from low in 1960-61. The medium level area between the two regions —— Punjab-Haryana-western Uttar Pradesh and the South of West Bengal is burdened with the high level of labour pressure on agriculture due to which the level of per capita income is low. There is high concentration of resource-based industrial activity in South Bihar and the area principally exhibits medium levels of agricultural and non-agricultural activity. With agricultural labour becoming an unwanted burden on its economy, its level of per capita income has remained at low level during the decade. However, the Nellore-Bellary-Chitradurga-Mysore area having medium level of overall economic activity has managed to register medium level of per capita income despite the prevalence of high level of labour pressure on agriculture. In 1960-61 this area generally had low level of per capita income. To explain this it is important to examine the values of the indices relating to overall economic activity and per capita income for both time points for the districts belonging to the area. In 1960-61, the area had barely attained medium level of overall economic activity and had high level of labour pressure on agriculture which resulted in low level of per capita income. At the end of the decade, although the area has remained at the medium level of overall economic activity the value of the index has risen. With the labour absorbability in agriculture also increasing to some extent, then has resulted in a marginally medium level of per capita income.

The regions of low level overall economic activity have high level of labour pressure on agriculture which is the basic income-generating activity. Consequently low level of per capita income has prevailed in those regions during the decade.

Thus, it is evident that a higher level of overall economic activity does not ensure a higher level of per capita income as there is a major problem of labour pressure on agriculture, the sector in which a large proportion of the total working force is engaged. By extending cropping area with increasing yield rate pressure of labour on agriculture may be reduced. As long as there remains any scope of increasing production in a way in which productivity of labour can be increased, transfer of labour from the agricultural sector to the non-agricultural sector may not merit our consideration as an immediate problem. Now, from our evaluation of the factor shares of changes in growth rate of production, it is evident that in Indian agriculture growth rate of cropped area, growth rate of productivity of land and growth rate of productivity of labour, in that order, are important contributors to the growth rate of production. It may be noted that growth rate of productivity of labour has the least influence on the growth rate of production; this is probably due to an increase in the labour engaged in producing a given output. It may also be noted that a positive growth rate in availability of cropped area per unit labour has a negative effect on the growth rate of production. This fact is the reflection of a technological aspect of production. Also, the system of cultivation that prevails in Indian agriculture often makes it difficult to increase agricultural production. As the availability of cropped area per unit labour increases, the process of cultivation becomes increasingly unmanageable for a given unit of labour due to the failure to modernise the system of cultivation. Thus, an increase in growth rate of available cropped land per unit labour does not always lead to a higher growth rate of production. Thus, apart from the factors relating to cropped area and cropped area per unit labour there are two other important factors. They are productivity of land and productivity of labour. We have therefore to look into the effects of inputs like fertilizer, rainfall and irrigation. On doing so we find that the different pairs of inputs may be ranked in the following decreasing order of contribution to change in productivity of land — fertilizer with irrigation, rainfall with irrigation and fertilizer with rainfall. The third combination is not favourable as one cannot depend on rainfall when fertilizer is being used. Though fertilizer with irrigation is an ideal combination, rainfall with irrigation can be chosen as a complementary combination of inputs. Thus, given rainfall, by simply increasing the extent of irrigation it is possible to increase considerably the productivity of land without the help of fertilizer, at any rate in the beginning. So, even if fertilizer is not made available, agricultural production should not be hampered much. On the other hand irrigation must be assured if fertilizer is to be applied.[1] Otherwise, agricultural production would be greatly disturbed. It should also be borne in mind that the extent of irrigation has the greatest influence on land productivity. We may conclude therefore that the primary need is of planning for water — which, it must be remembered, gives much longer

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1/ The situation may however be different if dry farming technique is developed using fertilizer. A discussion of this lies outside the scope of this study.

lasting benefits — before planning for distribution of fertilizer. We arrive at the same conclusion when we examine the role of inputs on the productivity of labour. Among the three chosen factors, irrigation is the only one whose influence on the productivity of labour can be established.

In the study of industrial concentration we do not observe any significant change in the sense of extension of traditional regions or any emergence of new regions except for the Punjab-Haryana-Western Uttar Pradesh region which has become a leading manufacturing region by intensifying the activity without much support in the form of public sector investments in industrial activity. In the analysis of the concentration pattern of large industrial activity for different industry group also, we do not find any significant change during the decade. The regions whose industries are mainly agro-based should also set up non-agro-based industries because the performance of the agro-based industries is directly dependent on agricultural production and therefore unreliable. The spread of industrial activities has not been possible for two important reasons. One is that small and medium size towns have not been equipped with better urban facilities; rather, it is the metropolises that have been favoured with increasing urban facilities as a result of which they are developing new problems. The second reason is that the spatial linkages between the towns have not been given enough emphasis, due to which the formation of more industrial regions has not taken place during the decade.

In Chapter 5, we have suggested two-stage use of the equal weighting system by which it may be possible to derive indices according to a priori objectives. However, we have not proved an existence theorem which would assure a solution under any kind of a prior objectives.

6.3 Conclusions

In the concluding part, we shall put forward our main observations in the study.

(i) Leading economic regions exhibit less divergence between the levels of agricultural and non-agricultural activities. They have been able to intensify their activities. Moreover, there have been no new region formations during the decade, only an intensification of activities in the economic regions of 1960-61. However, there have emerged some isolated pockets of growing economic activities as a result of the Government extending its patronage to the building of resource-based large factories.

(ii) It is the variations in agricultural activity that have primarily affected the formation of stable or balanced economic regions of overall economic activity.

(iii) A higher level of overall economic activity need not give rise to a higher level of per capita income.

(iv) Agricultural labour pressure has greatly influenced the level of per capita income; an increase in agricultural labour pressure has led to a fall in per capita income over the decade.

(v) A higher level of agricultural activity need not be associated with a lower level of labour pressure on agriculture.

(vi) Growth rate of labour pressure on agriculture is due to the excessive growth of labour, in relation to the growth of agricultural production.

(vii) Growth rate of agricultural production is primarily dependent on the growths of cropped area and productivity of land and to a lesser extent on the growth of productivity of labour in India.

(viii) Although the joint effect of irrigation and fertilizer contributes the maximum variation in changing the productivity of land, the contribution of irrigation and rainfall together is also significant. Productivity of labour is significantly associated with the extent of irrigation.

(ix) While the concentration of industrial activity has been intensified leading to an integration between areas, its pattern has not undergone any major change over the decade.

(x) Extension of regions and intesification of industrial activity are dependent on the degree of diversification of industries. This would also be reflected in the levels of per capita income.

Now, we shall give a few suggestions.

(i) Investment may be usually allocated in inverse relation to the values of the index of overall economic activity. In the process, the levels of sectoral indices are also to be taken into consideration in choosing the sector or sectors to which investment should go.

(ii) The availability of fertilizers in India, which is dependent on imports from other countries for its supply of fertilizers, suffers from problems of distribution-network. Hence, notwithstanding our long span of planning and development of irrigation facilities, it is the extension of the latter which remainsa priority for ensuring a minimum magnitude of agricultural production, and which can reduce the wide fluctuations over time in the magnitude of agricultural production. Further, it will help the agricultural sector to absorb more labour so that the adverse impact of the agricultural sector on the non-agricultural sector will be reduced.

(iii) In the course of formation of industrial regions diversified industries should be helped to grow so that the regions obtain stability. For example, agro-based industrial regions depend on the performance of agriculture; this is a source of instability within such regions. Technological clusters of industries should be always preferred for formation of industrial regions.

(iv) Lastly, gap between the levels of agricultural and non-agricultural activity should be reduced by promoting the weaker activity. This will raise the level of overall economic activity of spatial units and greater interactions will take place between the activities in the two sectors.

There are certain limitations of our study which, properly recognised, will serve to indicate the scope for further investigations. They are cited below.

(i) Estimates of sectoral income — agricultural and non-agricultural — might be made but we have not attempted to do so.

(ii) Effects of High Yielding Varities of seeds, institutional problems, marketing, social obligations etc., have not been taken into consideration in the study of the agricultural sector.

(iii) Industrial productivity, capital-output ratio, etc., i.e., technological aspects have not been taken into account as we could not consider the problem of energy, the problem of labour disputes etc., in the course of our study on industrial concentration.

(iv) We have not proved the existence theorem for indices — to be derived on the basis of two-stage use of the equal weighting system — satisfying any a priori objectives. Some more investigations in this direction can be made.

APPENDIX

A.1 Unequal and equal weighting systems of aggregation of variables

Let there be a vector of n standardised variables – $(x_1, x_2, \ldots, x_n)$ which denotes a point in an n-dimensional cartesian space. If there be N observations of n variables, N points may be considered to form a scatter around a central straight line passing through the origin. Kendall (1939) attempted to determine the straight line of closest fit to the scatter by minimizing the aggregated perpendicular distances between the points and the straight line. The projection value of each point on the straight line from the origin, thus determined, gives the index value of the unequal weighting system. The determination of the projection value is formally equivalent to the determination of what Hotelling (1933) called a 'first principal component'. The first principal component which is the linearly weighted aggregate of variables is determined by maximizing its aggregate squared correlation with the variables. While there is no assumption regarding the degree or direction of intercorrelations between variables in the principal component analysis by Hotelling (1933), Kendall (1939) preferred for positive high degree of mutual correlations so that the first principal component can leave negligible unexplained part of the total variation and consequently the determination of the other principal components becomes redundant.

Therefore, if I denotes the projection of $(x_1, x_2, \ldots, x_n)$ from the origin, then I is given by the following expression.

$$I = r_1x_1 + r_2x_2 + \ldots\ldots + r_nx_n$$

where r_i's $(i = 1, \ldots, n)$ are correlation coefficients between I and x_i's $(i = 1, \ldots, n)$; $\sum_{i=1}^{n} r_i^2 = \lambda$ which is the largest latent root of the correlation matrix derived from the variables x_i's,

$$\text{i.e.} \quad I = r_1 \left(\frac{X_1 - \mu_1}{\sigma_1}\right) + r_2 \left(\frac{X_2 - \mu_2}{\sigma_2}\right) + \ldots + r_n \left(\frac{X_n - \mu_n}{\sigma_n}\right)$$

where $X_1, \ldots, X_n$ are the variables whose standardised forms are given by $x_1, x_2, \ldots, x_n$ respectively, means by $\mu_1, \mu_2, \ldots, \mu_n$ respectively and standard deviations by $\sigma_1, \sigma_2, \ldots, \sigma_n$ respectively.

$$\text{Now,} \quad I = \frac{r_1 X_1}{\sigma_1} + \frac{r_2 X_2}{\sigma_2} + \ldots + \frac{r_n X_n}{\sigma_n} - \left(\frac{r_1 \mu_1}{\sigma_1} + \ldots + \frac{r_n \mu_n}{\sigma_n}\right)$$

$$\text{Therefore} \quad Z = \frac{I}{C} + 1 = \frac{r_1 X_1}{\sigma_1 C} + \frac{r_2 X_2}{\sigma_2 C} + \ldots + \frac{r_n X_n}{\sigma_n C}$$

$$= a_1 X_1 + a_2 X_2 + \ldots + a_n X_n$$

where $a_i = \dfrac{r_i}{\sigma_i C}$ for $i = 1, \ldots, n$ and

$$C = \sum_{i=1}^{n} \frac{r_i \mu_i}{\sigma_i}$$

$$\text{Thus,} \quad Z = \underset{(r_1)}{a_1 X_1} + \underset{(r_2)}{a_2 X_2} + \ldots + \underset{(r_n)}{a_n X_n}$$

We would consider Z whose mean is unity, instead of I. We would say that a_i's are physical weights and r_i's the logical weights to X_i's for $i = 1, \ldots, n$. The system is termed unequal weighting system as the logical weights are unequal.

Unlike the unequal weighting system, the equal weighting system given by Pal (1971) provides an index with an equal correlation coefficient between the constituent variables and the index. Pal (1971) solved a system of simultaneous equations in order to obtain such index.

If I' be the such index having equal correlation with the constituent variables, then I' is given as follows.

$$I' = w_1 x_1 + w_2 x_2 + \dots + w_n x_n$$

where x_i's are standardised variables and $\sum_{i=1}^{n} w_i = 1$. Let r be the correlation coefficient between x_i and I' for $i = 1, \dots, n$.

$$\text{Now, } I' = w_1\left(\frac{X_1 - \mu_1}{\sigma_1}\right) + w_2\left(\frac{X_2 - \mu_2}{\sigma_2}\right) + \dots + w_n\left(\frac{X_n - \mu_n}{\sigma_n}\right)$$

$$\text{Therefore} \quad Z' = \frac{I'}{C'} + 1 = \frac{w_1 X_1}{\sigma_1 C'} + \frac{w_2 X_2}{\sigma_2 C'} + \dots + \frac{w_n X_n}{\sigma_n C'}$$

$$= a_1' X_1 + a_2' X_2 + \dots + a_n' X_n$$

where $a_i' = \dfrac{w_i}{\sigma_i C'}$ for $i = 1, \dots, n$

and $C' = \sum_{i=1}^{n} \dfrac{w_i \mu_i}{\sigma_i}$

$$\text{Thus,} \quad Z' = \underset{(r)}{a_1'} X_1 + \underset{(r)}{a_2'} X_2 + \dots + \underset{(r)}{a_n'} X_n$$

We would consider Z' whose mean is unity, instead of I'. Here also we say that a_i''s are physical weights and r is the logical weight to X_i's. It may be noted that r_i's $(i = 1, \dots, n)$ in the case of the equal weighting system are also termed as the degrees of representation by the respective variables in the relevant index.

A.2 Detail classification of industrial groups.

	Industry-Groups[1]	ASI Code
Group 4 :	Food Processing, Tobacco Products, etc.	
	(i) Food manufacturing industries (except beverage)	20
	(ii) Beverage industries	21
	(iii) Tobacco manufacturing industries	22
Group 5:	Basic Metals and Their Products	
	(i) Basic metals industries	34
	(ii) Manufacturing of metal products except machinery and transport equipment	35
	(iii) Manufacturing of machinery except electrical machinery	36
	(iv) Manufacturing of electrical machinery apparatus, appliances and supplies	37
	(v) Manufacturing of transport equipment	38
	(vi) Miscellaneous manufacturing industries	39
	(vii) Manufacturing of furniture and fixtures (metal)	2600200
Group 6 :	Textiles and Their Products	
	(i) Manufacturing of textiles not elsewhere classified	23
	(ii) Manufacturing of footweat, other wearing apparel and made-up of textiles goods	24

1) Groups 1, 2 and 3 represent all industries (except household industries), all industries having small factories and all industries having large factories respectively. Groups 4 to 8 represent different industry-groups having large factories considered in our study.

Group 7 :	Chemicals, Chemical Products and Non-metallic Mineral Products	
	(i) Manufacturing of chemicals and chemical products (excluding synthetic rubber products)	31
	(ii) Manufacturing of products of petroleum and coal	32
	(iii) Manufacturing of non-metallic mineral products except products of petroleum and coal	33
Group 8 :	Miscellaneous Products	
	(i) Manufacturing of wood and cork except manufacturing of furniture	25
	(ii) Manufacturing of furniture and fixtures except manufacturing of furniture and fixtures made-up of metal	26
	(iii) Manufacturing of paper and paper products	27
	(iv) Printing, publishing and allied industries	28
	(v) Manufacturing of leather and fur products except footwear and other wearing apparel	29
	(vi) Manufacturing of rubber products	30
	(vii) Synthetic rubber	3110400

A.3 List of districts with code numbers (according to the Census 1971).

Code No. (0)	District Name (1)
	Andhra Pradesh
1.	Srikakulam
2.	Visakapatnam
3.	E. Godávari
4.	W. Godavari
5.	Krishna
6.	Guntur
7.	Ongole
8.	Nellore
9.	Chittor
10.	Cuddapah
11.	Anantapur
12.	Kurnool
13.	Mahbubnagar
14.	Hyderabad
15.	Medak
16.	Nizamabad
17.	Adilabad
18.	Karimnagar
19.	Warangal
20.	Khammam
21.	Nalgonda

Code No. (0)	District Name (1)
	Assam
1.	Goalpara
2.	Kamrup
3.	Darrang
4.	Lakhimpur
5.	Nowgong
6.	Sibsagar
7.	Mikir Hills
8.	N. C. Hills
9.	Cachar
	Bihar
1.	Patna
2.	Gaya
3.	Shahabad
4.	Saran
5.	Champaran
6.	Muzzafarpur
7.	Darbhanga
8.	Monghyr
9.	Bhagalpur
10.	Saharsa

Code No. (0)	District Name (1)
	Bihar (contd.)
11.	Purnea
12.	Santhal Parganas
13.	Palamau
14.	Hazaribag
15.	Ranchi
16.	Dhanbad
17.	Singhbhum
	Gujarat
1.	Jamnagar
2.	Rajkot
3.	Surendranagar
4.	Bhavnagar
5.	Amreli
6.	Junagadh
7.	Kutch
8.	Banaskantha
9.	Sabarkantha
10.	Mehsana
11.	Gandhinagar
12.	Ahmedabad

Code No. (0)	District Name (1)	Code No. (0)	District Name (1)	Code No. (0)	District Name (1)
	Gujarat (contd.)		Himachal Pradesh (contd.)		Karnataka (contd.)
13.	Kaira	7.	Mahasu	7.	Chitradurga
14.	Panchmahals	8.	Simla	8.	Coorg
15.	Baroda	9.	Sirmur	9.	Dharwar
16.	Broach	10.	Kinnaur	10.	Gulbarga
17.	Surat		Jammu and Kashmir	11.	Hassan
18.	Bulsar	1.	Anantanag	12.	Kolar
19.	Dangs	2.	Srinagar	13.	Mandya
	Haryana	3.	Baramula	14.	Mysore
1.	Ambala	4.	Ladakh	15.	North Kanara
2.	Karnal	5.	Doda	16.	Raichur
3.	Rohtak	6.	Udhampur	17.	Shimoga
4.	Gurgaon	7.	Jammu	18.	South Kanara
5.	Mohendragarh	8.	Kathua	19.	Tumkur
6.	Hissar	9.	Rajouri		Kerala
7.	Jind	10.	Poonch	1.	Cannanore
	Himachal Pradesh		Karnataka	2.	Kozhikode
1.	Chamba	1.	Bangalore	3.	Malapuram
2.	Kangra	2.	Belgaum	4.	Palghat
3.	Mondi	3.	Bellary	5.	Trichur
4.	Kulu	4.	Bidar	6.	Ernakulam
5.	Lahul and Spiti	5.	Bijapur	7.	Kottayam
6.	Bilaspur	6.	Chikmagular	8.	Alleppy
				9.	Quilon
				10.	Trivandrum

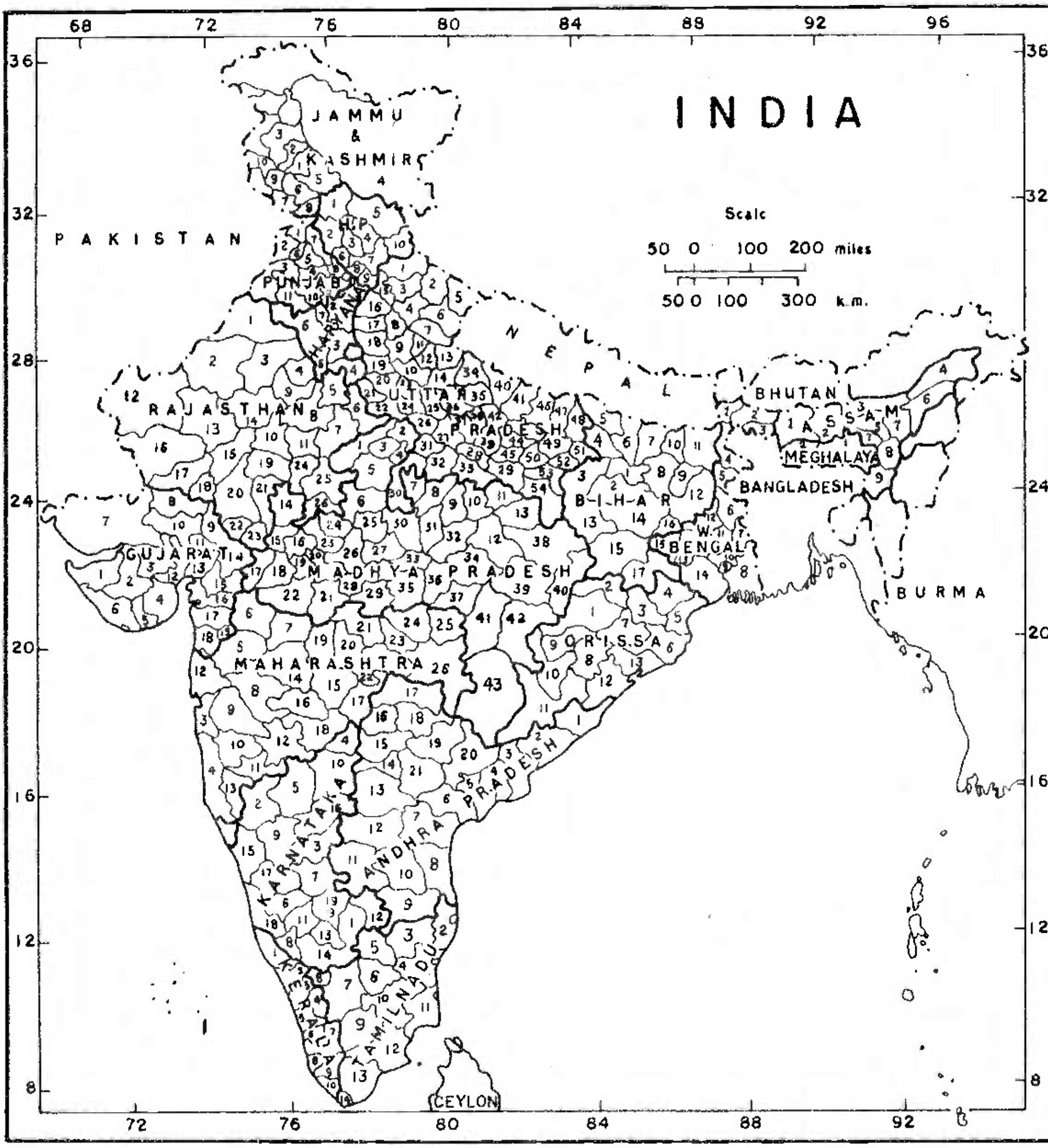
Code No.	District Name	Code No.	District Name	Code No.	District Name
(0)	(1)	(0)	(1)	(0)	(1)
	Madhya Pradesh		Madhya Pradesh (contd.)		Maharashtra (contd.)
1.	Morena	24.	Rajgarh	3.	Kolaba
2.	Bhind	25.	Vidisha	4.	Ratnagiri
3.	Gwalior	26.	Sehore	5.	Nasik
4.	Datia	27.	Raisen	6.	Dhulia
5.	Shivpuri	28.	Hoshangabad	7.	Jalgaon
6.	Guna	29.	Betul	8.	Ahmednagar
7.	Tikamgarh	30.	Sagar	9.	Poona
8.	Chhatarpur	31.	Damoh	10.	Satara
9.	Panna	32.	Jabalpur	11.	Sangli
10.	Satna	33.	Narsinhapur	12.	Sholapur
11.	Rewa	34.	Mondla	13.	Kolhapur
12.	Shahdol	35.	Chindwara	14.	Aurangabad
13.	Sidhi	36.	Seoni	15.	Parbhani
14.	Mandsaur	37.	Balaghat	16.	Bhir
15.	Ratlam	38.	Surguja	17.	Nanded
16.	Ujjain	39.	Bilaspur	18.	Osmanabad
17.	Jhabua	40.	Raigarh	19.	Buldhana
18.	Dhar	41.	Durg	20.	Akola
19.	Indore	42.	Raipur	21.	Amravati
20.	Dewas	43.	Bastar	22.	Yeotmal
21.	E. Nimar		Maharashtra	23.	Wardha
22.	W. Nimar	1.	Greater Bombay	24.	Nagpur
23.	Shajapur	2.	Thana	25.	Bhandra
				26.	Chandrapur

Code No. (0)	District Name (1)	Code No. (0)	District Name (1)	Code No. (0)	District Name (1)
	Orissa		Rajasthan		Tamil Nadu
1.	Sambalpur	1.	Ganganagar	1.	Madras
2.	Sundargarh	2.	Bikaner	2.	Chingleput
3.	Keonjhar	3.	Churu	3.	North Arcot
4.	Mayurbhanj	4.	Jhunjhunun	4.	South Arcot
5.	Balasore	5.	Alwar	5.	Dharmpuri
6.	Cuttack	6.	Bharatpur	6.	Salem
7.	Dhenkanal	7.	Sawai Madhopur	7.	Coimbatore
8.	Phulbani	8.	Jaipur	8.	Nilgiris
9.	Bolangir	9.	Sikar	9.	Madurai
10.	Kalahandi	10.	Ajmer	10.	Tiruchchirappalli
11.	Koraput	11.	Tonk	11.	Thanjavur
12.	Ganjam	12.	Jaisalmer	12.	Ramanathapuram
13.	Puri	13.	Jodhpur	13.	Tirunelveli
	Punjab	14.	Nagaur	14.	Kanya Kumari
1.	Gurudaspur	15.	Pali		Uttar Pradesh
2.	Amritsar	16.	Barmer	1.	Uttar Kashi
3.	Ferozepur	17.	Jalor	2.	Chamoli
4.	Ludhiana	18.	Sirohi	3.	Tehri Garwal
5.	Jullundur	19.	Bhilwara	4.	Garwal
6.	Kapurthala	20.	Udaipur	5.	Pithoragarh
7.	Hoshiarpur	21.	Chittorgarh	6.	Almora
8.	Ropar	22.	Dungarpur	7.	Nainital
9.	Patiala	23.	Banswara	8.	Bijner
10.	Sangrur	24.	Bundi	9.	Moradabad
11.	Bhatinda	25.	Kota	10.	Budaun
		26.	Jhalawar		

Code No. (0)	District Name (1)
	Uttar Pradesh (contd.)
11.	Rampur
12.	Bareilly
13.	Pilibhit
14.	Shahjahanpur
15.	Dehradun
16.	Saharanpur
17.	Muzaffarnagar
18.	Meerut
19.	Bulandshahr
20.	Aligarh
21.	Mathura
22.	Agra
23.	Etah
24.	Mainpuri
25.	Farrukhabad
26.	Etawah
27.	Kanpur
28.	Fatehpur
29.	Allahabad
30.	Jhansi
31.	Jalan
32.	Hamirpur
33.	Banda
34.	Kheri
35.	Sitapur
	Uttar Pradesh (contd.)
36.	Hardoi
37.	Unnao
38.	Lucknow
39.	Rai Bereli
40.	Bahraich
41.	Gonda
42.	Bara Banki
43.	Faizabad
44.	Sultanpur
45.	Pratapgarh
46.	Basti
47.	Gorakhpur
48.	Deoria
49.	Azamgarh
50.	Jaunpur
51.	Ballia
52.	Ghazipur
53.	Varanasi
54.	Mirzapur
	West Bengal
1.	Darjeeling
2.	Jalpaiguri
3.	Cooch Behar
4.	W. Dinajpur
5.	Malda
6.	Murshidabad
	West Bengal (contd.)
7.	Nadia
8.	24 Parganas
9.	Howrah
10.	Hooghly
11.	Burdwan
12.	Birbhum
13.	Bankura
14.	Midnapore
15.	Purulia
16.	Calcutta
	Meghalaya
1.	Khasia and Jaintia Hills
2.	Garo Hills
	Union Territories
1.	A and N Islands
2.	Delhi
3.	Manipur
4.	Pondicherry
5.	Tripura
6.	Chandigarh
7.	Goa-Daman-Diu

Note : These are the districts considered in the study.

A. 4 A district level sketch map of India
(according to 1971 boundaries)



A.5. Tables (2.8) and (3.2) (combined) : Estimates of per capita income and values of different activity indices with levels, and index value of labour absorbability in agriculture with levels of labour pressure on agriculture.

State/ district Sl.no.	Estimates of per capita income* (Rs.)		Levels of col. (1) and (2)		Index value of overall economic activity Z_0		Levels of col. (5) and (6)	
	1960-61	1970-71	1960-61	1970-71	1960-61	1970-71	1960-61	1970-71
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Andhra Pradesh					1.01499	1.05865	M	M
1	266.00	317.08	M	H	1.00837	1.02575	M	M
2	280.36	339.42	M	H	1.06097	1.09383	M	M
3	351.72	401.70	H	H	1.28773	1.26229	H	H
4	370.73	473.11	H	H	1.34035	1.42590	H	H
5	363.66	438.69	H	H	1.32111	1.35038	H	H
6	341.50	435.33	H	H	1.25822	1.34268	H	H
7	256.90	309.05	L	M	0.97357	1.00010	M	M
8	258.19	322.94	L	H	0.97857	1.04405	M	M
9	256.50	314.16	L	H	0.97203	1.01647	M	M
10	217.16	268.39	L	M	0.80531	0.85901	L	L
11	236.31	263.35	L	L	0.89004	0.84006	L	L
12	258.29	292.36	L	M	0.97895	0.94456	M	M
13	204.36	244.15	L	L	0.74479	0.76435	L	L
14	295.83	379.54	M	H	1.11466	1.20555	H	H
15	208.40	276.46	L	M	0.76434	0.88865	L	L
16	322.93	376.45	M	H	1.20231	1.19736	H	H
17	236.91	271.26	L	M	0.89258	0.86967	L	L
18	219.74	273.92	L	M	0.81735	0.87941	L	L
19	231.85	299.02	L	M	0.87096	0.96708	L	M
20	206.83	261.79	L	L	0.75678	0.83414	L	L
21	217.50	261.70	L	L	0.80710	0.83379	L	L
Assam					1.02951	1.07621	M	M
1	297.25	240.07	M	L	0.99377	1.02748	M	M
2	295.48	250.43	M	L	0.98779	1.06971	M	M
3	306.81	253.63	M	L	1.02540	1.08242	M	M
4	353.13	295.71	H	M	1.16601	1.23593	H	H
5	334.32	252.53	H	L	1.11129	1.07808	H	M
6	308.62	279.13	M	M	1.03128	1.17822	M	H

* at 1960-61 prices.

Note:- L : Low; M : Medium; H : High

contd...../-

State/ districts no.	Index value of agricultural activity Z_A		Levels of col.(9) and (10)		Index value of non-agricultural activity Z_N		Levels of col. (13) and (14)	
	1960-61	1970-71	1960-61	1970-71	1960-61	1970-71	1960-61	1970-71
(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Andhra Pradesh	0.98017	0.99154	M	M	1.02865	1.08865	M	H
1	1.11216	1.04619	M	M	0.95713	1.01714	M	M
2	0.91552	0.94007	M	M	1.13722	1.17439	H	H
3	1.49777	1.40695	H	H	1.18269	1.19063	H	H
4	1.72771	1.92127	H	H	1.14477	1.17527	H	H
5	1.66047	1.63356	H	H	1.15003	1.20807	H	H
6	1.39446	1.50936	H	H	1.19084	1.25990	H	H
7	0.90321	0.89565	M	M	1.01128	1.05520	M	M
8	0.93941	1.06453	M	M	1.00034	1.03545	M	M
9	1.16566	1.09140	H	M	0.87482	0.98000	L	M
10	0.82411	0.71316	L	L	0.79745	0.93509	L	M
11	0.80818	0.56348	L	L	0.93348	0.98293	M	M
12	0.97432	0.69400	M	L	0.98307	1.07433	M	M
13	0.37668	0.58158	L	L	0.83102	0.85914	L	L
14	0.64073	0.64346	L	L	1.35890	1.49245	H	H
15	0.76868	0.71218	L	L	0.76350	0.98044	L	M
16	1.56178	1.43712	H	H	1.02073	1.07697	M	M
17	0.74691	0.62366	L	L	0.96863	0.99697	M	M
18	0.64671	0.77211	L	L	0.90603	0.93584	L	M
19	0.54085	0.74286	L	L	1.04126	1.08343	M	H
20	0.61152	0.67746	L	L	0.83238	0.91572	L	L
21	0.62165	0.72325	L	L	0.90334	0.89178	L	L
Assam	1.10589	1.15438	M	H	0.98628	1.03187	M	M
1	1.05903	1.05672	M	M	0.96220	1.01438	M	M
2	0.96286	1.03089	M	M	1.00231	1.09147	M	[illegible]
3	1.10833	1.16911	M	H	0.98486	1.04005	M	M
4	1.28538	1.39435	H	H	1.10709	1.15718	H	H
5	1.33056	1.10992	H	M	1.00121	1.06374	M	M
6	1.00380	1.34999	M	H	1.04718	1.09255	M	H

contd..../-

State/ district Sl. no.	Index value of secondary activity Z_S		Levels of col. (17) and (18)		Index value of tertiary activity Z_T		Levels of col. (21) and (22)	
	1960-61	1970-71	1960-61	1970-71	1960-61	1970-71	1960-61	1970-71
(0)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Andhra Pradesh	1.01556	1.11438	M	M	1.03032	1.04761	M	M
1	0.84746	1.06383	L	M	1.05335	1.04451	M	M
2	1.24614	1.28711	H	H	1.07100	1.10667	H	H
3	1.32405	1.29838	H	H	1.15284	1.14888	H	H
4	1.28642	1.28438	H	H	1.10696	1.11225	H	H
5	1.17818	1.25946	H	H	1.14270	1.17785	H	H
6	1.46500	1.51426	H	H	1.09054	1.12173	H	H
7	1.25878	1.34686	H	H	1.00477	0.97224	M	M
8	0.91428	0.96923	M	M	1.00279	1.01963	M	M
9	0.72115	0.94820	L	M	0.92581	0.98189	L	M
10	0.40740	0.77851	L	L	0.95640	0.97823	M	M
11	0.90521	0.95526	M	M	0.94918	0.97067	M	M
12	0.99400	1.08570	M	M	0.96357	0.98599	M	M
13	0.73538	0.81326	L	L	0.91478	0.88154	L	L
14	1.35617	1.70168	H	H	1.30568	1.37653	H	H
15	0.47410	1.16286	L	H	0.91296	0.92350	L	L
16	1.15766	1.15585	H	H	0.96261	1.02134	M	M
17	1.13615	1.19823	H	H	0.91294	0.90067	L	L
18	0.86159	0.94984	L	M	0.99355	0.93993	M	L
19	1.17862	1.16253	H	H	0.98238	0.98724	M	M
20	0.53749	0.82394	L	L	0.92019	0.92543	L	L
21	0.83912	0.84922	L	L	0.94523	0.92232	M	L
Assam	1.08752	1.08511	M	M	1.00227	1.05715	M	H
1	1.01695	1.06856	M	M	1.01821	1.04380	M	M
2	0.86639	1.08461	L	M	1.08721	1.14654	H	H
3	1.31499	1.27556	H	H	0.94986	1.01931	M	M
4	1.49184	1.46429	H	H	0.99494	1.09206	M	H
5	1.02084	1.06303	M	M	1.00209	1.07182	M	H
6	1.44483	1.40420	H	H	0.95085	1.05623	M	H

contd..../-

State/ districts Sl. no.	Index values of urban activity Z_U		Levels of Col. (25) and (26)		Index values of labour absorbability in agriculture		Levels of labour pressure on agriculture	
	1960-61	1970-71	1960-61	1970-71	1960-61	1970-71	1960-61	1970-71
(0)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
Andhra Pradesh	1.03552	1.10463	M	H	0.83570	0.74510	H	H
1	0.95041	0.96668	M	M	0.65672	0.59749	H	H
2	1.12099	1.15697	H	H	0.52119	0.58890	H	H
3	1.11789	1.15604	H	H	0.93637	0.79345	M	H
4	1.08599	1.15643	H	H	1.18437	1.23357	L	L
5	1.13821	1.19963	H	H	1.27689	1.14141	L	L
6	1.09823	1.20918	H	H	1.09688	1.08278	M	M
7	0.86211	0.93835	L	M	0.93867	0.86264	M	H
8	1.05206	1.08907	M	H	0.63005	0.62069	H	H
9	0.93080	0.99836	M	M	0.77390	0.54455	H	H
10	0.91652	0.99902	L	M	0.74059	0.46739	H	H
11	0.93886	1.00973	M	M	0.9589	0.48157	M	H
12	0.99148	1.13616	M	H	1.22950	0.69631	L	H
13	0.82528	0.87025	L	L	0.76969	0.67347	H	H
14	1.40211	1.45249	H	H	0.49869	0.54916	H	H
15	0.82724	0.91118	L	L	0.69874	0.60493	H	H
16	0.98074	1.07122	M	M	1.24580	1.04510	L	M
17	0.90769	0.94668	L	M	0.87402	0.73308	H	H
18	0.86545	0.92392	L	L	0.56702	0.62651	H	H
19	1.00159	1.10918	M	H	0.49192	0.67684	H	H
20	0.94766	0.96535	M	M	0.65095	0.69025	H	H
21	0.91069	0.89448	L	L	0.74904	0.78038	H	H
Assam	0.91071	0.97897	L	M	0.93660	1.01990	M	M
1	0.88438	0.95765	L	M	0.88707	0.96379	H	M
2	1.02077	1.05278	M	M	0.97053	0.99542	M	M
3	0.80642	0.90945	L	L	0.98730	1.07707	M	M
4	0.95479	1.01658	M	M	0.71484	1.01021	H	M
5	0.98830	1.05788	M	M	1.21366	0.90558	L	M
6	0.87451	0.92665	L	M	0.83609	1.34541	H	L

contd..../-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Assam (contd.)								
7	180.84	196.42	L	L	0.49680	0.82680	L	L
8	211.56	217.31	L	L	0.65369	0.92785	L	M
9	344.52	249.73	H	L	1.14135	1.06692	H	M
Bihar					0.96600	0.97942	M	M
1	274.10	272.92	M	M	1.23410	1.25259	H	H
2	216.89	200.78	L	L	1.00001	0.94563	M	M
3	241.93	237.82	L	L	1.10926	1.11491	H	H
4	198.70	198.29	L	L	0.91239	0.93312	M	M
5	201.15	200.41	L	L	0.92465	0.94375	M	M
6	195.87	196.48	L	L	0.89808	0.92395	L	M
7	204.93	196.66	L	L	0.94329	0.92487	M	M
8	215.57	205.15	L	L	0.99391	0.96717	M	M
9	237.77	215.58	L	L	1.09193	1.01672	M	M
10	157.84	174.16	L	L	0.68220	0.80341	L	L
11	202.59	190.36	L	L	0.93181	0.89233	M	L
12	194.25	190.60	L	L	0.88977	0.89361	L	L
13	178.69	174.31	L	L	0.80624	0.80423	L	L
14	197.82	192.03	L	L	0.90798	0.90107	M	M
15	180.66	199.35	L	L	0.81724	0.93849	L	M
16	259.42	252.39	L	L	1.17906	1.17439	H	H
17	232.31	235.57	L	L	1.06870	1.10540	M	H
Gujarat					0.97133	1.08766	M	M
1	356.60	413.29	H	H	0.98524	0.95040	M	M
2	390.52	463.97	H	H	1.07611	1.06608	M	M
3	361.55	430.16	H	H	0.99901	0.99042	M	M
4	370.71	438.58	H	H	1.02404	1.00980	M	M
5	368.82	405.68	H	H	1.01893	0.93182	M	M
6	372.05	437.92	H	H	1.02766	1.00828	M	M
7	290.69	388.77	M	H	0.78087	0.88924	L	L
8	263.03	358.87	L	H	0.68090	0.80920	L	L
9	320.95	420.40	H	H	0.87990	0.96746	L	M

contd...../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Assam (contd.)								
7	0.83394	1.17003	L	H	0.32537	0.65286	L	L
8	0.83394	1.17003	L	H	0.56273	0.80574	L	L
9	1.27153	1.08700	H	M	1.07687	1.05858	M	M
Bihar	0.85518	0.85500	L	L	1.01871	1.03902	M	M
1	1.20814	1.16397	H	H	1.24959	1.30014	H	H
2	0.99899	0.98184	M	M	1.00233	0.92882	M	M
3	1.18596	1.21597	H	H	1.07205	1.06526	M	M
4	0.69768	0.81191	L	L	1.02378	0.99674	M	M
5	0.85834	0.96827	M	M	0.96021	0.93291	M	M
6	0.68636	0.83779	L	L	1.00790	0.96964	M	M
7	0.70817	0.70523	L	L	1.06516	1.03880	M	M
8	0.74477	0.72207	L	L	1.12304	1.09418	H	H
9	1.16908	1.03449	H	M	1.05446	1.00946	M	M
10	0.45793	0.58659	I	L	0.79805	0.91568	L	L
11	0.77119	0.71218	L	L	1.01558	0.98602	M	M
12	1.01950	0.94430	M	M	0.82506	0.86930	L	L
13	0.74186	0.76179	L	L	0.84059	0.82737	L	L
14	0.77613	0.69534	L	L	0.97700	1.00785	M	M
15	0.68961	0.76402	L	L	0.88394	1.02934	L	M
16	0.96816	0.83231	M	L	1.28898	1.35134	H	H
17	0.86921	0.90942	M	M	1.17258	1.20755	H	H
Gujarat	0.71154	1.01832	L	M	1.10016	1.11867	H	H
1	0.81524	0.62157	L	L	1.07398	1.12018	M	H
2	0.94024	0.80125	M	L	1.14748	1.20335	H	H
3	0.90968	0.87450	M	M	1.04647	1.05144	M	M
4	0.81127	0.76865	L	L	1.13463	1.13487	H	H
5	1.04377	0.87969	M	M	1.00806	0.96014	M	M
6	0.90921	0.79044	M	L	1.09005	1.12144	H	H
7	0.50115	0.85167	L	L	0.92525	0.91004	M	L
8	0.53885	0.89654	L	M	0.75473	0.76602	L	L
9	0.80254	0.99027	L	M	0.92103	0.95753	M	M

contd...../-

(0)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Assam (contd.)								
7	0.24484	0.37883	L	L	0.80673	0.81166	L	L
8	0.24125	0.83166	L	L	0.78604	0.95937	L	M
9	1.24299	1.18304	H	H	1.10256	1.05611	H	H
Bihar	1.09323	1.12520	M	M	1.00170	0.96215	M	M
1	1.32259	1.49009	H	H	1.21067	1.18629	H	H
2	1.04770	0.72865	M	L	0.99756	0.97440	M	M
3	1.19754	1.21989	H	H	1.07223	1.00715	H	M
4	1.15478	1.09442	H	M	0.99380	0.94557	M	M
5	1.17571	1.05053	H	M	0.91179	0.85399	L	L
6	1.04153	0.88580	M	M	1.02074	0.95908	M	M
7	1.20658	1.07721	H	M	1.02108	0.95495	M	M
8	1.29256	1.26168	H	H	1.08781	0.99687	H	M
9	0.99453	0.86888	M	L	1.07020	0.98452	H	M
10	0.62121	1.11497	L	M	0.97014	0.83739	M	L
11	1.16855	1.08619	H	M	1.04162	0.93411	M	L
12	0.69148	0.82739	L	L	0.90405	0.87115	L	L
13	0.98943	0.90624	M	M	0.84555	0.78867	L	L
14	1.25526	1.26293	H	H	0.86111	0.89781	L	L
15	0.89287	1.19810	M	H	0.83586	0.91378	L	L
16	1.77273	1.72969	H	H	1.14893	1.23545	H	H
17	1.48271	1.59671	H	H	0.98517	0.99433	M	M
Gujarat	1.16228	1.19451	H	H	1.03422	1.06776	M	H
1	1.16905	1.29964	H	H	1.03075	1.06694	M	H
2	1.18649	1.25938	H	H	1.08312	1.14008	H	H
3	1.14697	1.24303	H	H	1.00460	0.99728	M	M
4	1.21501	1.23861	H	H	1.07742	1.10243	H	H
5	1.13340	0.97431	H	M	0.96541	0.99653	M	M
6	1.12864	1.26080	H	H	1.06632	1.09650	H	H
7	0.95306	0.86222	M	L	0.96534	0.98277	M	M
8	0.42402	0.42964	L	L	0.91206	0.93618	L	L
9	0.99246	1.06435	M	M	0.95110	1.00241	M	M

contd..../-

(0)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
Assam (contd.)								
7	0.00000	0.69975	L	L	0.56757	0.95285	H	M
8	0.58887	0.66972	L	L	0.56757	0.95285	H	M
9	0.95329	0.98295	M	M	1.16875	0.85640	L	H
Bihar	0.98552	1.04529	M	M	0.73080	0.63730	H	H
1	1.23447	1.27057	H	H	0.83365	0.68095	H	H
2	0.97778	1.01801	M	M	0.72543	0.59595	H	H
3	0.99370	1.01422	M	M	1.07422	0.95720	M	M
4	0.96552	0.97579	M	M	0.64958	0.66991	H	H
5	0.86368	0.92119	L	L	0.81364	0.79769	H	H
6	0.97693	1.03014	M	M	0.66671	0.60840	H	H
7	1.01142	1.08028	M	H	0.66780	0.54544	H	H
8	1.04488	1.06571	M	M	0.66567	0.49203	H	H
9	1.07953	1.11652	H	H	0.83751	0.62964	H	H
10	0.77400	0.85255	L	L	0.45693	0.50448	H	H
11	0.89994	0.96409	L	M	0.87548	0.67390	H	H
12	0.84668	0.89399	L	L	0.78402	0.71856	H	H
13	0.74396	0.80841	L	L	0.61192	0.55547	H	H
14	0.89399	0.93472	L	M	0.59303	0.50183	H	H
15	0.91589	1.01433	L	M	0.66110	0.78433	H	H
16	1.09676	1.20596	H	H	0.63247	0.54986	H	H
17	1.12553	1.13138	H	H	0.68285	0.74918	H	H
Gujarat	1.11290	1.11113	H	H	1.07420	1.04420	M	M
1	1.04826	1.04988	M	M	1.51147	0.94740	L	M
2	1.17338	1.21781	H	H	1.56679	1.05963	L	M
3	1.01650	0.97430	M	M	1.89591	1.64594	L	L
4	1.12916	1.09551	H	H	1.33741	1.10759	L	M
5	0.96322	0.92291	M	L	1.63058	1.19590	L	L
6	1.08451	1.05404	H	M	1.33842	0.80866	L	H
7	0.87664	0.88310	L	L	0.96703	1.21151	M	L
8	0.83809	0.84291	L	L	0.87814	1.25860	H	L
9	0.85305	0.85596	L	L	1.15055	1.24508	L	L

contd...../-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Gujarat (contd.)								
10	329.88	486.44	H	H	0.90734	1.11337	M	H
11	257.96	447.12	L	H	0.66142	1.02908	L	M
12	453.52	588.24	H	H	1.22567	1.30338	H	H
13	395.36	588.96	H	H	1.08843	1.30461	M	H
14	296.33	379.39	M	H	0.80010	0.86481	L	L
15	404.48	499.00	H	H	1.11122	1.13885	H	H
16	339.64	405.34	H	H	0.93651	0.93098	M	M
17	377.48	471.96	H	H	1.04214	1.08314	M	M
18	342.71	438.10	H	H	0.94551	1.00869	M	M
19	198.07	242.41	L	L	0.39724	0.41689	L	L
Haryana					1.11945	1.52208	H	H
1	377.57	429.88	H	H	1.31029	1.41632	H	H
2	385.70	593.61	H	H	1.33158	1.73904	H	H
3	336.08	461.10	H	H	1.19387	1.48644	H	H
4	267.54	367.36	M	H	0.96578	1.25916	M	H
5	243.40	270.38	L	M	0.87123	0.95265	L	M
6	314.52	427.78	H	H	1.12758	1.41144	H	H
7	312.62	356.41	H	H	1.12151	1.22889	H	H
Himachal Pradesh					0.72513	0.86524	L	L
1	331.05	329.97	H	H	0.63709	0.72310	L	L
2	367.54	398.91	H	H	0.74164	0.91285	L	M
3	333.54	424.24	H	H	0.64457	0.97441	L	M
4	283.55	312.71	M	H	0.48219	0.66937	L	L
5	251.14	207.11	L	L	0.36083	0.25738	L	L
6	331.83	309.13	H	H	0.63944	0.65788	L	L
7	366.94	359.22	H	H	0.74000	0.80804	L	L
8	452.40	455.99	H	H	0.94939	1.04657	M	M
9	406.95	400.12	H	H	0.84350	0.91587	L	M
10	251.11	255.44	L	L	0.36069	0.46711	L	L
Jammu and Kashmir					0.88919	1.08043	L	M
1	280.33	321.41	M	H	0.97319	0.97927	M	M
2	391.11	508.41	H	H	1.30621	1.43783	H	H

contd.../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Gujarat (contd.)								
10	0.57013	1.00892	L	M	1.08132	1.16876	M	H
11	0.63710	0.87155	L	M	0.67503	1.11145	L	H
12	0.73655	0.93527	L	M	1.47787	1.49387	H	H
13	0.98052	1.58944	M	H	1.14554	1.16137	H	H
14	0.49142	0.64866	L	L	0.95931	0.97684	M	M
15	0.87651	0.85972	M	M	1.23318	1.28357	H	H
16	0.68282	0.71294	L	L	1.06786	1.04409	M	M
17	0.70942	0.74680	L	L	1.21407	1.25699	H	H
18	0.62087	0.69513	L	L	1.11313	1.17076	H	H
19	0.48719	0.52436	L	L	0.35197	0.36271	L	L
Haryana	1.22038	2.27168	H	H	1.06331	1.13275	M	H
1	1.39649	1.62339	H	H	1.26859	1.31302	H	H
2	1.85093	2.85598	H	H	1.06853	1.17127	M	H
3	1.28262	2.08080	H	H	1.15065	1.18533	H	H
4	0.72373	1.30494	L	H	1.09123	1.23802	H	H
5	0.77743	0.99556	L	M	0.92074	0.93243	M	M
6	1.32903	2.00398	H	H	1.02664	1.11112	M	H
7	1.64739	1.68610	H	H	0.85474	0.99741	L	M
Himachal Pradesh	0.66778	0.89723	L	M	0.75149	0.84537	L	L
1	0.64075	0.87160	L	M	0.63637	0.64850	L	L
2	0.84455	0.95417	L	M	0.69037	0.89337	L	L
3	0.66093	0.93470	L	M	0.63736	0.99646	L	M
4	0.33781	0.72750	L	L	0.55685	0.64087	L	L
5	0.37302	0.00000	L	L	0.35526	0.38940	L	L
6	0.55253	0.60207	L	L	0.68501	0.68759	L	L
7	0.76702	0.73731	L	L	0.72751	0.84559	L	L
8	0.65104	0.99573	L	M	1.10359	1.07444	H	M
9	0.87325	0.80910	M	L	0.82981	0.97203	L	M
10	0.42912	0.66719	L	L	0.32636	0.36569	L	L
Jammu and Kashmir	0.96590	1.37538	M	H	0.84637	0.92529	L	M
1	1.52873	1.10696	H	M	0.69099	0.91576	L	L
2	1.34254	1.55025	H	H	1.28999	1.38296	H	H

contd.../-

(0)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Gujarat (contd.)								
10	1.07797	1.41115	M	H	1.07879	1.09953	H	H
11	1.13573	1.42461	H	H	1.17222	1.09124	H	H
12	1.84603	1.83070	H	H	1.24324	1.31963	H	H
13	1.32794	1.33958	H	H	1.07611	1.09990	H	H
14	1.01688	1.01298	M	M	0.90664	0.92406	L	L
15	1.42112	1.55613	H	H	1.09615	1.12639	H	H
16	1.13122	1.15198	H	H	0.95568	0.96272	M	M
17	1.33597	1.46080	H	H	1.07030	1.07153	H	H
18	1.39268	1.47785	H	H	0.99984	1.05452	L	M
19	0.43962	0.53464	L	L	0.73309	0.69026	L	L
Haryana	1.03713	1.17530	M	H	1.06382	1.10833	H	H
1	1.37250	1.54763	H	H	1.22880	1.25461	H	H
2	0.99112	1.31658	M	H	1.07643	1.09637	H	H
3	1.27637	1.28277	H	H	1.06603	1.13664	H	H
4	1.18587	1.54074	[illegible]	H	1.06927	1.13426	H	H
5	0.96838	0.76498	M	L	0.93466	1.00362	L	M
6	1.08475	1.22669	M	H	0.96774	1.03589	M	M
7	0.49033	0.84774	L	L	1.04225	1.05316	M	M
Himachal Pradesh	0.74700	0.91683	L	M	0.79419	0.87789	L	L
1	0.36677	0.42731	L	L	0.64425	0.75488	L	L
2	0.40793	1.06506	L	M	0.85993	0.98145	L	M
3	0.33844	1.27994	L	H	0.75336	0.86517	L	L
4	0.31259	0.41558	L	L	0.69185	0.76327	L	L
5	0.53167	0.51321	L	L	0.66967	0.78960	L	L
6	0.46845	0.44826	L	L	0.80319	0.88684	L	L
7	0.88444	1.21749	M	H	0.76539	0.82814	L	L
8	1.14209	0.93363	H	M	1.14664	1.19035	H	H
9	1.00190	1.43299	M	H	0.77134	0.81912	L	L
10	0.45851	0.47265	L	L	0.63910	0.74896	L	L
Jammu and Kashmir	0.76123	0.84410	L	L	0.84142	0.94477	L	M
1	0.40520	0.95296	L	M	0.82748	0.96939	L	M
2	1.35013	1.44273	H	H	1.13189	1.26594	H	H

contd....../-

(0)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
Gujarat (contd.)								
10	1.08538	1.07170	H	M	0.77758	1.20215	H	L
11	0.00000	0.93204	L	M	0.97446	1.01934	M	M
12	1.43148	1.41989	H	H	1.20736	1.35071	L	L
13	1.08604	1.09825	H	H	1.09304	1.55414	M	L
14	0.96452	0.99551	M	M	0.67043	0.71836	H	H
15	1.22296	1.23633	H	H	1.14455	0.95778	L	M
16	1.11590	1.04034	H	M	1.03856	0.91123	M	M
17	1.25026	1.27468	H	H	0.80440	0.68235	H	H
18	1.02730	1.07007	M	M	0.80440	0.54714	H	H
19	0.00000	0.00000	L	L	0.41866	0.30271	H	H
Haryana	1.07923	1.12523	H	H	1.58380	2.43010	L	L
1	1.23489	1.21238	H	H	1.71944	1.92645	L	L
2	1.11062	1.13916	H	H	2.19158	3.20644	L	L
3	1.13832	1.16260	H	H	1.51344	2.53483	L	L
4	1.04938	1.13031	M	H	1.07569	1.69757	M	L
5	0.88019	0.98125	L	M	1.41508	1.58249	L	L
6	1.03637	1.09779	M	H	1.84913	2.53232	L	L
7	0.93554	1.04720	M	M	2.14735	1.95591	L	L
Himachal Pradesh	0.72099	0.77546	L	L	0.65000	0.77810	H	H
1	0.79823	0.70334	L	L	0.47966	0.67812	H	H
2	0.73412	0.71763	L	L	0.91222	1.03589	M	M
3	0.73316	0.92222	L	L	0.64564	0.89947	H	M
4	0.60375	0.68577	L	L	0.00116	0.05688	H	H
5	0.00000	0.00000	L	L	0.00031	0.00000	H	H
6	0.72777	0.68129	L	L	0.65349	0.61269	H	H
7	0.60017	0.62743	L	L	0.62342	0.59871	H	H
8	1.04601	1.07177	M	M	0.28658	0.81284	H	H
9	0.76817	0.80404	L	L	0.79468	0.67513	H	H
10	0.00000	0.00000	L	L	0.28781	0.25362	H	H
Jammu and Kashmir	0.90329	0.96069	L	M	0.71840	0.14345	H	H
1	0.76261	0.85075	L	L	0.88418	0.17933	H	H
2	1.37587	1.43700	H	H	0.74152	0.13444	H	H

contd......../-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Jammu and Kashmir (contd.)								
3	255.89	264.54	L	M	0.88195	0.78455	L	L
4	178.48	198.01	L	L	0.52166	0.49486	L	L
5	167.32	192.84	L	L	0.45713	0.46841	L	L
6	197.76	223.26	L	L	0.62425	0.61487	L	L
7	292.23	309.03	M	M	1.01475	0.93997	M	M
8	224.73	264.69	L	M	0.75224	0.78509	L	L
9	161.34	206.02	L	L	0.42075	0.53451	L	L
10	213.74	211.61	L	L	0.70199	0.56127	L	L
Karnataka					0.93585	1.06260	M	M
1	324.66	348.59	H	H	1.10839	1.27651	H	H
2	294.56	264.54	M	M	1.01110	1.00059	M	M
3	276.06	270.06	M	M	0.94623	1.02124	M	M
4	219.43	236.97	L	L	0.71666	0.89052	L	L
5	234.77	215.59	L	L	0.78423	0.79597	L	L
6	273.74	268.02	M	M	0.93779	1.01365	M	M
7	267.51	278.43	M	M	0.91480	1.05178	M	M
8	425.11	316.57	H	H	1.37798	1.18016	H	H
9	288.37	258.75	M	L	0.98988	0.97847	M	M
10	248.05	251.15	L	L	0.83925	0.94866	L	M
11	282.20	267.36	M	M	0.96823	1.01121	M	M
12	264.36	262.11	M	L	0.90295	0.99138	M	M
13	304.77	317.13	M	H	1.04517	1.18193	M	H
14	291.04	299.89	M	M	0.99907	1.12603	M	H
15	305.39	300.67	M	M	1.04722	1.12862	M	H
16	240.70	247.56	L	L	0.80917	0.93425	L	M
17	341.71	368.20	H	H	1.15959	1.33123	H	H
18	329.72	317.10	H	H	1.12388	1.18182	H	H
19	249.05	240.30	L	L	0.84326	0.90449	L	M
Kerala					1.21210	1.22726	H	H
1	221.34	237.85	L	L	1.07876	1.09130	M	M
2	264.86	258.85	M	L	1.25824	1.17593	H	H
3	201.88	220.50	L	L	0.98671	1.01557	M	M
4	275.71	277.66	M	M	1.29839	1.24607	H	H

contd.../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Jammu and Kashmir (contd.)								
3	1.13674	0.82097	M	L	0.75330	0.76735	L	L
4	0.59284	0.33697	L	L	0.48622	0.57646	L	L
5	0.31042	0.18022	L	L	0.53294	0.61654	L	L
6	0.60919	0.33710	L	L	0.63307	0.75795	L	L
7	0.84300	0.53046	L	L	1.10435	1.15097	H	H
8	0.82137	0.41385	L	L	0.71825	0.97625	L	M
9	0.17613	0.29942	L	L	0.54653	0.65563	L	L
10	0.80135	0.37339	L	L	0.65246	0.65831	L	L
Karnataka	0.73655	0.97560	L	M	1.03390	1.10275	M	H
1	0.65849	0.88626	L	M	1.34034	1.47827	H	H
2	0.89757	0.85265	M	L	1.07095	1.07800	M	M
3	0.79337	0.95650	L	M	1.02605	1.05616	M	M
4	0.54060	0.70070	L	L	0.80794	0.98914	L	M
5	0.46841	0.46830	L	L	0.94706	0.96488	M	M
6	0.92187	1.13189	M	M	0.94761	0.95504	M	M
7	0.64713	0.93147	L	M	1.05326	1.11516	M	H
8	2.23412	1.76058	H	H	0.94287	0.88562	M	L
9	0.75982	0.64727	L	L	1.10925	1.14951	H	H
10	0.52184	0.70382	L	L	1.00300	1.07551	M	M
11	1.06720	1.09243	M	M	0.91939	0.97151	M	M
12	0.74877	0.91997	L	M	0.98338	1.02967	M	M
13	1.21823	1.47982	H	H	0.95859	1.03180	M	M
14	0.79336	1.03641	L	M	1.10600	1.17385	H	H
15	1.18830	1.26036	H	H	0.97700	1.06331	M	M
16	0.60733	0.88489	L	M	0.91378	0.96115	L	M
17	1.29542	1.67981	H	H	1.09225	1.15537	H	H
18	1.08580	1.21347	M	H	1.14537	1.16776	H	H
19	0.78632	0.83088	L	L	0.87388	0.94374	L	M
Kerala	1.19986	1.16642	H	H	1.21342	1.25336	H	H
1	0.89649	0.87265	M	M	1.17387	1.20502	H	H
2	1.15564	0.81902	H	L	1.31294	1.36046	H	H
3	1.05730	1.07730	M	M	0.95240	0.98585	M	M
4	1.63519	1.45060	H	H	1.12857	1.14377	H	H

contd...../-

(0)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Jammu and Kashmir (contd.)								
3	0.66042	0.44059	L	L	0.79438	0.93252	L	L
4	0.32181	0.37307	L	L	0.57723	0.71096	L	L
5	0.36909	0.50251	L	L	0.61836	0.72500	L	L
6	0.33810	0.48893	L	L	0.75630	0.89462	L	L
7	1.08103	1.08305	M	M	1.11915	1.22478	H	H
8	0.43917	1.13240	L	H	0.87714	0.98128	L	M
9	0.35536	0.52866	L	L	0.69599	0.79321	L	L
10	0.36699	0.29898	L	L	0.71158	0.78768	L	L
Karnataka	1.06537	1.14478	M	H	0.98955	1.05481	M	M
1	1.55145	1.73375	H	H	1.19898	1.31950	H	H
2	1.31072	1.22076	H	H	0.95011	1.00531	M	M
3	1.04286	1.10875	M	M	0.99696	1.01215	M	M
4	0.28084	0.86809	L	L	0.99364	1.04094	M	M
5	0.97068	0.92374	M	M	0.91247	0.96957	L	M
6	1.01556	0.86034	M	L	0.91857	0.99192	L	M
7	1.25459	1.27867	H	H	0.91968	0.98023	L	M
8	1.07951	0.73476	M	L	0.97530	1.03141	M	M
9	1.23852	1.21973	H	H	1.03340	1.10811	M	H
10	0.98932	1.14568	M	H	0.95903	0.99537	M	M
11	0.99303	0.92829	M	M	0.87363	0.96473	L	M
12	0.84753	0.98165	L	M	0.95244	0.97456	M	M
13	1.14883	1.14431	H	H	0.87147	0.96224	L	M
14	1.21493	1.28305	H	H	1.01492	1.07095	M	H
15	1.05246	1.20858	M	H	0.98507	1.03441	M	M
16	0.92360	0.87902	M	M	0.94651	0.96128	M	M
17	1.34750	1.35041	H	H	0.97376	1.01292	M	M
18	1.39158	1.35475	H	H	1.06750	1.13874	H	H
19	0.77424	0.86984	L	L	0.87106	0.93852	L	L
Kerala	1.34791	1.37425	H	H	1.24538	1.27349	H	H
1	1.35030	1.39457	H	H	1.21331	1.23451	H	H
2	1.54214	1.54564	H	H	1.29212	1.33971	H	H
3	0.68431	0.68410	L	L	1.22074	1.23775	H	H
4	1.21351	1.24264	H	H	1.20911	1.17636	H	H

contd..../

(0)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
Jammu and Kashmir (contd.)								
3	0.77914	0.84212	L	L	0.70409	0.06380	H	H
4	0.51768	0.59827	L	L	0.13492	0.05256	H	H
5	0.56842	0.60299	L	L	0.48319	0.11375	H	H
6	0.72076	0.81899	L	L	0.67244	0.10562	H	H
7	1.10734	1.13571	H	H	0.86355	0.27048	H	H
8	0.76822	0.87500	L	L	0.90694	0.57760	M	H
9	0.54906	0.62743	L	L	0.06826	0.06907	H	H
10	0.78425	0.78133	L	L	1.15902	0.03589	L	H
Karnataka	1.04890	1.11395	M	H	0.91440	0.95670	M	M
1	1.31905	1.44292	H	H	0.53468	0.73644	H	H
2	1.01579	1.04575	M	M	1.14473	0.94509	L	M
3	1.03828	1.05774	M	M	1.18191	1.14875	L	L
4	0.99156	1.02417	M	M	0.79754	0.97719	H	M
5	0.95932	0.98687	M	M	1.02970	0.87409	M	H
6	0.92792	0.98529	M	M	0.75733	1.07202	H	M
7	1.03200	1.11854	M	H	0.73359	0.88120	H	H
8	0.83240	0.86589	L	L	1.79298	1.40917	L	L
9	1.08788	1.13805	H	H	1.09776	0.85029	M	H
10	1.04582	1.09431	M	H	1.05563	1.22598	M	L
11	0.90919	1.00373	L	M	0.79662	0.85143	H	H
12	1.09219	1.10259	H	H	0.59713	0.58116	H	H
13	0.90801	1.01596	L	M	0.90072	1.07481	M	M
14	1.10918	1.18609	H	H	0.72388	0.88786	H	H
15	0.92367	0.99532	L	M	0.86223	0.89343	H	M
16	0.88213	1.01223	L	M	1.18570	1.33270	L	L
17	1.0256[illegible]	1.14496	M	H	1.13017	1.37922	L	L
18	1.05267	1.07387	M	H	0.71743	0.72112	H	H
19	0.93816	0.99386	M	M	0.72436	0.63572	H	H
Kerala	1.10467	1.16231	H	H	0.68570	0.56060	H	H
1	1.03313	1.06388	M	M	0.67224	0.56400	H	H
2	1.18633	1.26124	H	H	1.08598	0.49508	M	H
3	0.91013	0.97737	L	M	0.49384	0.52815	H	H
4	1.01281	1.05672	M	M	1.24267	0.87289	L	H

contd...../-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Kerala (contd.)								
5	271.11	287.50	M	M	1.28157	1.28089	H	H
6	279.96	307.96	M	M	1.31369	1.34963	H	H
7	244.86	255.97	L	L	1.17972	1.16473	H	H
8	283.14	297.35	M	M	1.32499	1.31457	H	H
9	256.88	278.92	L	M	1.22767	1.25058	H	H
10	281.65	309.00	M	M	1.31970	1.35301	H	H
Madhya Pradesh					0.90300	0.91334	M	M
1	262.67	238.93	L	L	0.90028	0.84212	M	L
2	261.33	243.18	L	L	0.89517	0.85978	L	L
3	400.88	368.35	H	H	1.32305	1.27499	H	H
4	252.28	238.63	L	L	0.85993	0.84086	L	L
5	239.50	215.32	L	L	0.80797	0.73809	L	L
6	245.31	220.75	L	L	0.83192	0.76298	L	L
7	233.17	221.34	L	L	0.78115	0.76565	L	L
8	229.03	225.53	L	L	0.76323	0.78442	L	L
9	225.02	203.23	L	L	0.74557	0.68031	L	L
10	238.63	233.54	L	L	0.80431	0.81932	L	L
11	226.73	207.43	L	L	0.75317	0.70075	L	L
12	226.81	198.27	L	L	0.75351	0.65559	L	L
13	195.52	180.93	L	L	0.60507	0.56407	L	L
14	258.97	247.95	L	L	0.88611	0.87921	L	L
15	282.67	276.77	M	M	0.97368	0.98917	M	M
16	298.92	314.45	M	H	1.02956	1.11680	M	H
17	210.99	183.78	L	L	0.68123	0.57973	L	L
18	250.56	231.36	L	L	0.85309	0.80995	L	L
19	343.08	383.76	H	H	1.16735	1.31599	H	H
20	263.25	247.85	L	L	0.90250	0.87880	M	L
21	290.46	250.18	M	L	1.00088	0.88815	M	L
22	265.29	237.28	M	L	0.91023	0.83521	M	L
23	254.67	224.80	L	L	0.86938	0.78116	L	L
24	241.32	210.49	L	L	0.81552	0.71542	L	L
25	289.49	244.06	M	L	0.99751	0.86338	M	L
26	296.55	296.94	M	M	1.02163	1.05949	M	M
27	240.06	212.33	L	L	0.81029	0.72409	L	L
28	254.35	246.61	L	L	0.86809	0.87376	L	L

contd..../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Kerala (contd.)								
5	1.31367	1.29248	H	H	1.26747	1.27727	H	H
6	1.26883	1.24510	H	H	1.33898	1.40548	H	H
7	1.31929	1.26057	H	H	1.11050	1.11784	H	H
8	1.30343	1.25609	H	H	1.33839	1.34683	H	H
9	1.10261	1.08486	M	M	1.29380	1.33753	H	H
10	1.30018	1.20851	H	H	1.33204	1.42930	H	H
Madhya Pradesh	0.81874	0.77749	L	L	0.94240	0.97906	M	M
1	0.91373	0.82369	M	L	0.89502	0.85306	L	L
2	1.11845	0.94181	M	M	0.78266	0.81940	L	L
3	1.37021	1.18718	H	H	1.30132	1.32216	H	H
4	0.81511	0.75432	L	L	0.88438	0.88660	L	L
5	0.78356	0.73519	L	L	0.82190	0.74089	L	L
6	0.87506	0.77033	M	L	0.81136	0.76060	L	L
7	0.88579	0.90887	M	M	0.72907	0.69382	L	L
8	0.82062	0.83000	L	L	0.73527	0.76253	L	L
9	0.73314	0.63689	L	L	0.75324	0.70372	L	L
10	0.58188	0.53054	L	L	0.91945	0.96840	M	M
11	0.53188	0.52791	L	L	0.86763	0.79036	L	L
12	0.65128	0.56845	L	L	0.80712	0.70131	L	L
13	0.77703	0.58669	L	L	0.51827	0.55353	L	L
14	0.65597	0.68072	L	L	1.00533	0.98225	M	M
15	0.64613	0.67413	L	L	1.14285	1.15196	H	H
16	0.71091	0.92311	L	M	1.19428	1.21780	H	H
17	0.50896	0.39628	L	L	0.77044	0.67454	L	L
18	0.81109	0.61287	L	L	0.87608	0.91214	L	L
19	0.68160	1.05309	L	M	1.41772	1.45272	H	H
20	0.84057	0.73131	L	L	0.93578	0.95576	M	M
21	0.89138	0.67558	M	L	1.05865	0.99839	M	M
22	0.81416	0.52579	L	L	0.96097	0.99486	M	M
23	0.78491	0.75484	L	L	0.91412	0.79602	L	L
24	0.65181	0.63095	L	L	0.90066	0.75987	L	L
25	1.12861	0.76809	M	L	0.93224	0.91364	M	L
26	0.76483	0.73482	L	L	1.15473	1.22733	H	H
27	0.97788	0.77029	M	L	0.72609	0.70178	L	L
28	0.71923	0.62923	L	L	0.94574	1.00031	M	M

contd......./-

(0)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Kerala (contd.)								
5	1.53959	1.51462	H	H	1.30021	1.30982	H	H
6	1.59620	1.64817	H	H	1.32198	1.36918	H	H
7	1.25513	1.23362	H	H	1.15166	1.15966	H	H
8	1.61151	1.53995	H	H	1.30971	1.35806	H	H
9	1.80156	1.82457	H	H	1.14764	1.21756	H	H
10	1.50913	1.72631	H	H	1.31977	1.34396	H	H
Madhya Pradesh	0.93966	1.00515	M	M	0.88881	0.88873	L	L
1	0.87433	0.75229	M	L	0.85885	0.83673	L	L
2	0.35063	0.38681	L	L	0.90177	0.87865	L	L
3	1.49204	1.47387	H	H	1.12180	1.15816	H	H
4	0.43046	0.44057	L	L	0.98285	0.92177	M	L
5	0.68438	0.40150	L	L	0.83796	0.82546	L	L
6	0.62117	0.39207	L	L	0.88120	0.83963	L	L
7	0.37292	0.34004	L	L	0.81654	0.74554	L	L
8	0.45312	0.40221	L	L	0.88802	0.79116	L	L
9	0.43226	0.40232	L	L	0.82870	0.72386	L	L
10	0.92462	1.09184	M	M	0.90534	0.88225	L	L
11	0.71906	0.41054	L	L	0.84385	0.84248	L	L
12	0.87800	1.04185	M	M	0.79057	0.76122	L	L
13	0.35099	0.33441	L	L	0.63359	0.62266	L	L
14	1.02095	0.87279	M	M	0.93329	0.93912	L	L
15	1.23648	1.17612	H	H	1.02779	1.04352	M	M
16	1.36838	1.44143	H	H	1.01225	1.04587	M	M
17	0.64284	0.29297	L	L	0.73040	0.77983	L	L
18	0.96657	1.00855	M	M	0.83151	0.84553	L	L
19	1.64411	1.63089	H	H	1.22539	1.29536	H	H
20	1.00992	1.03527	M	M	0.86181	0.83811	L	L
21	1.11538	0.98699	M	M	0.91583	0.85127	L	L
22	1.02735	0.92814	M	M	0.87319	0.93609	L	L
23	0.95793	0.45829	M	L	0.87509	0.86470	L	L
24	1.05738	0.46521	M	L	0.85489	0.83700	L	L
25	0.75852	0.64871	L	L	0.93720	0.87092	L	L
26	1.28019	1.35396	H	H	1.04380	1.10467	M	H
27	0.43640	0.38256	L	L	0.93368	0.82204	L	L
28	0.89960	1.02904	M	M	1.00504	1.00260	M	M

contd....../-

(0)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
Kerala (contd.)								
5	1.07234	1.10394	M	H	0.79984	0.65606	H	H
6	1.19193	1.28256	H	H	0.65164	0.63091	H	H
7	0.98824	1.01305	M	M	0.61009	0.45918	H	H
8	1.19055	1.21770	H	H	0.69535	0.59730	H	H
9	1.09138	1.12760	H	H	0.36929	0.34950	H	H
10	1.23125	1.31079	H	H	0.45368	0.33758	H	H
Madhya Pradesh	0.98591	1.03328	M	M	0.93030	0.87650	M	H
1	0.93612	0.92860	M	M	1.17803	0.95875	L	M
2	0.95899	1.04277	M	M	1.40093	1.08109	L	M
3	1.32251	1.35557	H	H	1.45758	1.25535	L	L
4	1.09045	1.13713	H	H	1.11866	1.00721	L	M
5	0.89506	0.88643	L	L	0.95959	0.88602	M	H
6	0.87540	0.92861	L	M	1.28776	1.12406	L	L
7	0.88279	0.87396	L	L	0.76878	0.80222	H	H
8	0.79193	0.96475	L	M	0.89059	0.80175	H	H
9	0.89493	0.87586	[illegible]	L	0.96839	0.81960	M	H
10	0.92723	0.95868	M	M	0.83979	0.69272	H	H
11	0.97877	0.98641	M	M	0.78593	0.70196	H	H
12	0.77587	0.44234	L	L	0.81734	0.69525	H	H
13	0.53255	0.63614	L	L	0.86211	0.60810	H	H
14	1.05182	1.08412	M	H	0.94854	0.85158	M	H
15	1.17428	1.22152	H	H	0.93160	0.91654	M	M
16	1.22780	1.21257	H	H	1.07968	1.32483	M	L
17	0.88123	0.83020	L	L	0.74804	0.63183	H	H
18	0.85447	0.90403	L	L	1.16419	0.85551	L	H
19	1.42669	1.46446	H	H	0.99176	1.46220	M	L
20	0.94729	0.99801	M	M	1.20845	0.99021	L	M
21	1.13472	1.12029	H	H	1.18541	0.84216	L	H
22	0.98808	1.08228	M	H	1.14118	0.69275	L	H
23	0.91727	0.95290	L	M	1.09843	0.98461	M	M
24	0.83869	0.88335	L	L	0.93130	0.86244	M	H
25	1.03666	1.11207	M	H	1.71872	1.13273	L	L
26	1.16309	1.24411	H	H	1.04110	1.01134	M	M
27	0.74467	0.80690	L	L	1.47401	1.06807	L	M
28	0.92818	0.98063	M	M	0.98655	0.94029	M	M

contd..../-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Madhya Pradesh (contd.)								
29	221.32	258.12	L	L	0.72900	0.91939	L	M
30	272.69	262.41	M	L	0.93773	0.93586	M	M
31	244.59	241.45	L	L	0.82899	0.85263	L	L
32	284.96	286.89	M	M	0.98175	1.02506	M	M
33	265.09	227.22	M	L	0.90948	0.79190	M	L
34	202.17	191.25	L	L	0.63851	0.61957	L	L
35	243.98	221.52	L	L	0.82649	0.76650	L	L
36	227.81	208.68	L	L	0.75790	0.70676	L	L
37	243.94	239.97	L	L	0.82633	0.84650	L	L
38	216.12	224.36	L	L	0.70521	0.77920	L	L
39	264.66	252.89	M	L	0.90783	0.89892	M	L
40	255.47	219.81	L	L	0.87251	0.75872	L	L
41	283.41	276.14	M	M	0.97629	0.98688	M	M
42	291.24	286.31	M	M	1.00355	1.02304	M	M
43	226.99	201.86	L	L	0.75430	0.67354	L	L
Maharashtra					1.02212	0.96292	M	M
1	965.41	995.61	H	H	1.99216	2.03288	H	H
2	405.61	460.43	H	H	1.12500	1.26169	H	H
3	366.13	388.67	H	H	1.02261	1.09225	M	M
4	294.30	305.78	M	M	0.80420	0.85239	L	L
5	327.80	336.39	H	H	0.91200	0.94780	M	M
6	337.76	318.47	H	H	0.94193	0.89305	M	L
7	353.58	325.18	H	H	0.98773	0.91390	M	M
8	342.84	327.74	H	H	0.95688	0.92173	M	M
9	366.46	369.56	H	H	1.02349	1.04185	M	M
10	322.63	320.69	H	H	0.89610	0.89999	L	L
11	353.88	336.29	H	H	0.98858	0.94750	M	M
12	363.21	333.05	H	H	1.01459	0.93781	M	M
13	419.70	440.87	H	H	1.15915	1.21827	H	H
14	299.46	293.24	M	M	0.82160	0.81053	L	L
15	335.25	271.88	H	M	0.93450	0.73489	M	L
16	287.48	255.55	M	L	0.78076	0.67294	L	L
17	312.21	284.28	H	M	0.86327	0.77949	L	L
18	306.33	282.76	M	M	0.84428	0.77411	L	L
19	341.84	287.83	H	M	0.95394	0.79190	M	L

contd....../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Madhya Pradesh (contd.)								
29	0.72771	1.25378	L	H	0.73097	0.75012	L	L
30	0.87594	1.01575	M	M	0.97101	0.89670	M	L
31	0.85029	0.71456	L	L	0.81959	0.92474	L	M
32	0.60194	0.64731	L	L	1.17764	1.21997	H	H
33	0.93218	0.80780	M	L	0.89951	0.78520	L	L
34	0.55056	0.56721	L	L	0.68461	0.64744	L	L
35	0.74831	0.62131	L	L	0.86793	0.84209	L	L
36	0.64027	0.70366	L	L	0.81939	0.70962	L	L
37	1.07067	1.06214	M	M	0.70293	0.73780	L	L
38	0.74067	0.72711	L	L	0.68835	0.80722	L	L
39	0.97982	0.95899	M	M	0.87266	0.86983	L	L
40	0.96416	0.85900	M	M	0.82723	0.70884	L	L
41	0.95089	0.81210	M	L	0.99103	1.07799	M	M
42	1.07056	1.16932	M	H	0.97102	0.95011	M	M
43	0.91402	0.81544	M	L	0.67402	0.60223	L	L
Maharashtra	0.80954	0.54944	L	L	1.12662	1.17034	H	H
1	-	-	-	-	2.04090	2.08362	H	H
2	0.96095	1.12209	M	M	1.21088	1.33531	H	H
3	1.16273	1.25331	H	H	0.95283	1.01189	M	M
4	0.65461	0.79905	L	L	0.88211	0.88119	L	L
5	0.57382	0.59678	L	L	1.08649	1.12892	H	H
6	0.86694	0.62143	M	L	0.98195	1.03349	M	M
7	0.86394	0.57789	M	L	1.05278	1.08728	M	H
8	0.95532	0.69658	M	L	0.95940	1.03847	M	M
9	0.69582	0.55222	L	L	1.19280	1.29399	H	H
10	0.80580	0.69981	L	L	0.94386	1.00393	M	M
11	1.01675	0.73064	M	L	0.97595	1.06005	M	M
12	0.77581	0.50735	L	L	1.13845	1.15951	H	H
13	1.36931	1.35822	H	H	1.05381	1.14893	M	H
14	0.61121	0.48494	L	L	0.93061	0.97840	M	M
15	0.99161	0.50616	M	L	0.90699	0.85311	L	L
16	0.89235	0.52964	M	L	0.72513	0.74739	L	L
17	0.65696	0.50053	L	L	0.97026	0.92348	M	M
18	0.89647	0.55975	M	L	0.81912	0.88506	L	L
19	0.92260	0.48717	M	L	0.97168	0.94907	M	M

contd......./-

(0)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Madhya Pradesh (contd.)								
29	0.42414	0.38802	L	L	0.83619	0.83863	L	L
30	0.84141	0.46230	L	L	0.97171	0.97548	M	M
31	0.43210	0.84559	L	L	0.91491	0.85708	L	L
32	1.28657	1.36497	H	H	1.09304	1.11939	H	H
33	0.85487	0.40673	L	L	0.98344	0.90419	M	L
34	0.37871	0.32659	L	L	0.72625	0.68706	L	L
35	0.78063	0.51155	L	L	0.84728	0.85198	L	L
36	0.68450	0.32508	L	L	0.79463	0.75814	L	L
37	0.46969	0.46154	L	L	0.76297	0.77155	L	L
38	0.62027	0.94422	L	M	0.67009	0.69002	L	L
39	0.92449	0.77187	M	L	0.82335	0.83870	L	L
40	0.86560	0.36938	L	L	0.78160	0.76526	L	L
41	1.19792	1.39448	H	H	0.86235	0.86860	L	L
42	1.08350	0.82595	M	L	0.85345	0.88836	L	L
43	0.69434	0.34842	L	L	0.61911	0.66670	L	L
Maharashtra	1.20732	1.20953	H	H	1.06085	1.09727	H	H
1	2.48300	2.47683	H	H	1.76260	1.80105	H	H
2	1.44207	1.66196	H	H	1.11277	1.16414	H	H
3	1.04898	1.22209	M	H	1.00704	0.99202	M	M
4	0.87549	0.86980	M	L	0.94321	0.92808	L	L
5	1.22827	1.27518	H	H	0.98131	1.01959	M	M
6	1.00953	1.02900	M	M	0.92695	0.94348	L	L
7	1.12314	1.12322	M	M	1.00850	1.02862	M	M
8	1.00683	1.17004	M	H	0.90284	0.94274	L	L
9	1.31809	1.50465	H	H	1.12470	1.17861	H	H
10	1.10775	1.18323	M	H	0.92529	0.99386	L	M
11	1.01129	1.11532	M	M	0.94837	1.02050	M	M
12	1.37947	1.32856	H	H	0.99011	1.03292	M	M
13	1.17389	1.31544	H	H	0.95656	1.01743	M	M
14	0.99561	0.89341	M	M	0.88997	0.93963	L	L
15	0.93874	0.61626	M	L	0.91729	0.89891	L	L
16	0.48631	0.40177	L	L	0.84291	0.86602	L	L
17	1.16890	0.84837	H	L	0.92323	0.93548	L	L
18	0.79280	0.87226	L	L	0.86786	0.88539	L	L
19	1.03551	0.80532	M	L	0.91881	0.89018	L	L

contd..../-

(0)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
Madhya Pradesh (contd.)								
29	0.84011	0.90674	L	L	0.92678	1.33893	M	L
30	1.05123	1.10596	M	H	1.20381	1.28908	L	L
31	0.98672	1.02686	M	M	1.19123	0.94934	L	M
32	1.17576	1.20808	H	H	0.81416	0.84773	H	H
33	0.86184	0.92823	L	M	1.28643	0.97447	L	M
34	0.84277	0.81650	L	L	0.67462	0.61153	H	H
35	0.93844	1.04038	M	M	0.92553	0.70184	M	H
36	0.92278	0.91142	L	L	0.78923	0.80463	H	H
37	0.80143	0.88365	L	L	0.93527	0.87804	M	H
38	0.74503	0.81329	L	L	0.81066	0.77245	H	H
39	0.87883	0.95516	L	M	0.95619	0.87125	M	H
40	0.83891	0.87637	L	L	0.97446	0.83913	M	H
41	0.96249	1.04412	M	M	1.02413	0.76233	M	H
42	0.99264	1.07566	M	H	1.08768	1.05160	M	M
43	0.70421	0.71010	L	L	0.92261	0.84871	M	H
Maharashtra	1.12764	1.20293	H	H	1.04230	0.72820	M	H
1	1.98251	2.05903	H	H	-	-	-	-
2	1.14334	1.26528	H	H	0.59407	0.66851	H	H
3	0.85062	0.89638	L	L	0.80750	0.81275	H	H
4	0.83857	0.85169	L	L	0.43470	0.50246	H	H
5	1.08019	1.12307	H	H	0.82322	0.73522	H	H
6	1.00767	1.10652	M	H	1.14428	0.69256	L	H
7	1.04341	1.11066	M	H	0.95002	0.56072	M	H
8	0.97397	1.03115	M	M	1.38895	0.99495	L	M
9	1.16785	1.25272	H	H	0.91937	0.73086	M	H
10	0.85621	0.90003	L	L	0.96747	0.78078	M	H
11	0.97545	1.05646	M	M	1.31510	0.78479	L	H
12	1.10398	1.15291	H	H	1.21553	0.81725	L	H
13	1.05485	1.14776	M	H	1.05856	0.88517	M	H
14	0.92182	1.06162	L	M	1.00836	0.80072	M	H
15	0.87917	0.96500	L	M	1.34539	0.67661	L	H
16	0.78208	0.87024	L	L	1.23049	0.72914	L	H
17	0.88316	0.96092	L	M	0.76494	0.70527	H	H
18	0.79749	0.89278	L	L	1.19309	0.70346	L	H
19	0.97314	1.08462	M	H	1.22127	0.61936	L	H

contd....../-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Maharashtra (contd.)								
20	350.44	298.48	H	M	0.97879	0.82824	M	L
21	357.85	300.32	H	M	0.99972	0.83436	M	L
22	320.09	275.75	H	M	0.88822	0.74887	L	L
23	352.02	315.24	H	H	0.98329	0.88286	M	L
24	378.41	361.87	H	H	1.05560	1.02080	M	M
25	360.11	347.34	H	H	1.00602	0.97982	M	M
26	294.02	303.51	M	M	0.80325	0.84493	L	L
Orissa					0.96705	0.87365	M	L
1	229.13	253.00	L	L	0.99891	1.06213	M	M
2	249.73	259.73	L	L	1.08498	1.08839	M	M
3	204.48	218.49	L	L	0.88509	0.91547	L	M
4	182.69	206.81	L	L	0.77242	0.86056	L	L
5	223.35	211.02	L	L	0.97336	0.88068	M	L
6	250.40	259.20	L	L	1.08766	1.08636	M	M
7	203.00	215.39	L	L	0.87780	0.90117	L	M
8	155.09	169.98	L	L	0.60861	0.66442	L	L
9	212.41	215.17	L	L	0.92314	0.90015	M	M
10	182.94	188.29	L	L	0.77379	0.76671	L	L
11	188.21	209.51	L	L	0.80214	0.87349	L	L
12	214.80	252.55	L	L	0.93433	1.06037	M	M
13	232.34	270.83	L	M	1.01281	1.13023	M	H
Punjab					1.35340	1.70837	H	H
1	348.19	459.90	H	H	1.26245	1.54516	H	H
2	416.40	530.86	H	H	1.44133	1.68864	H	H
3	346.47	475.84	H	H	1.25750	1.57922	H	H
4	404.34	672.32	H	H	1.41194	1.92488	H	H
5	429.13	534.77	H	H	1.47146	1.69598	H	H
6	389.78	531.96	H	H	1.37528	1.69071	H	H
7	264.47	338.55	M	H	0.98743	1.23883	M	H
8	262.03	389.20	L	H	0.97813	1.37823	M	H
9	468.68	543.38	H	H	1.55961	1.71196	H	H
10	371.87	456.18	H	H	1.32824	1.53704	H	H
11	333.98	426.70	H	H	1.22077	1.47023	H	H

contd.../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Maharashtra (contd.)								
20	0.82907	0.38486	L	L	1.05708	1.05636	M	M
21	0.89351	0.40532	M	L	1.05581	1.05515	M	M
22	0.84025	0.44342	L	L	0.91434	0.90633	L	L
23	0.76512	0.41212	L	L	1.09658	1.12505	H	H
24	0.61590	0.47628	L	L	1.28224	1.30088	H	H
25	1.04167	1.03171	M	M	0.98960	0.95506	M	M
26	0.72536	0.72624	L	L	0.84450	0.90712	L	L
Orissa	1.08423	1.13784	M	M	0.90322	0.73507	L	L
1	1.22295	1.23042	H	H	0.88620	0.97803	L	M
2	1.03855	0.91450	M	M	1.11066	1.17922	H	H
3	1.08502	1.00976	M	M	0.78450	0.86892	L	L
4	0.90614	0.87755	M	M	0.70546	0.85342	L	L
5	1.22723	1.06561	H	M	0.84536	0.78774	L	L
6	1.14627	1.09348	M	M	1.05966	1.08467	M	H
7	1.29105	1.26572	H	H	0.66816	0.71647	L	L
8	0.67751	0.78188	L	L	0.57449	0.60559	L	L
9	1.29393	1.13319	H	M	0.73527	0.78266	L	L
10	0.93279	0.99218	M	M	0.69392	0.65285	L	L
11	0.93209	0.97318	M	M	0.73716	0.82410	L	L
12	1.12116	1.22491	M	H	0.84051	0.97818	L	M
13	1.20607	1.15905	H	H	0.91586	1.11752	L	H
Punjab	1.79602	2.73798	H	H	1.12166	1.17518	H	H
1	1.47124	2.18770	H	H	1.15800	1.21953	H	H
2	1.68445	2.41310	H	H	1.31965	1.32139	H	H
3	1.56915	2.51781	H	H	1.10047	1.10233	H	H
4	1.79042	3.06512	H	H	1.22103	1.34555	H	H
5	1.94515	2.47391	H	H	1.23199	1.30141	H	H
6	1.75698	2.58566	H	H	1.18266	1.23633	H	H
7	0.96726	1.59008	M	H	0.99952	1.06153	M	M
8	1.11391	1.84883	M	H	0.91049	1.14018	L	H
9	2.35146	2.58454	H	H	1.15769	1.26904	H	H
10	1.91494	2.50213	H	H	1.03075	1.04653	M	M
11	1.66470	2.35550	H	H	0.99607	1.02039	M	M

contd....../-

(0)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Maharashtra (contd.)								
20	1.14619	1.03988	H	M	1.00239	0.97965	M	M
21	1.13674	1.00783	H	M	0.99729	0.98944	M	M
22	0.98850	0.80427	M	L	0.88063	0.87310	L	L
23	1.24660	1.22468	H	H	0.97880	0.97320	M	M
24	1.46723	1.37804	H	H	1.14557	1.20228	H	H
25	1.10283	0.88793	M	M	0.90937	0.88650	L	L
26	0.86859	1.00318	L	M	0.82557	0.82260	L	L
Orissa	0.96387	1.03031	M	M	0.93863	0.93808	L	L
1	0.96781	1.17850	M	H	0.88137	0.90989	L	L
2	1.46532	1.49099	H	H	0.99437	1.05040	M	M
3	0.85817	0.96378	L	M	0.80163	0.86484	L	L
4	0.61954	1.03921	L	M	0.75703	0.78159	L	L
5	0.67878	0.40562	L	L	0.96644	0.93229	M	L
6	1.17741	1.21922	H	H	1.08531	1.07200	H	H
7	0.29408	0.48358	L	L	0.84753	0.83520	L	L
8	0.30039	0.32042	L	L	0.85265	0.79345	L	L
9	0.53992	0.63038	L	L	0.88552	0.84745	L	L
10	0.56961	0.34634	L	L	0.84955	0.79011	L	L
11	0.58756	0.83098	L	L	0.86141	0.84854	L	L
12	0.45227	0.92069	L	M	1.02844	1.02850	M	M
13	0.78241	1.33009	L	H	1.02978	1.05873	M	H
Punjab	1.04010	1.16184	M	H	1.15201	1.16534	H	H
1	1.19091	1.31487	H	H	1.20541	1.20584	H	H
2	1.43583	1.39391	H	H	1.25953	1.26372	H	H
3	1.05970	1.05077	M	M	1.11107	1.07386	H	H
4	1.19279	1.45534	H	H	1.16622	1.24149	H	H
5	1.21932	1.42737	H	H	1.24759	1.26269	H	H
6	1.43875	1.49319	H	H	1.12830	1.14443	H	H
7	0.95760	1.03086	M	M	1.04008	1.13055	M	H
8	0.55126	1.35257	L	H	1.04513	1.12745	M	H
9	1.19736	1.54005	H	H	1.15109	1.15751	H	H
10	0.96756	0.89877	M	M	1.04879	1.07023	M	H
11	0.76022	0.83965	L	L	1.05298	1.06611	M	H

contd..../-

(0)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
Maharashtra (contd.)								
20	1.04421	1.12647	M	H	1.19041	0.56490	L	H
21	1.05103	1.13591	M	H	1.23837	0.56238	L	H
22	0.89442	0.99586	L	M	1.14354	0.60106	L	H
23	1.09497	1.18143	H	H	1.19189	0.67953	L	H
24	1.27357	1.32972	H	H	0.80980	0.67333	H	H
25	0.98163	1.05039	M	M	0.91263	0.82764	M	H
26	0.84426	0.91319	L	L	0.85828	0.82801	H	H
Orissa	0.83780	0.89267	L	L	1.00790	1.06680	M	M
1	0.83911	0.90625	L	L	1.16924	1.18961	L	L
2	0.98036	1.08542	M	H	1.08900	0.93468	M	M
3	0.72521	0.81298	L	L	1.03931	0.98811	M	M
4	0.71878	0.79368	L	L	0.76356	0.79799	H	H
5	0.85471	0.91312	L	L	1.41667	1.07088	L	M
6	0.96627	1.01070	M	M	1.00247	0.93523	M	M
7	0.76136	0.76896	L	L	1.26260	1.25002	L	L
8	0.52829	0.63674	L	L	0.46492	0.65149	H	H
9	0.73980	0.82702	L	L	1.15946	0.95709	L	M
10	0.64997	0.73678	L	L	1.09585	1.11766	M	L
11	0.73345	0.80074	L	L	0.86926	0.93656	H	M
12	0.93586	0.97473	M	M	0.72645	0.93970	H	M
13	0.91014	1.03092	L	M	1.13923	1.00266	L	M
Punjab	1.14883	1.19116	H	H	0.95540	2.44630	L	L
1	1.10050	1.17080	H	H	1.57486	2.29560	L	L
2	1.29416	1.32118	H	H	1.50377	2.24401	L	L
3	1.11760	1.15667	H	H	1.90330	2.61495	L	L
4	1.28139	1.35832	H	H	1.58666	2.98802	L	L
5	1.22771	1.25312	H	H	1.85968	2.28468	L	L
6	1.06548	1.14794	M	H	1.80015	2.54963	L	L
7	0.99400	1.02680	M	M	1.11589	1.76297	L	L
8	1.02932	1.01775	M	M	1.19302	1.98950	L	L
9	1.13811	1.18715	H	H	2.72261	2.61894	L	L
10	1.05605	1.12012	M	H	2.02955	2.52562	L	L
11	1.09865	1.09737	H	H	1.90965	2.52583	L	L

contd..../-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rajasthan					0.89837	1.04817	L	M
1	380.98	455.47	H	H	1.10330	1.16338	H	H
2	227.85	294.81	L	M	0.58925	0.72839	L	L
3	221.48	268.79	L	M	0.56088	0.63599	L	L
4	235.35	296.60	L	M	0.62165	0.73443	L	L
5	282.96	387.93	M	H	0.80585	1.00287	L	M
6	316.32	408.82	H	H	0.91730	1.05533	M	M
7	313.16	347.54	H	H	0.90727	0.89292	M	L
8	321.85	434.87	H	H	0.93464	1.11709	M	H
9	243.22	310.96	L	H	0.65453	0.78172	L	L
10	336.16	419.40	H	H	0.97814	1.08087	M	M
11	275.42	332.35	M	H	0.77886	0.84824	L	L
12	205.03	239.55	L	L	0.48371	0.52082	L	L
13	263.68	380.13	L	H	0.73530	0.98256	L	M
14	226.59	278.37	L	M	0.58370	0.67099	L	L
15	283.94	370.20	M	H	0.80933	0.95610	L	M
16	204.76	302.30	L	M	0.48239	0.75348	L	L
17	215.44	362.64	L	H	0.5[illegible]325	0.93545	L	M
18	263.68	352.39	L	H	0.73529	0.90679	L	M
19	294.87	357.44	M	H	0.84710	0.92100	L	M
20	306.47	372.67	M	H	0.88568	0.96275	L	M
21	273.94	343.41	M	H	0.77345	0.88097	L	L
22	243.28	296.54	L	M	0.65476	0.73421	L	L
23	243.98	311.56	L	H	0.65766	0.78363	L	L
24	315.28	417.54	H	H	0.91403	1.07642	M	M
25	319.47	428.32	H	H	0.92721	1.10191	M	H
26	267.19	331.86	M	H	0.74852	0.84677	L	L
Tamil Nadu					1.16460	1.31551	H	H
1	688.42	723.43	H	H	1.98476	2.05689	H	H
2	324.52	378.93	H	H	1.23271	1.41025	H	H
3	310.45	336.98	H	H	1.18839	1.29291	H	H
4	293.47	332.48	M	H	1.13214	1.27946	H	H
5	232.25	210.09	L	L	0.89817	0.82043	L	L
6	269.80	283.98	M	M	1.04805	1.12178	M	H

contd..../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Rajasthan	0.87646	1.19605	M	H	0.90592	0.96832	L	M
1	1.50693	1.54742	H	H	0.89898	0.96918	L	M
2	0.08452	0.18327	L	L	0.84828	1.00832	L	M
3	0.17806	0.29785	L	L	0.75755	0.80995	L	L
4	0.33306	0.48882	L	L	0.77027	0.86128	L	L
5	0.81316	1.33455	L	H	0.80356	0.83515	L	L
6	0.83314	1.18969	L	H	0.96196	0.98855	M	M
7	0.82797	1.04271	L	M	0.94944	0.81797	M	L
8	0.59623	0.92509	L	M	1.10929	1.21723	H	H
9	0.35965	0.57297	L	L	0.80642	0.88982	L	L
10	0.57011	0.76046	L	L	1.18845	1.24657	H	H
11	0.67587	0.95352	L	M	0.83290	0.79596	L	L
12	0.28692	0.29683	L	L	0.58516	0.63625	L	L
13	0.18392	0.85436	L	L	1.01844	1.04985	M	M
14	0.26171	0.41992	L	L	0.74932	0.80053	L	L
15	0.63629	0.94762	L	M	0.89923	0.96216	L	M
16	0.26815	0.88563	L	M	0.59276	0.68730	L	L
17	0.38155	1.35827	L	H	0.61175	0.72101	L	L
18	0.62906	0.98515	L	M	0.79091	0.86838	L	L
19	0.81384	0.87321	L	M	0.86562	0.94708	L	M
20	0.83194	0.92775	L	M	0.91474	0.98238	L	M
21	0.73566	0.94989	L	M	0.79415	0.84733	L	L
22	0.61037	0.77914	L	L	0.67863	0.71256	L	L
23	0.66778	0.99431	L	M	0.65366	0.67735	L	L
24	0.91109	1.32360	M	H	0.91718	0.95202	L	M
25	0.78261	1.08036	L	M	1.00278	1.11490	M	H
26	0.69828	0.76349	L	L	0.77555	0.89085	L	L
Tamil Nadu	1.24256	1.52443	H	H	1.12002	1.20337	H	H
1	-	-	-	-	2.03314	2.10881	H	H
2	1.42216	1.69433	H	H	1.13810	1.26758	H	H
3	1.34926	1.53820	H	H	1.10830	1.16982	H	H
4	1.34744	1.58567	H	H	1.02413	1.12525	M	H
5	1.03505	0.82291	M	L	0.82983	0.82064	L	L
6	0.87772	0.97628	M	M	1.13700	1.19817	H	H

contd...... /-

(0)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Rajasthan	0.90570	0.97053	M	M	0.91513	0.94402	L	L
1	0.95489	0.96574	M	M	0.93556	0.93643	L	L
2	0.42928	0.93064	L	M	0.99495	1.00649	M	M
3	0.35998	0.38804	L	L	0.87693	0.88861	L	L
4	0.42002	0.48280	L	L	0.90467	0.98328	L	M
5	0.42770	0.43264	L	L	0.92181	0.96602	L	M
6	1.06121	1.02823	M	M	0.92915	0.95085	L	M
7	1.12385	0.45449	M	L	0.90235	0.93015	L	L
8	1.14742	1.36423	H	H	1.05659	1.12213	H	H
9	0.44779	0.50424	L	L	0.92213	0.97276	L	M
10	1.33202	1.37009	H	H	1.12342	1.14201	H	H
11	0.80287	0.49720	L	L	0.86302	0.88550	L	L
12	0.47741	0.40778	L	L	0.73462	0.82353	L	L
13	1.01100	1.02283	M	M	0.96853	1.00259	M	M
14	0.62647	0.65157	L	L	0.82153	0.83513	L	L
15	1.08595	1.18200	M	H	0.92946	0.93600	L	L
16	0.25996	0.32202	L	L	0.73447	0.76475	L	L
17	0.33256	0.43091	L	L	0.84254	0.82538	L	L
18	0.44594	0.54400	L	L	1.02696	1.02534	M	M
19	1.02010	1.13616	M	H	0.82020	0.85705	L	L
20	0.85632	0.99175	L	M	0.92296	0.95441	L	M
21	0.78920	0.84276	L	L	0.82411	0.85442	L	L
22	0.41708	0.33852	L	L	0.76413	0.83161	L	L
23	0.35593	0.29043	L	L	0.73055	0.78786	L	L
24	1.13324	1.11174	H	M	0.87067	0.88849	L	L
25	1.05570	1.25047	M	H	1.01763	1.05291	M	M
26	0.69326	1.02533	L	M	0.86848	0.86305	L	L
Tamil Nadu	1.18082	1.28522	H	H	1.14870	1.18080	H	H
1	2.32946	2.41835	H	H	1.83780	1.90552	H	H
2	1.32881	1.59519	H	H	1.12325	1.19547	H	H
3	1.15725	1.27564	H	H	1.09485	1.12174	H	H
4	1.06168	1.27271	M	H	1.02629	1.04190	M	M
5	0.50650	0.44005	L	L	1.01235	0.95301	M	M
6	1.24636	1.40527	H	H	1.07337	1.12422	H	H

contd..../-

(0)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
Rajasthan	0.89887	0.98591	L	M	0.89780	1.25890	M	L
1	0.83559	0.99688	L	M	2.21118	2.06627	L	L
2	0.99498	1.05815	M	M	0.57858	0.66183	H	H
3	0.91218	1.01154	L	M	0.54001	0.78079	H	H
4	0.88369	1.00198	L	M	0.63901	0.89460	H	M
5	0.94555	0.98390	M	M	1.09683	1.73514	M	L
6	0.92570	0.99323	L	M	1.03983	1.44792	M	L
7	0.87747	0.95698	L	M	1.00126	1.27291	M	L
8	1.12665	1.19980	H	H	0.67115	1.13084	H	L
9	0.93964	1.06542	M	M	0.63027	0.91851	H	M
10	1.14971	1.25117	H	H	0.70136	1.05186	H	M
11	0.82811	0.91229	L	L	1.07110	1.45055	M	L
12	0.53569	0.63252	L	L	1.08741	0.86591	M	H
13	1.06202	1.10356	M	H	0.84500	1.61317	H	L
14	0.76954	0.86636	L	L	0.70852	0.89114	H	H
15	0.75928	0.84555	L	L	0.95597	1.44794	M	L
16	0.68962	0.85451	L	L	0.98696	1.74958	M	L
17	0.60568	0.82039	L	L	0.84664	2.19479	H	L
18	0.82173	0.94807	L	M	0.79619	1.25071	H	L
19	0.80478	0.89948	L	L	0.63251	0.84084	H	H
20	0.94475	0.99836	M	M	0.75604	0.89482	H	M
21	0.77386	0.84464	L	L	0.75571	0.97877	H	M
22	0.77492	0.85278	L	L	0.59254	0.86216	H	H
23	0.77923	0.83226	L	L	0.75724	1.16749	H	L
24	0.81880	0.90205	L	L	1.18476	1.59890	L	L
25	0.95821	1.07877	M	H	1.16353	1.45310	L	M
26	0.75432	0.82873	L	L	0.98623	1.04119	M	M
Tamil Nadu	1.05975	1.16996	M	H	0.83580	0.88460	H	H
1	2.00087	2.07450	H	H	–	–	–	–
2	1.03082	1.11967	M	H	1.02239	1.16627	M	M
3	1.08830	1.14139	H	H	0.94223	0.84456	M	H
4	0.99904	1.09837	M	H	0.89326	0.94209	M	M
5	0.88893	0.95455	L	M	0.89833	0.53173	M	H
6	1.11849	1.12679	H	H	0.56950	0.55532	H	H

contd......./-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tamil Nadu (contd.)								
7	343.51	333.43	H	H	1.28957	1.28233	H	H
8	313.45	434.66	H	H	1.19799	1.54745	H	H
9	344.17	326.02	H	H	1.29151	1.25984	H	H
10	297.39	310.44	M	H	1.14542	1.21086	H	H
11	364.84	397.79	H	H	1.34983	1.45880	H	H
12	277.44	287.00	M	M	1.07596	1.13236	M	H
13	316.03	334.16	H	H	1.20621	1.28452	H	H
14	378.61	406.43	H	H	1.38686	1.48030	H	H
Uttar Pradesh					1.05427	1.14286	M	H
1	142.45	168.01	L	L	0.50721	0.58138	L	L
2	118.83	163.10	L	L	0.32586	0.55172	L	L
3	140.24	158.98	L	L	0.49157	0.52617	L	L
4	180.73	188.64	L	L	0.74521	0.69720	L	L
5	122.06	174.02	L	L	0.35270	0.61652	L	L
6	177.27	190.63	L	L	0.72588	0.70770	L	L
7	286.71	366.91	M	H	1.2[illegible]665	1.36248	H	H
8	318.25	350.16	H	H	1.31103	1.31577	H	H
9	280.07	318.89	M	H	1.18322	1.22223	H	H
10	220.01	245.07	L	L	0.94186	0.95892	M	M
11	305.62	337.60	M	H	1.27053	1.27924	H	H
12	284.03	315.12	M	H	1.19728	1.21034	H	H
13	287.66	319.47	M	H	1.20997	1.22403	H	H
14	255.26	278.83	L	M	1.09047	1.08798	M	M
15	259.28	318.41	L	H	1.10611	1.22073	H	H
16	344.78	368.63	H	H	1.39110	1.36718	H	H
17	383.70	428.21	H	H	1.49805	1.51698	H	H
18	386.21	464.88	H	H	1.50458	1.59915	H	H
19	298.87	347.55	M	H	1.24819	1.30828	H	H
20	276.37	354.98	M	H	1.16992	1.32943	H	H
21	264.37	311.42	M	H	1.12555	1.19852	H	H
22	294.59	326.98	M	H	1.23377	1.24728	H	H
23	243.21	283.29	L	M	1.04210	1.10386	M	H
24	243.13	288.46	L	M	1.04179	1.12192	M	H
25	245.38	279.08	L	M	1.05101	1.08886	M	M

contd....../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Tamil Nadu (contd.)								
7	1.39926	1.29869	H	H	1.23583	1.27627	H	H
8	1.37196	1.98733	H	H	1.11122	1.32541	H	H
9	1.37326	1.30245	H	H	1.25203	1.24032	H	H
10	1.21897	1.29497	H	H	1.10988	1.17005	H	H
11	1.85514	2.07324	H	H	1.09398	1.14737	H	H
12	1.01354	1.07773	M	M	1.10979	1.16232	H	H
13	1.25427	1.40184	H	H	1.18381	1.22686	H	H
14	1.73363	1.79908	H	H	1.21211	1.32003	H	H
Uttar Pradesh	1.01359	1.23695	M	H	1.07077	1.09012	M	H
1	-	-	-	-	0.48299	0.56082	L	L
2	-	-	-	-	0.29274	0.52970	L	L
3	-	-	-	-	0.46659	0.50289	L	L
4	-	-	-	-	0.73269	0.68232	L	L
5	-	-	-	-	0.32090	0.59768	L	L
6	-	-	-	-	0.71241	0.69334	L	L
7	1.56838	1.87739	H	H	1.02394	1.10175	M	H
8	1.64922	1.64641	H	H	1.14052	1.14915	H	H
9	1.19875	1.27246	H	H	1.17741	1.19875	H	H
10	0.88592	0.97044	M	M	0.97214	0.95475	M	M
11	1.32354	1.36709	H	H	1.24572	1.23664	H	H
12	1.08888	1.08706	M	M	1.25483	1.27552	H	H
13	1.36926	1.42876	H	H	1.13073	1.12158	H	H
14	1.13556	1.15912	M	H	1.06938	1.05357	M	M
15	0.96978	1.14879	M	M	1.17779	1.25969	H	H
16	1.63864	1.56655	H	H	1.26708	1.26773	H	H
17	2.08709	2.14352	H	H	1.19968	1.19947	H	H
18	1.95349	2.11598	H	H	1.27784	1.33777	H	H
19	1.54159	1.69366	H	H	1.10047	1.11365	H	H
20	1.06057	1.51821	M	H	1.22791	1.23533	H	H
21	1.16651	1.42764	H	H	1.10664	1.08357	H	H
22	1.03111	1.01288	M	M	1.33957	1.36933	H	H
23	1.05444	1.26340	M	H	1.03767	1.02431	M	M
24	1.05679	1.28166	M	H	1.03600	1.04229	M	M
25	1.18636	1.30776	H	H	0.98372	0.97894	M	M

contd....../-

(0)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Tamil Nadu (contd.)								
7	1.52828	1.57551	H	H	1.16526	1.18039	H	H
8	1.27935	2.03763	H	H	1.13091	1.14890	H	H
9	1.42341	1.34123	H	H	1.19980	1.18432	H	H
10	1.23076	1.31679	H	H	1.07630	1.11672	H	H
11	1.02317	1.14285	M	H	1.15579	1.17062	H	H
12	1.23649	1.31965	H	H	1.06739	1.11080	H	H
13	1.39773	1.47777	H	H	1.13962	1.17311	H	H
14	1.18064	1.56132	H	H	1.26947	1.24414	H	H
Uttar Pradesh	1.03122	1.06434	M	M	1.05195	1.03158	M	M
1	0.43759	0.36766	L	L	0.58360	0.67840	L	L
2	0.35577	0.22521	L	L	0.61761	0.72358	L	L
3	0.31121	0.28810	L	L	0.60166	0.68188	L	L
4	0.77623	0.37159	L	L	0.79375	0.89973	L	L
5	0.35453	0.31107	L	L	0.70534	0.82122	L	L
6	0.63591	0.33946	L	L	0.74963	0.85552	L	L
7	1.04883	1.14136	M	H	1.03229	1.08627	M	H
8	1.21706	1.26784	H	H	1.10193	1.06537	H	H
9	1.11671	1.18826	M	H	1.13277	1.11389	H	H
10	0.82415	0.79185	L	L	0.97325	0.89443	M	L
11	1.38502	1.34656	H	H	1.10899	1.08027	H	H
12	1.35432	1.44129	H	H	1.16858	1.13472	H	H
13	1.21304	1.21089	H	H	1.04977	0.97313	M	M
14	0.99022	0.95621	M	M	1.05806	0.98468	H	M
15	1.21917	1.36876	H	H	1.20881	1.26866	H	H
16	1.37489	1.40087	H	H	1.23423	1.18816	H	H
17	1.30414	1.28528	H	H	1.18001	1.12190	H	H
18	1.43424	1.58073	H	H	1.24161	1.24917	H	H
19	1.00728	1.08342	M	M	1.14466	1.09853	H	H
20	1.26085	1.27781	H	H	1.18928	1.14470	H	H
21	0.93854	0.85594	M	L	1.16753	1.13778	H	H
22	1.44525	1.47580	H	H	1.26150	1.27573	H	H
23	0.96097	0.93490	M	M	1.07190	0.99609	H	M
24	1.10339	1.10375	M	M	1.04598	0.98327	M	M
25	0.72206	0.74177	L	L	1.06498	0.99181	H	M

contd.../-

(0)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
Tamil Nadu (contd.)								
7	1.10861	1.16458	H	H	1.17935	0.87335	L	H
8	0.99107	1.01923	M	M	0.71872	1.61356	H	L
9	1.18597	1.22112	H	H	1.05816	0.71419	M	H
10	1.06075	1.12020	M	H	0.89103	0.88187	H	H
11	1.08989	1.13206	H	H	1.21910	1.40573	L	L
12	1.06392	1.10446	M	H	0.79010	0.82860	H	H
13	1.08498	1.11243	H	H	0.84933	0.89536	H	M
14	1.18697	1.22885	H	H	1.09842	0.77776	M	H
Uttar Pradesh	1.11009	1.15186	H	H	1.04080	1.07000	M	M
1	0.43280	0.58945	L	L	–	–	–	–
2	0.00000	0.56819	L	L	–	–	–	–
3	0.45805	0.49710	L	L	–	–	–	–
4	0.65792	0.70635	L	L	–	–	–	–
5	0.00000	0.60189	L	L	–	–	–	–
6	0.73105	0.78734	L	L	–	–	–	–
7	1.00191	1.08913	M	H	1.69525	1.98242	L	L
8	1.12294	1.14054	H	H	1.92243	1.65054	L	L
9	1.25007	1.27150	H	H	1.32981	1.21027	L	L
10	1.06349	1.10334	M	H	1.03257	0.83824	M	H
11	1.26559	1.29013	H	H	1.55613	1.35456	L	L
12	1.26012	1.28206	H	H	1.17428	0.97697	L	M
13	1.14259	1.18174	H	H	1.71655	1.54544	L	L
14	1.12754	1.16799	H	H	1.26032	1.09131	L	M
15	1.12779	1.18471	H	H	0.90846	1.05173	M	M
16	1.22552	1.24684	H	H	1.86231	1.47400	L	L
17	1.14992	1.20652	H	H	1.94854	1.80222	L	L
18	1.20864	1.25548	H	H	1.75304	1.79137	L	L
19	1.12406	1.14429	H	H	1.44624	1.51862	L	L
20	1.23752	1.27956	H	H	1.11892	1.45214	L	L
21	1.16389	1.18314	H	H	1.30180	1.46451	L	L
22	1.33461	1.37600	H	H	1.13139	1.00784	L	M
23	1.05876	1.10205	M	H	1.07333	1.10156	M	M
24	0.98621	1.05003	M	M	1.07422	1.14601	M	L
25	1.08339	1.11670	H	H	1.15431	1.11968	L	L

contd......./-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Uttar Pradesh (contd.)								
26	225.19	276.11	L	M	0.96513	1.07817	M	M
27	321.21	364.31	H	H	1.32027	1.35538	H	H
28	197.93	226.99	L	L	0.83610	0.88228	L	L
29	242.18	276.41	L	M	1.03787	1.07927	M	M
30	249.73	267.07	L	M	1.06855	1.04490	M	M
31	226.64	239.34	L	L	0.97157	0.93524	M	M
32	205.41	220.38	L	L	0.87319	0.85273	L	L
33	209.61	212.53	L	L	0.89342	0.81646	L	L
34	231.79	248.90	L	L	0.99402	0.97441	M	M
35	225.95	244.46	L	L	0.96850	0.95642	M	M
36	214.58	242.67	L	L	0.91685	0.94909	M	M
37	212.30	239.36	L	L	0.90621	0.93536	M	M
38	292.43	355.54	M	H	1.22640	1.33101	H	H
39	194.91	225.54	L	L	0.82075	0.87588	L	L
40	186.62	217.32	L	L	0.77728	0.83875	L	L
41	196.11	229.99	L	L	0.82687	0.89540	L	L
42	214.32	237.29	L	L	0.91564	0.92667	M	M
43	227.55	253.78	L	L	0.97554	0.99384	M	M
44	180.44	202.84	L	L	0.74357	0.76981	L	L
45	166.79	199.02	L	L	0.66491	0.75079	L	L
46	194.66	229.46	L	L	0.81943	0.89309	L	L
47	235.39	281.55	L	M	1.00942	1.09770	M	M
48	223.19	255.00	L	L	0.95662	0.99862	M	M
49	198.62	245.14	L	L	0.83956	0.95921	L	M
50	214.20	251.95	L	L	0.91508	0.98660	M	M
51	196.96	228.93	L	L	0.83121	0.89081	L	L
52	213.75	241.78	L	L	0.91298	0.94540	M	M
53	262.28	305.36	L	M	1.11759	1.17888	H	H
54	218.26	241.67	L	L	0.93386	0.94495	M	M

contd......../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Uttar Pradesh (contd.)								
26	1.10234	1.24750	M	H	0.89674	0.99355	L	M
27	1.07212	1.16567	M	H	1.44948	1.45478	H	H
28	0.95048	0.95830	M	M	0.77914	0.84502	L	L
29	0.72828	0.78625	L	L	1.19797	1.23098	H	H
30	0.99435	0.92735	M	M	1.10839	1.10686	H	H
31	1.21[illegible]52	1.06996	H	M	0.84914	0.86806	L	L
32	1.06639	0.98393	M	M	0.77601	0.78721	L	L
33	1.15900	0.91916	H	M	0.75929	0.76544	L	L
34	1.15076	1.07800	M	M	0.91569	0.92322	L	M
35	0.92432	0.90079	M	M	0.99283	0.98656	M	M
36	0.88431	0.97878	M	M	0.93513	0.93551	M	M
37	0.93409	0.95336	M	M	0.89358	0.92783	L	M
38	0.79155	0.96041	L	M	1.45086	1.52282	H	H
39	0.93040	0.94752	M	M	0.7[illegible]618	0.84085	L	L
40	0.53194	0.67248	L	L	0.90407	0.92524	L	M
41	0.61206	0.79262	L	L	0.93815	0.94953	M	M
42	0.88920	0.96026	M	M	0.93080	0.91117	M	L
43	0.99217	0.99511	M	M	0.96880	0.99497	M	M
44	0.75733	0.84790	L	L	0.73788	0.73129	L	L
45	0.58138	0.79435	L	L	0.70880	0.72988	L	L
46	0.79277	0.93973	L	M	0.83453	0.87086	L	L
47	0.76864	0.95625	L	M	1.13430	1.17197	H	H
48	0.98036	1.07507	M	M	0.94565	0.96135	M	M
49	0.89944	0.93292	M	M	0.81046	0.97437	L	M
50	0.87316	1.02972	M	M	0.93815	0.96634	M	M
51	0.83708	0.85986	L	M	0.82970	0.90823	L	L
52	0.84746	0.93247	L	M	0.94811	0.95370	M	M
53	0.89398	0.98970	M	M	1.23389	1.27769	H	[illegible]
54	0.83817	0.85805	L	M	0.98445	0.99106	M	M

contd...../-

(0)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Uttar Pradesh (contd.)								
26	0.39524	0.77599	L	L	1.04732	1.00194	M	M
27	1.68733	1.68191	H	H	1.26160	1.29491	H	H
28	0.29301	0.66178	L	L	0.98488	0.88506	M	L
29	1.16476	1.29358	H	H	1.11927	1.11091	H	H
30	1.17732	1.14957	H	H	1.06983	1.06093	H	H
31	0.36951	0.39741	L	L	0.99610	0.95407	M	M
32	0.31507	0.38290	L	L	0.94317	0.82854	L	L
33	0.27346	0.31172	L	L	0.91391	0.84425	L	L
34	0.98421	0.97648	M	M	0.89371	0.84907	L	L
35	1.06870	1.09723	M	M	0.96157	0.88363	M	L
36	0.85388	0.87771	L	M	0.94764	0.87628	M	L
37	0.82181	0.93083	L	M	0.91620	0.86988	L	L
38	1.57197	1.71741	H	H	1.34140	1.38215	H	H
39	0.32958	0.61114	L	L	0.95686	0.88660	M	L
40	0.78951	0.87365	L	M	0.88673	0.80968	L	L
41	0.92624	0.99514	M	M	0.92973	0.85771	L	L
42	0.92945	0.88300	M	M	0.94151	0.86411	L	L
43	0.88026	0.92151	M	M	0.97021	0.96091	M	M
44	0.31414	0.26445	L	L	0.92024	0.88024	L	L
45	0.27502	0.30753	L	L	0.92387	0.88445	L	L
46	0.86837	0.93607	L	M	0.82186	0.82054	L	L
47	1.28414	1.30985	H	H	0.99070	1.01406	M	M
48	1.21229	1.17316	H	H	0.84199	0.86605	L	L
49	0.34519	0.91113	L	M	0.93404	0.91261	L	L
50	0.88835	0.87919	M	M	0.97797	0.98570	M	M
51	0.37051	0.70605	L	L	1.06509	0.98432	H	M
52	0.94589	0.93826	M	M	1.01301	0.96905	M	M
53	1.16228	1.32020	H	H	1.20736	1.21416	H	H
54	1.01178	1.14737	M	H	0.95061	0.91270	M	L

contd. ..../-

(0)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
Uttar Pradesh (contd.)								
26	1.09180	1.12260	H	H	1.08929	1.12422	M	L
27	1.44784	1.43797	H	H	1.03835	1.08796	M	M
28	0.92159	0.92797	L	M	0.88959	0.83999	H	H
29	1.28006	1.28564	H	H	0.66163	0.71591	H	H
30	1.09552	1.11609	H	H	1.18826	1.06144	L	M
31	1.03340	1.09428	M	H	1.49977	1.17959	L	L
32	0.93287	1.00694	M	M	1.35032	1.17857	L	L
33	0.94144	0.98671	M	M	1.40816	1.03695	L	M
34	0.89015	0.94788	L	M	1.45374	1.17294	L	L
35	0.96994	0.99790	M	M	1.05843	0.85596	M	H
36	0.97600	1.01774	M	M	0.98901	0.89693	M	M
37	0.92066	0.97118	L	M	0.93921	0.84802	M	H
38	1.46077	1.51128	H	H	0.62416	0.76682	H	H
39	0.88952	0.94830	L	M	0.76623	0.70962	H	H
40	0.98899	1.04754	M	M	0.74158	0.78477	H	H
41	0.95214	0.99275	M	M	0.72967	0.77209	H	H
42	0.92330	0.96545	L	M	0.87642	0.75451	H	H
43	1.02288	1.06733	M	M	0.75552	0.68294	H	H
44	0.85969	0.90602	L	L	0.75757	0.68265	H	H
45	0.81134	0.87249	L	L	0.56232	0.63848	H	H
46	0.82333	0.86947	L	L	0.61494	0.72671	H	H
47	1.15295	1.20925	H	H	0.58659	0.73695	H	H
48	0.86010	0.90369	L	L	0.80489	0.91300	H	M
49	1.00401	1.06197	M	M	0.70052	0.73276	H	H
50	0.93811	1.00555	M	M	0.72188	0.81364	H	H
51	0.93224	0.97486	M	M	0.77283	0.72816	H	H
52	0.89886	0.95135	L	M	0.69639	0.76381	H	H
53	1.29922	1.30078	H	H	0.66474	0.77761	H	H
54	0.99383	0.95478	M	M	0.71567	0.72563	H	H

contd....... /-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
West Bengal					1.34489	1.35321	H	H
1	243.85	216.94	L	L	1.12197	1.15154	H	H
2	283.71	235.07	M	L	1.27335	1.23181	H	H
3	238.34	184.36	L	L	1.09910	0.98881	M	M
4	229.86	193.25	L	L	1.06286	1.03595	M	M
5	206.25	178.87	L	L	0.95449	0.95863	M	M
6	260.09	217.12	L	L	1.18644	1.15239	H	H
7	286.10	245.50	M	L	1.28176	1.27523	H	H
8	299.60	236.54	M	L	1.32787	1.23805	H	H
9	393.55	303.19	H	M	1.60061	1.48631	H	H
10	368.55	320.71	H	H	1.53499	1.54247	H	H
11	371.79	333.79	H	H	1.54375	1.58246	H	H
12	294.76	279.95	M	M	1.31156	1.40656	H	H
13	255.98	226.60	L	L	1.17052	1.19514	H	H
14	249.14	200.16	L	L	1.14343	1.07106	H	M
15	215.87	189.00	L	L	1.00009	1.01370	M	M
16	651.79	582.10	H	H	2.10513	2.13859	H	H
Meghalaya					0.85774	0.93110	L	M
1	271.94**	286.96**	M	M	0.94018	1.00932	M	M
2	220.87**	229.18**	L	L	0.66134	0.71236	L	L
Union Territories								
1	286.68**	317.85**	M	H	1.00807	1.13804	M	H
2	668.00	751.00	H	H	1.53150	1.80481	H	H
3	155.00	194.00	L	L	0.79849	0.91885	L	M
4	352.76**	442.36**	H	H	1.26600	1.53468	H	H
5	249.00	247.00	L	L	0.70315	0.89363	L	L
6	431.29**	486.98**	H	H	1.50512	1.64561	H	H
7	287.86**	334.18**	M	H	1.01332	1.19992	M	H
All-India					1.04343	1.09134	M	M

** Not adjusted to State-total which was not available.

contd......../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
West Bengal	1.42914	1.41821	H	H	1.29636	1.31448	H	H
1	0.98506	0.94348	M	M	1.19397	1.25996	H	H
2	1.50376	1.34243	H	H	1.15787	1.17748	H	H
3	1.34341	1.26762	H	H	0.97621	0.84809	M	L
4	1.30584	1.39206	H	H	0.94057	0.85579	M	L
5	1.07689	1.01965	M	M	0.89365	0.92911	L	M
6	1.43882	1.37031	H	H	1.05958	1.04308	M	M
7	1.41675	1.32784	H	H	1.21506	1.25064	H	H
8	1.17574	0.89733	H	M	1.40801	1.41442	H	H
9	1.59732	1.25871	H	H	1.60516	1.60531	H	H
10	1.75582	1.73492	H	H	1.42488	1.44688	H	H
11	2.06378	2.02631	H	H	1.28072	1.35835	H	H
12	1.94121	2.23845	H	H	0.99209	0.98398	M	M
13	1.48690	1.54269	H	H	1.01092	1.01964	M	M
14	1.48140	1.27092	H	H	0.97274	0.97083	M	M
15	1.06981	1.05695	M	M	0.96626	0.99341	M	M
16	-	-	-	-	2.15943	2.19453	H	H
Meghalaya	0.93885	1.00077	M	M	0.81280	0.89170	L	L
1	1.04292	1.10382	M	M	0.88935	0.96284	L	M
2	0.87347	0.90727	M	M	0.55410	0.61402	L	L
Union Territories								
1	1.12673	1.23610	M	H	0.94923	1.08997	M	H
2	1.04963	1.70173	M	H	1.78054	1.86074	H	H
3	0.85674	0.98656	L	M	0.77015	0.88589	L	L
4	1.50387	1.65794	H	H	1.14670	1.47443	H	H
5	0.29804	0.78502	L	L	0.91148	0.95074	L	M
6	-	-	-	-	1.52994	1.67733	H	H
7	-	-	-	-	1.01398	1.20974	M	H
All-India	0.99693	1.06245	M	M	1.06294	1.10167	M	H

contd......./-

(0)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
West Bengal	1.43340	1.41484	H	H	1.23619	1.22250	H	H
1	1.28130	1.38627	H	H	1.15428	1.21706	H	H
2	1.58247	1.55124	H	H	1.08802	1.11254	H	H
3	0.87660	0.41246	M	L	1.07300	1.01266	H	M
4	0.84425	0.39442	L	L	1.02740	0.97915	M	M
5	0.49719	0.59853	L	L	1.07894	1.01929	H	M
6	1.07249	1.04830	M	M	1.10330	1.03842	H	M
7	1.35638	1.44150	H	H	1.19904	1.18084	H	H
8	1.83654	1.75020	H	H	1.22915	1.24775	H	H
9	2.13393	2.12215	H	H	1.44831	1.44207	H	H
10	1.85705	1.85868	H	H	1.26485	1.27115	H	H
11	1.58930	1.78057	H	H	1.21201	1.20427	H	H
12	0.99860	0.92656	M	M	1.04155	1.01886	M	M
13	1.13935	1.14276	H	H	0.97843	0.94571	M	M
14	0.85547	0.88166	L	M	1.05679	1.01793	H	M
15	1.03698	1.02574	M	M	0.9[illegible]508	0.99409	M	M
16	2.43849	2.52742	H	H	1.96254	1.98196	H	H
Meghalaya	0.71477	0.71165	L	L	0.69669	0.88859	L	L
1	0.87237	0.80610	L	L	0.71276	0.95257	L	M
2	0.27574	0.23874	L	L	0.66775	0.72144	L	L
Union Territories								
1	1.16077	1.33332	H	H	0.86635	1.01379	L	M
2	1.89240	2.00678	H	H	1.60227	1.66995	H	H
3	0.25967	0.72875	L	L	0.86720	0.90089	L	L
4	0.80326	1.87383	L	H	1.35563	1.35002	H	H
5	0.74410	0.71566	L	L	1.01595	1.03102	M	M
6	1.77414	1.90598	H	H	1.50589	1.61974	H	H
7	0.70309	1.33520	L	H	1.25857	1.27657	H	H
All-India	1.10249	1.13843	M	H	1.03575	1.05231	M	M

contd.!....../-

(0)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
West Bengal	1.25789	1.32366	H	H	1.28360	1.16880	L	L
1	1.17050	1.21470	H	H	0.78882	0.76790	H	H
2	0.94775	0.99520	M	M	1.51130	1.39875	L	L
3	0.96277	0.99118	M	M	1.54743	1.34235	L	L
4	0.93286	1.04709	M	M	1.43081	1.54924	L	L
5	0.99616	1.06477	M	M	1.23903	1.02362	L	M
6	1.01742	1.04346	M	M	1.45139	1.24405	L	L
7	1.13949	1.18614	H	H	1.67319	1.79036	L	L
8	1.28048	1.33520	H	H	0.96224	0.65150	M	H
9	1.39800	1.41055	H	H	1.08615	0.69127	M	H
10	1.28041	1.32735	H	H	1.29973	1.11747	L	L
11	1.14202	1.21542	H	H	1.83759	1.50286	L	L
12	0.94945	0.99236	M	M	1.70093	1.95807	L	L
13	0.95622	1.00060	M	M	1.18955	1.20095	L	L
14	0.98026	0.98965	M	M	1.33408	1.05709	L	M
15	0.93012	0.97273	M	M	0.68[illegible]34	0.85631	H	H
16	2.13912	2.15292	H	H	-	-	-	-
Meghalaya	0.96449	1.00633	M	M	0.60290	0.57940	H	H
1	1.03772	1.06853	M	M	0.54170	0.51720	H	H
2	0.63893	0.76408	L	L	0.65850	0.64850	H	H
Union Territories								
1	0.88206	0.99775	L	M	1.23100	1.21830	L	L
2	1.84991	1.91859	H	H	1.06730	1.96010	M	L
3	1.01258	0.97213	M	M	0.83610	0.77700	H	H
4	1.19773	1.32259	H	H	1.16490	1.12050	L	L
5	0.93428	1.03461	M	M	0.32480	1.03970	H	M
6	1.39652	1.57975	H	H	-	-	-	-
7	1.01690	1.07940	M	H	-	-	-	-
All-India	1.05952	1.11710	M	H	1.00090	0.96570	M	M

A.6. Table (4.2) :- Values of concentration indices of labour in different category of factories

Districts Sl. No.	Values of concentration index of labour in all factories	small factories	large factories	large factories of food processing, tobacco products etc.	Levels of cols. (1)	(2)	(3)	(4)
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Andhra Pradesh	1.00753	0.99460	1.34810	2.71275	M	M	H	H
1	0.63343	0.66051	0.86958	2.41311	L	L	M	H
2	0.99063	0.90291	1.64823	1.47441	M	M	H	H
3	1.28932	1.38189	1.17633	2.63270	H	H	M	H
4	1.25526	1.33603	1.20006	2.59857	H	H	M	H
5	1.33474	1.47001	1.01656	2.38420	H	H	M	H
6	1.50458	1.11246	2.50772	7.10002	H	H	H	H
7	0.91271	0.41555	2.47973	8.47199	M	L	H	H
8	0.90077	1.05475	0.37506	0.32998	M	M	L	L
9	0.76245	0.87870	0.40033	1.01035	M	M	L	M
10	0.71197	0.86006	0.12433	0.00000	L	M	L	L
11	0.57513	0.65103	0.47645	0.23490	L	L	L	L
12	0.71672	0.73146	0.99195	1.69933	L	L	M	H
13	0.31543	0.36268	0.32841	0.30075	L	L	L	L
14	2.11773	1.57706	2.78579	2.35734	H	H	H	H
15	0.64526	0.64228	1.06117	0.00000	L	L	M	L
16	1.36102	1.58438	0.58195	1.88517	H	H	L	H
17	0.91871	0.95576	1.01645	0.00000	M	M	M	L
18	1.09372	1.28718	0.21637	0.00000	M	H	L	L
19	1.01579	1.11546	0.85774	0.93328	M	H	M	M
20	0.46942	0.56629	0.17062	0.00000	L	L	L	L
21	0.76208	0.90426	0.15474	0.63778	M	M	L	L
Assam	0.66153	0.58455	1.36132	3.37587	L	L	H	H
1	0.69890	0.73060	0.90159	0.00000	L	L	M	L
2	0.97261	1.07335	0.78843	0.42781	M	M	M	L
3	0.84389	0.82149	1.26988	3.90054	M	M	H	H
4	0.85842	0.28892	2.64067	5.99934	M	L	H	H
5	0.65471	0.67377	0.94513	2.56798	L	L	M	H

Note : L: Low, M: Medium and H : High

contd..../-

Dis-tricts Sl.No.	Values of concentration index of labour in large factories of basic metals and their products	large factories of tex-tiles and their products	large factories of chemical, chemical products and non-metallic mineral products	large fac-tories of misc. products	Levels of cols. (9)	(10)	(11)	(12)
(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Andhra Pradesh	1.18628	1.15456	1.20416	1.37399	H	H	H	H
1	1.19690	0.00000	0.00000	0.00000	H	L	L	L
2	2.27598	3.20863	1.64762	0.00000	H	H	H	L
3	1.05274	0.82533	0.47621	2.52917	M	M	L	H
4	0.54816	1.93270	0.52755	0.00000	L	H	L	L
5	1.01336	0.30824	1.25615	1.72449	M	L	H	H
6	0.70241	1.28752	1.75878	0.00000	L	H	H	L
7	0.25285	0.37119	0.00000	0.00000	L	L	L	L
8	0.00000	0.22429	1.71359	0.64604	L	L	H	L
9	0.38036	0.64745	0.00000	0.00000	L	L	L	L
10	0.00000	0.34876	0.47168	0.00000	L	L	L	L
11	0.00000	1.72474	0.00000	0.00000	L	H	L	L
12	0.30991	1.93475	0.71185	1.82950	L	H	L	H
13	0.20005	0.79363	0.65381	0.00000	L	M	L	L
14	3.53025	1.43807	3.28697	3.26597	H	H	H	H
15	3.14090	0.00000	0.00000	0.00000	H	L	L	L
16	0.27934	0.00000	0.00000	0.00000	L	L	L	L
17	0.00000	2.02645	1.28713	3.42384	L	H	H	H
18	0.16913	0.32270	0.92992	0.00000	L	L	M	L
19	0.22212	2.30801	0.00000	0.60526	L	H	L	L
20	0.00000	0.00000	0.52807	0.00000	L	L	L	L
21	0.21547	0.00000	0.00000	0.00000	L	L	L	L
Assam	0.94359	0.36731	1.47555	2.35402	M	L	H	H
1	2.10089	0.00000	2.04084	0.00000	H	L	H	L
2	1.24076	0.36817	1.76230	2.01727	H	L	H	H
3	0.00000	1.04084	0.00000	0.00000	L	M	L	L
4	1.64065	0.00000	3.25583	4.93171	H	L	H	H
5	0.00000	1.51405	0.00000	0.00000	L	H	L	L

contd. ..../

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Assam (cond.)								
6	0.64502	0.29351	2.31921	7.34456	L	L	H	H
7	0.00000	0.00000	0.00000	0.00000	L	L	L	L
8	0.08165	0.00000	2.87142	0.00000	L	L	H	L
9	0.66829	0.68504	0.96746	2.94386	L	L	M	H
Bihar	0.87345	0.77860	1.66472	1.15483	M	L	H	M
1	1.16195	0.56033	3.06781	0.00000	H	L	H	L
2	0.64127	0.73966	0.15933	0.46553	L	L	L	L
3	0.88221	0.79326	1.64754	1.40588	M	M	H	H
4	0.94065	0.99310	1.01306	2.90463	M	M	M	H
5	0.70385	0.70531	1.11632	3.49072	L	L	M	H
6	0.75537	0.83689	0.45109	1.55738	M	M	L	H
7	0.78295	0.80004	1.09181	2.02202	M	M	M	H
8	1.02620	1.00287	1.48413	0.82058	M	M	H	M
9	0.79921	0.90761	0.32703	0.00000	M	M	L	L
10	0.42890	0.14833	2.32104	0.81765	L	L	H	M
11	0.62034	0.63530	0.94526	0.836 7	L	L	M	M
12	0.57846	0.66601	0.30287	0.00000	L	L	L	L
13	0.35923	0.35871	0.78984	0.00000	L	L	M	L
14	0.56608	0.27381	2.15131	0.00000	L	L	H	L
15	0.90127	0.81173	1.49844	0.00000	M	M	H	L
16	1.86842	1.73760	2.21003	0.00000	H	H	H	L
17	1.87196	1.20251	2.67552	0.00000	H	H	H	L
Gujarat	1.50153	1.38101	1.72405	1.12720	H	H	H	M
1	1.34727	1.19402	1.59002	2.31601	H	H	H	H
2	1.57994	1.75983	1.05664	0.96388	H	H	M	M
3	1.17510	1.06781	1.47809	2.14492	H	M	H	H
4	1.29918	1.35466	1.20681	1.29609	H	H	M	H
5	0.75892	0.87334	0.49226	1.98099	M	M	L	H
6	1.14176	1.12658	1.37062	1.17446	H	H	H	H
7	0.52316	0.61258	0.40289	1.44350	L	L	L	H
8	0.45381	0.56869	0.00000	0.00000	L	L	L	L
9	0.70839	0.71651	1.02200	0.47476	L	L	M	L
10	1.20402	0.85550	2.28684	0.73455	H	M	H	L
11	1.78207	1.92299	1.40211	0.00000	H	H	H	L

contd. ..../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Assam (contd.)								
6	0.25710	0.00000	0.00000	3.55917	L	L	L	H
7	0.00000	0.00000	0.00000	0.00000	L	L	L	L
8	0.00000	0.00000	0.00000	21.38830	L	L	L	H
9	0.57403	0.37368	0.00000	1.05105	L	L	L	M
Bihar	2.94147	0.72440	2.81611	1.57953	H	L	H	H
1	1.67407	1.70615	1.09853	3.50586	H	H	M	H
2	0.00000	0.00000	0.00000	1.13625	L	L	L	M
3	1.56967	0.96727	3.11879	4.82060	H	M	H	H
4	0.85603	0.00000	0.00000	0.00000	M	L	L	L
5	0.75843	0.00000	0.00000	0.00000	M	L	L	L
6	0.00000	0.00000	0.00000	0.00000	L	L	L	L
7	0.86241	2.06675	0.00000	0.00000	M	H	L	L
8	3.22564	0.00000	2.38340	1.44717	H	L	H	H
9	0.00000	0.91446	0.00000	0.00000	L	M	L	L
10	4.70630	0.00000	6.11393	0.00000	H	L	H	L
11	0.00000	3.00183	0.00000	0.00000	L	H	L	L
12	0.00000	0.00000	1.91185	0.00000	L	L	H	L
13	0.00000	0.00000	4.87921	0.00000	L	L	H	L
14	0.94584	0.23824	11.02612	0.00000	M	L	H	L
15	3.80460	0.58093	1.56565	0.54640	H	L	H	L
16	2.54739	0.00000	7.05869	0.00000	H	L	H	L
17	6.95820	0.00000	1.91205	0.00000	H	L	H	L
Gujarat	1.43781	3.86943	2.35237	1.38610	H	H	H	H
1	0.77326	1.35906	4.79341	0.82400	M	H	H	M
2	1.28790	1.67576	1.95083	1.54518	H	H	H	H
3	0.86690	2.88938	2.39659	0.00000	M	H	H	L
4	1.23678	2.23761	1.81655	1.47651	H	H	H	H
5	0.00000	0.00000	0.00000	0.00000	L	L	L	L
6	0.79792	2.21859	3.76849	0.00000	M	H	H	L
7	0.19921	0.35084	0.00000	0.00000	L	L	L	L
8	0.00000	0.00000	0.00000	0.00000	L	L	L	L
9	0.34237	3.34260	0.00000	0.00000	L	H	L	L
10	0.93647	7.28388	0.79074	0.00000	M	H	L	L
11	0.00000	1.25323	2.52979	4.96490	L	H	H	H

contd...../-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Gujarat (contd.)								
12	3.59912	2.76061	2.89329	1.15558	H	H	H	M
13	1.45024	1.49638	1.47482	1.91711	H	H	H	H
14	0.48202	0.41812	1.31336	0.49018	L	L	H	L
15	1.84740	1.35894	2.56464	0.86775	H	H	H	M
16	0.83178	0.78059	1.33166	0.00000	M	L	H	L
17	2.36031	2.66083	1.38498	1.11169	H	H	H	M
18	1.78422	1.75156	1.83766	1.03690	H	H	H	M
19	0.04765	0.06402	0.00000	0.00000	L	L	L	L
Haryana	1.30960	1.19760	1.74621	0.95615	H	H	H	M
1	1.88325	1.57999	2.28115	2.09409	H	H	H	H
2	1.15713	1.12166	1.50381	0.97526	H	H	H	M
3	1.22419	1.21160	1.47411	1.09317	H	H	H	M
4	1.89529	1.50750	2.37917	0.00000	H	H	H	L
5	0.66112	0.78649	0.16512	0.00000	L	L	L	L
6	1.03877	1.02834	1.28834	0.00000	M	M	H	L
7	0.78110	0.91930	0.19484	0.98015	M	M	L	M
Himachal Pradesh	0.34785	0.25051	1.33423	0.49194	L	L	H	L
1	0.17557	0.23476	0.00000	0.00000	L	L	L	L
2	0.53770	0.49825	1.14428	0.00000	L	L	M	L
3	0.38537	0.00000	3.63384	0.00000	L	L	H	L
4	0.15613	0.20693	0.00000	0.00600	L	L	L	L
5	0.03306	0.04666	0.00000	0.00000	L	L	L	L
6	0.47476	0.57224	0.00000	0.00000	L	L	L	L
7	0.38078	0.00000	3.36825	2.61534	L	L	H	H
8	0.86329	1.01400	0.30444	0.00000	M	M	L	L
9	0.58049	0.62027	0.73184	0.00000	L	L	M	L
10	0.05895	0.08185	0.00000	0.00000	L	L	L	L
Jammu and Kashmir	0.33803	0.36559	0.52605	0.10234	L	L	L	L
1	0.43581	0.44425	0.79974	0.00000	L	L	M	L
2	1.53101	1.46919	1.76528	0.88019	H	H	H	M

contd......... /-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Gujarat (contd.)								
12	2.50019	7.17733	2.14954	2.52948	H	H	H	H
13	2.03867	2.05954	2.44789	0.00000	H	H	H	L
14	3.83701	0.37246	0.00000	0.00000	H	L	L	L
15	3.06911	3.09397	4.81911	2.29159	H	H	H	H
16	0.38077	4.30182	1.03661	0.00000	L	H	M	L
17	1.04024	2.56603	2.51281	1.91161	M	H	H	H
18	1.28161	3.29942	3.71536	3.08912	H	H	H	H
19	0.00000	0.00000	0.00000	0.00000	L	L	L	L
Haryana	2.85517	1.99481	1.48731	3.00131	H	H	H	H
1	4.12140	0.00000	2.16272	5.27931	H	L	H	H
2	0.00000	0.62645	0.00000	1.28336	L	L	L	H
3	2.79400	1.20892	2.09139	2.26103	H	H	H	H
4	4.70949	2.30331	2.31078	3.95119	H	H	H	H
5	0.59103	0.00000	0.00000	0.00000	L	L	L	L
6	0.24063	4.15332	0.00000	0.00000	L	H	L	L
7	0.00000	0.00000	0.00000	0.00000	L	L	L	L
Himachal Pradesh	2.32491	0.00000	1.33009	0.58271	H	L	H	L
1	0.00000	0.00000	0.00000	0.00000	L	L	L	L
2	2.52504	0.00000	1.61056	1.30893	H	L	H	H
3	10.10962	0.00000	3.76531	0.00000	H	L	H	L
4	0.00000	0.00000	0.00000	0.00000	L	L	L	L
5	0.00000	0.00000	0.00000	0.00000	L	L	L	L
6	0.00000	0.00000	0.00000	0.00000	L	L	L	L
7	0.00000	0.00000	2.67195	0.00000	L	L	H	L
8	0.00000	0.00000	0.00000	2.31216	L	L	L	H
9	2.31171	0.00000	0.00000	0.00000	H	L	L	L
10	0.00000	0.00000	0.00000	0.00000	L	L	L	L
Jammu and Kashmir	0.15026	1.24674	0.30982	0.63746	L	H	L	L
1	0.00000	0.00000	3.39192	2.63817	L	L	H	H
2	1.15291	3.29688	0.00000	2.19768	M	H	L	H

contd....../-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Jammu and Kashmir (contd.)								
3	0.32265	0.40786	0.00000	0.00000	L	L	L	L
4	0.02327	0.03300	0.00000	0.00000	L	L	L	L
5	0.06573	0.08959	0.00000	0.00000	L	L	L	L
6	0.25612	0.33100	0.00000	0.00000	L	L	L	L
7	1.05158	1.20525	0.60291	0.81246	M	H	L	L
8	0.52849	0.38857	1.51625	0.00000	L	L	H	L
9	0.14506	0.19088	0.00000	0.00000	L	L	L	L
10	0.08340	0.11050	0.00000	0.00000	L	L	L	L
Karnataka	1.17627	1.19141	1.31590	1.27243	H	H	H	H
1	2.78580	2.55621	2.45150	2.17238	H	H	H	H
2	1.08704	1.13698	1.15265	1.33837	M	H	M	H
3	0.85566	0.92068	0.86617	1.67304	M	M	M	H
4	0.70753	0.83752	0.22232	1.09072	L	M	L	M
5	0.72543	0.84890	0.36180	0.2478	L	M	L	L
6	0.68545	0.83851	0.07938	0.00000	L	M	L	L
7	1.04728	0.99062	1.45821	0.98259	M	M	H	M
8	0.71839	0.88421	0.00000	0.00000	L	M	L	L
9	1.06554	1.09854	1.19809	0.56816	M	M	M	L
10	0.84113	0.89150	0.91388	0.35281	M	M	M	L
11	0.68785	0.80944	0.25646	0.00000	L	M	L	L
12	0.88871	1.03537	0.33447	1.08666	M	M	L	M
13	0.85713	0.87592	1.12094	2.79111	M	M	M	H
14	1.13573	1.12479	1.39182	0.00000	H	H	H	L
15	0.97615	1.05404	0.88917	0.36442	M	M	M	L
16	0.58033	0.67918	0.33464	1.14363	L	L	L	M
17	1.12440	0.98329	1.66732	0.85116	M	M	H	M
18	1.67228	1.84793	1.20235	2.60446	H	H	M	H
19	0.66663	0.78534	0.23813	0.00000	L	L	L	L

contd....../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Jammu and Kashmir (contd.)								
3	0.00000	0.00000	0.00000	0.00000	L	L	L	L
4	0.00000	0.00000	0.00000	0.00000	L	L	L	L
5	0.00000	0.00000	0.00000	0.00000	L	L	L	L
6	0.00000	0.00000	0.00000	0.00000	L	L	L	L
7	0.00000	1.06491	0.00000	2.28472	L	M	L	H
8	0.94102	5.43035	0.00000	0.00000	M	H	L	L
9	0.00000	0.00000	0.00000	0.00000	L	L	L	L
10	0.00000	0.00000	0.00000	0.00000	L	L	L	L
Karnataka	1.98963	1.58792	1.52512	1.91361	H	H	H	H
1	3.87986	2.70425	2.54364	3.30939	H	H	H	H
2	1.00360	2.63777	0.76528	0.00000	M	H	L	L
3	1.56426	0.42969	0.00000	1.07770	H	L	L	M
4	0.00000	0.00000	0.00000	0.00000	L	L	L	L
5	0.83277	0.50561	0.00000	0.00000	M	L	L	L
6	0.00000	0.00000	0.70320	0.00000	L	L	L	L
7	1.49016	3.80559	0.00000	0.00000	H	H	L	L
8	0.00000	0.00000	0.00000	0.00000	L	L	L	L
9	2.45255	1.44977	0.00000	1.79744	H	H	L	H
10	1.03843	1.53423	2.12073	0.81136	M	H	H	M
11	0.86486	0.00000	0.00000	0.00000	M	L	L	L
12	0.51414	0.00000	0.00000	0.00000	L	L	L	L
13	0.00000	0.00000	1.51335	2.88438	L	L	H	H
14	1.73973	2.92314	0.97073	2.40515	H	H	M	H
15	0.43376	0.00000	1.01705	4.46475	L	L	M	H
16	0.00000	0.23690	0.00000	0.98331	L	L	L	M
17	3.87376	0.00000	0.00000	3.39801	H	L	L	H
18	0.76561	0.00000	2.53236	1.73751	M	L	H	H
19	0.00000	0.00000	1.58181	0.00000	L	L	H	L

contd....../-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Kerala	2.21270	2.23377	1.79287	3.67185	H	H	H	H
1	2.15792	2.50291	1.07925	1.60194	H	H	M	H
2	2.00699	2.16354	1.58164	2.24927	H	H	H	H
3	1.57553	1.85203	0.00000	0.00000	H	H	L	L
4	1.59280	1.81736	0.82168	0.95552	H	H	M	M
5	2.34370	2.66580	1.37422	2.11067	H	H	H	H
6	2.62736	2.90414	1.75016	1.81608	H	H	H	H
7	1.41218	1.63432	0.59893	0.00000	H	H	L	L
8	2.22031	2.48060	1.45738	3.05686	H	H	H	H
9	2.75015	1.85349	3.16658	8.50381	H	H	H	H
10	2.35246	2.38499	2.18418	2.62807	H	H	H	H
Madhya Pradesh	0.67273	0.67510	0.99523	0.40946	L	L	M	L
1	0.42862	0.51903	0.20489	0.00000	L	L	L	L
2	0.49139	0.59921	0.00000	0.00000	L	L	L	L
3	2.00916	1.92277	1.81009	1.04073	H	H	H	M
4	0.45073	0.55736	0.00000	0.00000	L	L	L	L
5	0.29312	0.37775	0.00000	0.00000	L	L	L	L
6	0.36777	0.46941	0.00000	0.00000	L	L	L	L
7	0.26333	0.33269	0.00000	0.00000	L	L	L	L
8	0.28792	0.36673	0.00000	0.00000	L	L	L	L
9	0.15370	0.20202	0.00000	0.00000	L	L	L	L
10	0.79367	0.81952	1.00097	0.00000	M	M	M	L
11	0.42538	0.51937	0.00000	0.00000	L	L	L	L
12	0.36735	0.30328	1.16971	0.00000	L	L	M	L
13	0.12650	0.16588	0.00000	0.00000	L	L	L	L
14	0.68447	0.80574	0.33110	0.76736	L	M	L	L
15	0.97920	0.97151	1.24930	1.56171	M	M	H	H
16	1.57466	1.34928	1.95474	0.65339	H	H	H	L
17	0.17200	0.22321	0.00000	0.00000	L	L	L	L
18	0.34396	0.15280	1.86732	0.00000	L	L	H	L
19	2.59377	2.40077	2.19978	1.14271	H	H	H	M
20	0.56857	0.55087	1.00958	0.00000	L	L	M	L
21	0.42499	0.35005	1.25777	1.72253	L	L	H	H
22	0.95516	1.14366	0.36116	0.46918	M	H	L	L

contd....../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Kerala	1.24567	1.52709	3.42275	2.55833	H	H	H	H
1	0.00000	1.89480	1.15564	2.61263	L	H	M	H
2	0.77419	1.56203	3.64155	3.33696	M	H	H	H
3	0.00000	0.00000	0.00000	0.00000	L	L	L	L
4	1.14918	1.12838	1.17822	1.87312	M	H	M	H
5	0.94499	2.53754	1.25394	0.00000	M	H	H	L
6	2.43294	1.55489	3.87735	2.57836	H	H	H	H
7	0.29793	0.41887	1.30504	2.56490	L	L	H	H
8	0.90428	1.71782	0.00000	2.11504	M	H	L	H
9	1.28758	1.05555	1.91792	2.57086	H	M	H	H
10	1.56882	1.53444	1.71518	3.63368	H	H	H	H
Madhya Pradesh	1.37633	1.75964	1.16393	1.16117	H	H	M	H
1	0.00000	0.00000	1.53192	0.00000	L	L	H	L
2	0.00000	0.00000	0.00000	0.00000	L	L	L	L
3	1.55720	4.47102	1.03135	1.62416	H	H	M	H
4	0.00000	0.00000	0.00000	0.00000	L	L	L	L
5	0.00000	0.00000	0.00000	0.00000	L	L	L	L
6	0.00000	0.00000	0.00000	0.00000	L	L	L	L
7	0.00000	0.00000	0.00000	0.00000	L	L	L	L
8	0.00000	0.00000	0.00000	0.00000	L	L	L	L
9	0.00000	0.00000	0.00000	0.00000	L	L	L	L
10	1.25921	0.00000	3.92977	0.00000	H	L	H	L
11	0.00000	0.00000	0.00000	0.00000	L	L	L	L
12	0.00000	0.00000	0.84705	7.49791	L	L	M	H
13	0.00000	0.00000	0.00000	0.00000	L	L	L	L
14	0.00000	0.34932	1.15535	0.00000	L	L	M	L
15	0.00000	3.17934	1.00108	1.58251	L	H	M	H
16	0.90155	5.07630	3.03210	0.00000	M	H	H	L
17	0.00000	0.00000	0.00000	0.00000	L	L	L	L
18	0.00000	8.06599	0.00000	0.00000	L	H	L	L
19	1.26803	5.64497	1.41279	1.82398	H	H	H	H
20	2.12249	1.89942	0.00000	0.00000	H	H	L	L
21	0.00000	0.90209	0.00000	5.76376	L	M	L	H
22	0.00000	1.01514	0.48964	0.00000	L	M	L	L

contd......../-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Madhya Pradesh (contd.)								
23	0.40237	0.49990	0.00000	0.00000	L	L	L	L
24	0.39411	0.49122	0.00000	0.00000	L	L	L	L
25	0.40915	0.50297	0.11224	0.00000	L	L	L	L
26	1.46764	1.35911	1.66921	0.95446	H	H	H	M
27	0.29563	0.38096	0.00000	0.00000	L	L	L	L
28	0.57600	0.61625	0.71856	0.00000	L	L	M	L
29	0.21927	0.28168	0.00000	0.00000	L	L	L	L
30	0.72469	0.89353	0.00000	0.00000	L	M	L	L
31	0.38851	0.44169	0.42701	1.95447	L	L	L	H
32	1.62918	1.66055	1.50587	0.00000	H	H	H	L
33	0.51527	0.64103	0.00000	0.00000	L	L	L	L
34	0.12602	0.16518	0.00000	0.00000	L	L	L	L
35	0.32979	0.41698	0.00000	0.00000	L	L	L	L
36	0.20976	0.26963	0.00000	0.00000	L	L	L	L
37	0.37364	0.46228	0.00000	0.00000	L	L	L	L
38	0.15919	0.11867	1.05628	4.70611	L	L	M	H
39	0.44174	0.52691	0.16363	0.00000	L	L	L	L
40	0.37324	0.46645	0.00000	0.00000	L	L	L	L
41	1.08290	0.79505	2.12039	0.00000	M	M	H	L
42	0.59853	0.70030	0.27764	0.00000	L	L	L	L
43	0.11338	0.15219	0.00000	0.00000	L	L	L	L
Maharashtra	1.67444	1.66440	1.63499	1.40798	H	H	H	H
1	5.75588	5.43754	3.97963	3.88949	H	H	H	H
2	2.77523	2.58396	2.27476	1.38725	H	H.	H	H
3	0.71425	0.58266	1.66209	0.61469	L	L	H	L
4	0.66741	0.78249	0.26815	0.91783	L	L	L	M
5	1.52786	1.68896	1.09891	1.41583	H	H	M	H
6	0.78579	0.85735	0.76397	1.01001	M	M	M	M
7	0.95143	1.01208	0.98928	1.05782	M	M	M	M
8	1.01133	1.03273	1.17609	3.49895	M	M	M	H
9	2.11714	2.07296	1.86237	1.41754	H	H	H	H
10	0.94704	0.96495	1.15747	1.79621	M	M	M	H
11	1.21354	1.38744	0.71624	1.19604	H	H	M	H
12	1.56633	1.64554	1.34265	1.89015	H	H	H	H

contd....../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Madhya Pradesh (contd.)								
23	0.00000	0.00000	0.00000	0.00000	L	L	L	L
24	0.00000	0.00000	0.00000	0.00000	L	L	L	L
25	0.00000	0.00000	0.00000	1.23752	L	L	L	H
26	3.60263	1.14211	0.82570	2.85437	H	H	M	H
27	0.00000	0.00000	0.00000	0.00000	L	L	L	L
28	0.00000	0.30207	0.00000	4.56716	L	L	L	H
29	0.00000	0.00000	0.00000	0.00000	L	L	L	L
30	0.00000	0.00000	0.00000	0.00000	L	L	L	L
31	0.00000	0.00000	0.00000	0.00000	L	L	L	L
32	1.31450	0.00000	3.54188	1.02054	H	L	H	M
33	0.00000	0.00000	0.00000	0.00000	L	L	L	L
34	0.00000	0.00000	0.00000	0.00000	L	L	L	L
35	0.00000	0.00000	0.00000	0.00000	L	L	L	L
36	0.00000	0.00000	0.00000	0.00000	L	L	L	L
37	0.00000	0.00000	0.00000	0.00000	L	L	L	L
38	0.00000	0.00000	0.00000	0.00000	L	L	L	L
39	0.00000	0.70820	0.00000	0.00000	L	L	L	L
40	0.00000	0.00000	0.00000	0.00000	L	L	L	L
41	5.19638	1.67534	1.75803	0.00000	H	H	H	L
42	0.70354	0.00000	0.81658	0.00000	L	L	M	L
43	0.00000	0.00000	0.00000	0.00000	L	L	L	L
Maharashtra	2.36731	2.28671	2.39802	2.42139	H	H	H	H
1	5.72250	5.50519	5.80244	6.25348	H	H	H	H
2	3.33876	2.65806	4.60956	2.75901	H	H	H	H
3	2.09529	0.00000	5.21493	2.86935	H	L	H	H
4	0.42262	0.00000	0.00000	0.00000	L	L	L	L
5	1.06608	0.00000	0.00000	4.25090	M	L	L	H
6	0.18975	2.08656	0.46077	0.00000	L	H	L	L
7	0.20201	2.52603	1.28724	0.00000	L	H	H	L
8	0.63652	0.36574	0.73130	0.00000	L	L	L	L
9	3.51348	1.40933	2.49858	3.11525	H	H	H	H
10	2.50869	0.43626	0.00000	0.00000	H	L	L	L
11	0.57537	1.54457	0.00000	0.00000	L	H	L	L
12	0.82291	3.02761	0.81570	0.00000	M	H	M	L

contd....../-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Maharashtra (contd.)								
13	1.59250	1.72635	1.27502	2.35678	H	H	H	H
14	0.49942	0.55735	0.51257	0.00000	L	L	L	L
15	0.38290	0.46829	0.06381	0.00000	L	L	L	L
16	0.30545	0.38323	0.00000	0.00000	L	L	L	L
17	0.76745	0.90920	0.24758	0.57285	M	M	L	L
18	0.58819	0.67949	0.37763	1.21032	L	L	L	H
19	0.56992	0.66035	0.32357	0.00000	L	L	L	L
20	0.74813	0.80355	0.81317	1.03376	L	M	M	M
21	0.77704	0.85873	0.69436	0.00000	M	M	M	L
22	0.53604	0.62727	0.30134	0.00000	L	L	L	L
23	0.92288	0.84569	1.47843	0.00000	M	M	H	L
24	1.69413	1.81181	1.36911	1.77708	H	H	H	H
25	0.98789	1.15374	0.23839	0.37945	M	H	L	L
26	0.50010	0.51737	0.77443	0.00000	L	L	M	L
Orissa	0.60669	0.54786	1.27073	0.23177	L	L	H	L
1	0.79625	0.67281	1.53792	0.74125	M	L	H	L
2	1.62787	1.22868	2.18057	0.00000	H	H	H	L
3	0.36815	0.39704	0.57921	0.00000	L	L	L	L
4	0.25852	0.03393	2.22159	0.00000	L	L	H	L
5	0.56459	0.67232	0.00000	0.00000	L	L	L	L
6	0.95031	0.93383	1.37291	0.00000	M	M	H	L
7	0.35358	0.44334	0.00000	0.00000	L	L	L	L
8	0.11719	0.15561	0.00000	0.00000	L	L	L	L
9	0.38421	0.46573	0.09871	0.00000	L	L	L	L
10	0.26906	0.34242	0.00000	0.00000	L	L	L	L
11	0.33185	0.36312	0.51952	0.27545	L	L	L	L
12	0.58492	0.66183	0.45326	0.66782	L	L	L	L
13	0.62771	0.02629	2.81615	0.00000	L	L	H	L
Punjab	1.55116	1.66076	1.31108	1.13083	H	H	H	M
1	1.51966	1.65111	1.22600	1.16322	H	H	H	H
2	2.00781	2.25017	1.29171	1.13108	H	H	H	M
3	0.86132	0.94194	0.79154	0.60089	M	M	M	L
4	2.49998	2.87438	1.33474	0.94197	H	H	H	M

contd..../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Maharashtra (contd.)								
13	1.51500	1.82052	0.86709	1.00176	H	H	M	M
14	0.99876	0.95949	0.00000	0.69399	M	M	L	L
15	0.00000	0.29757	0.00000	0.00000	L	L	L	L
16	0.00000	0.00000	0.00000	0.00000	L	L	L	L
17	0.23287	0.49653	0.00000	0.00000	L	L	L	L
18	0.00000	0.66267	0.00000	0.00000	L	L	L	L
19	0.00000	1.01546	0.74431	0.00000	L	M	L	L
20	0.26153	2.28864	0.00000	0.00000	L	H	L	L
21	0.17353	2.07366	0.99485	0.00000	L	H	M	L
22	0.00000	1.07292	0.44431	0.00000	L	M	L	L
23	0.00000	5.02860	0.00000	0.00000	L	H	L	L
24	1.45584	2.13974	1.79266	2.73355	H	H	H	H
25	0.38689	0.00000	0.00000	1.24662	L	L	L	H
26	0.00000	0.00000	1.44145	4.46174	L	L	H	H
Orissa	1.84528	0.82264	1.81184	2.1896	H	M	H	H
1	1.23996	1.78023	2.30027	4.84237	H	H	H	H
2	5.55224	0.00000	2.33953	0.00000	H	L	H	L
3	2.00088	0.00000	0.00000	0.00000	H	L	L	L
4	0.00000	0.00000	13.92952	0.00000	L	L	H	L
5	0.00000	0.00000	0.00000	0.00000	L	L	L	L
6	1.07471	2.36501	2.24207	3.52085	M	H	H	H
7	0.00000	0.00000	0.00000	0.00000	L	L	L	L
8	0.00000	0.00000	0.00000	0.00000	L	L	L	L
9	0.00000	0.00000	0.84150	0.00000	L	L	M	L
10	0.00000	0.00000	0.00000	0.00000	L	L	L	L
11	0.68088	0.00000	0.00000	2.52524	L	L	L	H
12	0.47232	0.26162	1.55828	0.00000	L	L	H	L
13	0.22802	0.00000	0.00000	1.40717	L	L	L	H
Punjab	1.63813	1.86323	1.05420	1.04959	H	H	M	M
1	1.29353	2.64596	0.94750	0.00000	H	H	M	L
2	1.88947	2.13098	0.81960	1.53924	H	H	M	H
3	0.00000	2.44365	0.00000	0.00000	L	H	L	L
4	1.95477	2.33162	0.83311	1.69551	H	H	M	H

contd...../-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Punjab (contd.)								
5	2.26641	2.58933	1.28165	1.39942	H	H	H	H
6	1.99456	1.93044	1.88999	1.73497	H	H	H	H
7	1.08570	1.25932	0.45316	0.00000	M	H	L	L
8	1.45374	1.45913	1.54601	1.31164	H	H	H	H
9	1.45053	0.59901	3.05095	2.11678	H	L	H	H
10	0.89205	1.04500	0.23262	1.09658	M	M	L	M
11	0.80241	0.94476	0.23955	0.00000	M	M	L	L
Rajasthan	0.61007	0.62766	0.84769	0.32530	L	L	M	L
1	0.64621	0.70307	0.68617	1.02870	L	L	L	M
2	0.46546	0.46716	0.71133	0.00000	L	L	M	L
3	0.37977	0.49476	0.00000	0.00000	L	L	L	L
4	0.57247	0.70424	0.00000	0.00000	L	L	L	L
5	0.54182	0.66189	0.00000	0.00000	L	L	L	L
6	0.65196	0.68880	0.82483	0.00000	L	L	M	L
7	0.56208	0.69489	0.00000	0.00000	L	L	L	L
8	1.17667	0.98505	1.88286	1.37479	H	M	H	H
9	0.64380	0.79425	0.00000	0.00000	L	M	L	L
10	1.15683	0.96129	1.85102	0.00000	H	M	H	L
11	0.56393	0.70512	0.00000	0.00000	L	L	L	L
12	0.09824	0.13849	0.00000	0.00000	L	L	L	L
13	0.65019	0.65419	0.88648	0.00000	L	L	M	L
14	0.47575	0.59308	0.08630	0.00000	L	L	L	L
15	0.79876	0.79417	1.06152	0.00000	M	M	M	L
16	0.17218	0.23277	0.00000	0.00000	L	L	L	L
17	0.28727	0.37264	0.00000	0.00000	L	L	L	L
18	0.51923	0.65651	0.00000	0.00000	L	L	L	L
19	0.63792	0.61421	1.11014	0.49566	L	L	M	L
20	0.48862	0.57197	0.32650	0.75724	L	L	L	L
21	0.48862	0.57197	0.32650	0.75724	L	L	L	L
22	0.35787	0.44672	0.00000	0.00000	L	L	L	L
23	0.28896	0.36489	0.00000	0.00000	L	L	L	L
24	0.66275	0.67952	0.90075	1.01292	L	L	M	M
25	1.08000	1.00298	1.41413	0.00000	M	M	H	L
26	0.56534	0.59178	0.78897	0.00000	L	L	M	L

contd..../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Punjab (contd.)								
5	2.68773	0.00000	0.00000	0.00000	H	L	L	L
6	1.70689	4.51545	0.00000	0.00000	H	H	L	L
7	1.29558	0.00000	0.00000	0.00000	H	L	L	L
8	2.01528	0.00000	4.56334	0.00000	H	L	H	L
9	2.24734	2.08925	0.00000	2.04722	H	H	L	H
10	0.00000	0.00000	0.00000	0.00000	L	L	L	L
11	0.29804	0.29242	0.00000	1.31652	L	L	L	H
Rajasthan	1.22473	1.24747	0.85871	0.31058	H	H	M	L
1	0.21367	1.99512	0.00000	0.00000	L	H	L	L
2	2.06644	0.49996	0.00000	0.67362	H	L	L	L
3	0.00000	0.00000	0.00000	0.00000	L	L	L	L
4	0.00000	0.00000	0.00000	0.00000	L	L	L	L
5	0.00000	0.00000	0.00000	0.00000	L	L	L	L
6	2.35657	0.00000	0.75132	0.00000	H	L	L	L
7	0.00000	0.00000	0.00000	0.00000	L	L	L	L
8	2.16321	1.26822	0.83712	1.29253	H	H	M	H
9	0.00000	0.00000	0.00000	0.00000	L	L	L	L
10	3.62725	2.92231	0.00000	1.08584	H	H	L	M
11	0.00000	0.00000	0.00000	0.00000	L	L	L	L
12	0.00000	0.00000	0.00000	0.00000	L	L	L	L
13	2.45417	0.64482	0.00000	0.75102	H	L	L	M
14	0.00000	0.00000	0.75278	0.00000	L	L	L	L
15	0.00000	3.87041	0.00000	0.00000	L	H	L	L
16	0.00000	0.00000	0.00000	0.00000	L	L	L	L
17	0.00000	0.00000	0.00000	0.00000	L	L	L	L
18	0.00000	0.00000	0.00000	0.00000	L	L	L	L
19	0.00000	3.82599	0.64629	0.00000	L	H	L	L
20	0.93709	0.75300	2.19350	0.56759	M	L	H	L
21	0.00000	0.00000	1.52866	0.00000	L	L	H	L
22	0.00000	0.00000	0.00000	0.00000	L	L	L	L
23	0.00000	0.00000	0.00000	0.00000	L	L	L	L
24	0.00000	0.00000	4.34043	0.00000	L	L	H	L
25	2.32898	1.84785	3.03686	0.00000	H	H	H	L
26	0.00000	3.03768	0.00000	0.00000	L	H	L	L

contd......../-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tamil Nadu	1.74240	1.74610	1.77655	1.46556	H	H	H	H
1	4.56962	4.49767	3.78773	3.35994	H	H	H	H
2	2.05349	1.86138	2.27373	1.18262	H	H	H	H
3	1.51599	1.67956	1.09355	1.45438	H	H	M	H
4	1.06470	1.06175	1.41526	2.22408	M	M	H	H
5	0.64583	0.77367	0.00000	0.00000	L	L	L	L
6	1.86818	2.06848	1.31728	1.16533	H	H	H	H
7	2.14316	2.12280	1.97753	1.31756	H	H	H	H
8	1.51453	0.00000	10.55016	1.86834	H	L	H	H
9	1.58940	1.73822	1.23453	1.39846	H	H	H	H
10	1.55679	1.70136	1.21504	1.22235	H	H	H	H
11	1.20495	1.34451	0.76828	1.42605	H	H	M	H
12	1.64891	1.82115	1.18820	0.00000	H	H	M	L
13	1.84306	1.90093	1.67166	1.59239	H	H	H	H
14	1.91219	2.02333	1.68577	3.65174	H	H	H	H
Uttar pradesh	1.02203	1.01522	1.37867	1.97156	M	M	H	H
1	0.18384	0.24624	0.00000	0.00000	L	L	L	L
2	0.07860	0.10537	0.00000	0.00000	L	L	L	L
3	0.20492	0.26022	0.00000	0.00000	L	L	L	L
4	0.24934	0.31394	0.00000	0.00000	L	L	L	L
5	0.10311	0.13780	0.00000	0.00000	L	L	L	L
6	0.26609	0.33541	0.00000	0.00000	L	L	L	L
7	0.99750	1.09982	0.82809	2.56347	M	M	M	H
8	1.25820	1.32355	1.25191	2.83945	H	H	H	H
9	1.36850	1.53203	0.88792	2.03312	H	H	M	H
10	0.69191	0.79307	0.26435	0.00000	L	M	L	L
11	1.41805	1.47442	1.43702	2.55508	H	H	H	H
12	1.37404	1.17652	2.18402	2.60646	H	H	H	H
13	0.86323	0.82522	1.36816	4.53836	M	M	H	H
14	0.95345	1.08907	0.44116	1.67992	M	M	L	H
15	1.34449	1.23493	1.77208	1.66038	H	H	H	H
16	1.44051	1.40100	1.74710	3.65431	H	H	H	H
17	1.25160	1.28655	1.39899	3.62910	H	H	H	H
18	1.92538	1.79746	2.20328	3.24991	H	H	H	H

contd....../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Tamil Nadu	2.17101	2.52303	2.24375	2.51426	H	H	H	H
1	6.14472	4.53569	4.30704	6.91943	H	H	H	H
2	4.26454	1.18984	3.52460	3.94168	H	H	H	H
3	1.13427	1.26782	1.82842	2.81872	M	H	H	H
4	0.88227	0.82494	3.44191	1.40063	M	M	H	H
5	0.00000	0.00000	0.00000	0.00000	L	L	L	L
6	1.00783	2.08469	2.56181	2.78883	M	H	H	H
7	1.97069	4.45921	1.50946	1.67617	H	H	H	H
8	2.14645	0.00000	1.09013	0.00000	H	L	M	L
9	1.28886	2.30196	1.00044	2.13569	H	H	M	H
10	2.01194	1.48191	1.92753	0.97774	H	H	H	M
11	1.17428	0.80498	0.73798	0.00000	M	M	L	L
12	0.16581	1.93468	3.24104	1.65753	L	H	H	H
13	0.44156	3.75462	2.33876	1.40003	L	H	H	H
14	1.67875	1.75635	0.00000	0.00000	H	H	L	L
Uttar Pradesh	1.66740	1.70176	1.72302	1.72926	H	H	H	H
1	0.00000	0.00000	0.00000	0.00000	L	L	L	L
2	0.00000	0.00000	0.00000	0.00000	L	L	L	L
3	0.00000	0.00000	0.00000	0.00000	-			
4	0.00000	0.00000	0.00000	0.00000	L	L	L	L
5	0.00000	0.00000	0.00000	0.00000	L	L	L	L
6	0.00000	0.00000	0.00000	0.00000	L	L	L	L
7	0.73303	0.00000	0.00000	0.00000	M	L	L	L
8	1.63173	0.00000	1.66712	0.00000	H	L	H	L
9	0.84009	0.91850	1.18704	0.00000	M	M	M	L
10	0.00000	0.96400	0.00000	0.00000	L	M	L	L
11	0.00000	2.97074	0.00000	0.00000	L	H	L	L
12	3.87010	0.00000	3.17697	3.50665	H	L	H	H
13	0.00000	0.00000	0.00000	0.00000	L	L	L	L
14	0.00000	0.00000	0.00000	0.00000	L	L	L	L
15	1.47330	1.72497	4.80826	2.08922	H	H	H	H
16	0.96093	2.04129	1.24509	3.10859	M	H	H	H
17	1.44449	0.00000	0.00000	0.00000	H	L	L	L
18	3.07868	2.93418	2.61461	1.74430	H	H	H	H

contd....../-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Uttar Pradesh (contd.)								
19	1.08828	1.21777	0.68846	1.69903	M	H	L	H
20	1.41722	1.52863	1.21995	1.76330	H	H	H	H
21	0.88987	1.02834	0.25123	0.00000	M	M	L	L
22	2.11694	2.28664	1.59914	1.68318	H	H	H	H
23	0.85715	0.96576	0.49787	1.86055	M	M	L	H
24	0.77090	0.75135	1.26714	0.00000	M	L	H	L
25	1.06281	1.23730	0.10660	0.63072	M	H	L	L
26	0.83252	0.96652	0.17835	0.00000	M	M	L	L
27	2.36294	2.05168	2.53564	1.40371	H	H	H	H
28	0.65104	0.75567	0.11614	0.67395	L	L	L	L
29	1.13528	1.07528	1.70076	1.13405	H	M	H	M
30	0.65281	0.48750	1.67372	0.00000	L	L	H	L
31	0.61688	0.74760	0.00000	0.00000	L	L	L	L
32	0.34999	0.43471	0.00000	0.00000	L	L	L	L
33	0.36143	0.44530	0.00000	0.00000	L	L	L	L
34	0.68456	0.74118	0.73197	2.70327	L	L	M	H
35	0.66979	0.60120	1.46256	3.92153	L	L	H	H
36	0.54803	0.60442	0.52829	2.12706	L	L	L	H
37	0.78411	0.87333	0.56727	0.69619	M	M	L	L
38	1.86880	0.78305	3.55213	2.00894	H	L	H	H
39	0.46119	0.53851	0.13155	0.00000	L	L	L	L
40	0.48848	0.52294	0.65477	1.95253	L	L	L	H
41	0.58743	0.57143	1.12298	4.00367	L	L	M	H
42	0.65452	0.71620	0.59245	1.84575	L	L	L	H
43	0.84894	0.94592	0.51100	1.45560	M	M	L	H
44	0.36587	0.43839	0.00000	0.00000	L	L	L	L
45	0.51953	0.61066	0.00000	0.00000	L	L	L	L
46	0.63858	0.66984	0.83633	2.97379	L	L	M	H
47	1.00993	0.82071	2.12841	3.16972	M	M	H	H
48	0.77354	0.61931	1.93707	6.40849	M	L	H	H
49	0.80217	0.89179	0.50336	0.00000	M	M	L	L
50	0.86052	0.97226	0.36210	1.46759	M	M	L	H
51	0.75523	0.86355	0.13838	0.00000	M	M	L	L
52	0.76552	0.84793	0.53775	0.00000	M	M	L	L
53	1.53973	1.67111	1.25882	0.00000	H	H	H	L
54	0.88023	0.86577	1.23311	0.00000	M	M	H	L

contd.../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Uttar Pradesh (contd)								
19	0.67912	0.86606	0.00000	0.00000	L	M	L	L
20	1.68766	0.00000	2.23275	2.98899	H	L	H	H
21	0.80834	0.00000	0.00000	0.00000	M	L	L	L
22	1.39677	0.34777	4.66176	1.56888	H	L	H	H
23	0.00000	0.00000	0.00000	0.00000	L	L	L	L
24	2.41958	0.00000	3.51111	0.00000	H	L	H	L
25	0.00000	0.00000	0.00000	0.00000	L	L	L	L
26	0.00000	0.00000	0.00000	0.00000	L	L	L	L
27	2.26236	5.92483	1.98919	3.45688	H	H	H	H
28	0.00000	0.00000	0.00000	0.00000	L	L	L	L
29	2.66822	1.97669	2.12483	3.59014	H	H	H	H
30	5.02677	0.00000	0.71872	0.00000	H	L	L	L
31	0.00000	0.00000	0.00000	0.00000	L	L	L	L
32	0.00000	0.00000	0.00000	0.00000	L	L	L	L
33	0.00000	0.00000	0.00000	0.00000	L	L	L	L
34	0.00000	0.00000	0.00000	0.00000	L	L	L	L
35	0.00000	0.00000	0.00000	3.89776	L	L	L	H
36	0.00000	0.00000	0.00000	0.00000	L	L	L	L
37	0.71775	0.00000	1.65455	1.39056	L	L	H	H
38	4.51443	0.85917	1.78765	3.90994	H	M	H	H
39	0.48997	0.00000	0.00000	0.00000	L	L	L	L
40	0.92421	0.00000	0.00000	0.00000	M	L	L	L
41	0.00000	0.00000	0.00000	0.00000	L	L	L	L
42	0.00000	0.00000	1.39892	0.00000	L	L	H	L
43	0.00000	0.56901	0.00000	1.30534	L	L	L	H
44	0.00000	0.00000	0.00000	0.00000	L	L	L	L
45	0.00000	0.00000	0.00000	0.00000	L	L	L	L
46	0.00000	0.00000	0.00000	0.00000	L	L	L	L
47	3.71015	1.18350	2.24860	2.44381	H	H	H	H
48	0.00000	0.00000	0.00000	0.00000	L	L	L	L
49	0.33409	1.22527	0.00000	1.45227	L	H	L	H
50	0.00000	0.00000	0.00000	0.00000	L	L	L	L
51	0.49291	0.00000	0.00000	0.00000	L	L	L	L
52	0.00000	0.00000	2.68401	0.00000	L	L	H	L
53	2.22276	1.29203	2.04257	1.83615	H	H	H	H
54	2.58177	0.82371	2.50806	0.00000	H	M	H	L

contd..../-

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
West Bengal	2.07881	1.90179	2.29242	1.90907	H	H	H	H
1	0.93801	0.94159	1.27210	2.83000	M	M	H	H
2	0.85185	0.00817	3.07592	10.71204	M	L	H	H
3	0.73387	0.85263	0.00000	0.00000	L	M	L	L
4	0.69305	0.81126	0.00000	0.00000	L	M	L	L
5	0.87806	1.01769	0.00000	0.00000	M	M	L	L
6	0.89938	0.99744	0.58239	0.00000	M	M	L	L
7	1.49605	1.47882	1.75582	2.49068	H	H	H	H
8	2.92935	2.73657	2.48754	1.72103	H	H	H	H
9	4.38981	3.31848	3.60081	2.21024	H	H	H	H
10	2.89335	2.41111	2.95537	1.28532	H	H	H	H
11	2.09433	1.45071	2.99718	0.85965	H	H	H	M
12	0.90676	1.03277	0.39575	0.77692	M	M	L	L
13	0.80717	0.77126	1.35561	0.54000	M	L	H	L
14	0.95057	1.09056	0.30506	1.16198	M	M	L	H
15	0.86954	0.97239	0.62343	0.00000	M	M	L	L
16	4.91387	4.93608	3.99254	4.45339	H	H	H	H
Meghalaya	0.26960	0.35029	0.00000	0.00000	L	L	L	L
1	0.26960	0.35029	0.00000	0.00000	L	L	L	L
2	0.26960	0.35029	0.00000	0.00000	L	L	L	L
Union Territories								
1	0.75999	0.00000	3.45995	0.00000	M	L	H	L
2	3.59652	3.75364	2.71625	2.82557	H	H	H	H
3	0.31070	0.36825	0.30204	0.00000	L	L	L	L
4	3.03301	2.57098	3.07797	2.81898	H	H	H	H
5	0.56030	0.67659	0.12374	0.38918	L	L	L	L
6	2.74878	2.67597	2.76840	3.47342	H	H	H	H
7	1.28488	1.38469	1.12486	1.01567	H	H	M	M

contd....../-

(0)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
West Bengal	3.55879	3.20535	2.48316	3.48614	H	H	H	H
1	1.17730	0.00000	1.27463	2.51849	M	L	H	H
2	0.00000	0.00000	0.00000	0.00000	L	L	L	L
3	0.00000	0.00000	0.00000	0.00000	L	L	L	L
4	0.00000	0.00000	0.00000	0.00000	L	L	L	L
5	0.00000	0.00000	0.00000	0.00000	L	L	L	L
6	1.28425	0.84437	0.00000	0.00000	H	M	L	L
7	2.93782	2.29185	0.00000	0.00000	H	H	L	L
8	3.85517	3.18554	3.29750	4.67231	H	H	H	H
9	5.55925	6.14132	2.99384	4.33696	H	H	H	H
10	2.49216	6.61426	3.21587	4.46522	H	H	H	H
11	6.66726	1.88093	3.20068	3.06318	H	H	H	H
12	0.00000	1.01994	0.00000	0.00000	L	M	L	L
13	3.25701	1.02383	0.63214	1.14246	H	M	L	M
14	0.27240	0.00000	0.00000	0.00000	L	L	L	L
15	1.03296	0.00000	2.18998	0.00000	M	L	H	L
16	5.67497	4.32615	5.25486	6.97474	H	H	H	H
Meghalaya	0.00000	0.00000	0.00000	0.00000	L	L	L	L
1	0.00000	0.00000	0.00000	0.00000	L	L	L	L
2	0.00000	0.00000	0.00000	0.00000	L	L	L	L
Union Territories								
1	9.15514	0.00000	1.14107	6.54222	H	L	M	H
2	2.92336	4.00860	3.56289	4.77760	H	H	H	H
3	0.94259	0.00000	0.00000	0.65287	M	L	L	L
4	0.00000	7.21873	0.00000	3.83157	L	H	L	H
5	0.00000	0.00000	0.00000	0.88119	L	L	L	M
6	4.14918	0.00000	3.02284	6.54932	H	L	H	H
7	2.35260	1.11701	0.00000	1.21103	H	M	L	H

REFERENCES

0. Alagh, Y. K., G. S. Bhalla and A. Bhaduri (1978) : "Agricultural growth and Manpower Absorption in India", in labour Absorption in Indian Agriculture : Some Explanatory Investigations; P. K. Bardhan, A. Vaidyanathan, Y. K. Alagh, G. S. Bhalla and A. Bhaduri, ILO, Asian Regional Programme for Employment Promotion, Bangkok.

1. Aitchison, J. and J. A. C. Brown (1957) : The Lognormal Distribution, Cambridge University Press, Cambridge.

2. Berry, B.J.L. (1960) : "An Inductive Approach to the Regionalization of Economic Development", in Essays on Geography and Economic Development, N. Ginsburg (ed.) The University of Chicago Press, Chicago.

3. Bhalla, G. S. and Y. K. Alagh (1979) : Performance of Indian Agriculture : A Districtwise Study, Sterling Publishing Pvt. Ltd., New Delhi.

4. Dandekar, V.M. (1980) : "Problems of Measurement of Growth Rates in Agriculture", Special lecture delivered at the 19th Conference of Indian Econometric Society, Dec. 1980- Jan. 1981, Gokhale Institute Politics and Economics, Pune.

5. Dasgupta, B. (1971) : "Some Comparative Studies on the Construction of Composite Regional Indices", Economic and Political Weekly, August 14, Vol. 6.

6. De, R. N. (1976) : "An Analysis of Regional Development Pattern of West Bengal : 1960-61 to 1970-71", contributed to the 16th Indian Econometric Conference, 17-19 December 1976, S. V. University, Tirupati. Technical Paper No.ERU/3/77.

7. ________ (1980) : "A Note on Two Stages Aggregation of Variables Through Equal Weighting in Every Stage", contributed to the 4th World Congress of Econometric Society, August-September 1980, France.

8. Economic Survey of Europe (1954) : Department of Economic and Social Affairs, United Nations, Geneva.

9. Girshick, M. A. (1936) : "Principal Components", Journal of the American Statistical Association, Vol. 31.

10. Govt. of India (1971-72) : Estimates of Area and Production of Principal Crops in India, Directorate of Economics and Statistics, Ministry of Food, Agriculture, Community Development and Cooperation.

11. Hagood, M. J. (1943) : "Statistical Methods for Delineation of the Regions Applied to Data on Agriculture and Population", Social Forces, Vol. 21.

12. Holzinger, K. and H. H. Harmon (1941) : Factor Analysis : A Synthesis of Factorial Methods, The University of Chicago Press, Chicago.

13. Hotelling, H. (1933) : "Analysis of a Complex of Statistical Variables into Principal Components", Journal of Educational Psychology, Vol. 24.

14. Karan, P. P. (1957) : "Locational Pattern of the New Centres of the Indian Iron and Steel Industry", Journal of Geography, Vol. 56.

15. ____________ and W. M. Jenkins (1959) : "Geography of Manufacturing in India" Economic Geography, Vol. 35.

16. Karan, P. P. (1964) : "Changes in Indian Industrial Location", Annals of the Association of American Geographers, Vol. 54.

17. Kendall, M. G. (1939) : "The Geographical Distribution of Crop Productivity in England", Journal of the Royal Statistical Society, Vol. 102.

18. Lakdawala, D. T., Y. K. Alagh and A. Sharma (1974) : Regional Variations in Industrial Development, Monograph Series 2, Sardar Patel Institute of Economic and Social Research, Ahmedabad.

19. Mehta, M. M. (1961) : Structure of Indian Industries, Popular Book Depot, Bombay.

20. Minhas, B. S. and A. Vaidyanathan (1965) : "Growth of Crop Output in India, 1951-54 to 1958-61 : An Analysis by Component Elements", Journal of the Indian Society of Agricultural Statistics, Vol. 17.

21. Minhas, B. S. (1966) : "Rapporteur's Report on Measurement of Agricultural Growth", Indian Journal of Agricultural Economics, Vol. 21.

22. Mitra, A. (1965, 1966) : Levels of Regional Development in India, Census of India 1961, Vol. 1, Part I-A(i) : Text (1965), Part I-A(ii) : Tables (1966), Government of India.

23. Narashimham, R. (1962) : "Developing India's South", Far Eastern Economic Review, Vol. 38.

24. Pal, M. N. (1961) : "Quantitative Delimitations of Regions", Bombay Geographical Magazine, Vol.8 and 9.

25. ________ (1963) : "A Method of Regional Analysis of Economic Development with Special Reference to South India", Journal of Regional Science, Vol. 5.

26. ____________ (1971) : "Quantitative Techniques for Regional Planning", Indian Journal of Regional Science, Vol. 3.

27. ____________ (1974) : "Regional Information, Regional Statistics and Regional Planning in India", in Regional Information and Regional Planning, A. Kuklinski (ed.), Vol. 6, UNRISD Publication Series on Regional Planning, Mouton, The Hague.

28. ____________ (1975) : "Regional Disparities in the Level of Development in India", Indian Journal of Regional Science, Vol. 7.

29. ____________, R. N. De and B. Malakar (1978) : "A Statistical Revision of 1961 Agricultural Workers for the Comparability with 1971 Estimates by Indian Districts", Indian Journal of Regional Science, Vol. 10.

30. ____________, and R. N. De (1979a) : "An Index of Agricultural Labour Pressure on Cropped Land and Production for a Classification of Indian Districts", Indian Journal of Regional Science, Vol. 11.

31. ____________, ____________ (1979b) : "On An Identification of Contributory Factors to Spatial Dynamism in Agricultural Growth in India", Forthcoming in Sankhya, Series D.

32. Pathak, C. R., A. Aziz and R. N. Chattopadhyay (1970) : "Identification of Planning Areas in the Three-State Region — Bihar, Orissa and West Bengal, with respect to their Levels of Development and Planning Problem," Indian Journal of Regional Science, Vol. 2.

33. Pathak, C. R. (1975) : "Spatial Variation in Urban and Industrial Growth in India", Indian Journal of Regional Science, Vol. 7.

34. Patnaik, S. and R. N. Chattopadhyay (1975) : "Spatial Variation in Levels of Development in Orissa", Indian Journal of Regional Science, Vol. 7.

35. Planning Commission (1965) : Resource Development Regions and Divisions of India, Govt. of India.

36. Roychoudhuri, S. P. (1963) : Soils of India, Indian Council of Agricultural Research, New Delhi.

37. __________ (1964) : Land Resources of India, Vol. 1, Govt. of India, Planning Commission, Committee on Natural Resources, New Delhi.

38. Schwartzberg, J. E. (1962) : "Three Approaches to the Mapping of Economic Development in India", Annals of the Association of American Geographers, Vol. 52.

39. Sharma, K. L. (1975) : "Spatial Disparities in Rajasthan", Indian Journal of Regional Science, Vol. 7.

40. Silvey, S. D. (1969) : "Multicollinearity and Imprecise Estimation", Journal of the Royal Statistical Society, Series B, Vol. 31.

41. Singh Manmohan, H. K. (1979) : "Population pressure and Labour Absorbability in Agriculture and Related Activities", Economic and Political Weekly, March 17, Vol. 14.

42. Solari, M. E. (1969) : "The ML Solution of the Problem of Estimating a Linear Functional Relationship", Journal of the Royal Statistical Society, Series B, Vol. 31.

43. Spate, O. H. K., and Learmonth, A. T. A. (1960) : India and Pakistan, Methuen, London, Third edition.

44. Sprent, P. (1966) : "A Generalised L. S. Approach to Linear Functional Relationships", Journal of the Royal Statistical Society, Series B, Vol.28.

45. Stevens, B. H. (1959) : Inter-Regional Linear Programming, Doctoral Dissertation, M.I.T. Press, Cambridge.

46. Stewart, J. Q. (1947) : "Empirical Mathematical Rules Concerning the Distribution and Equilibrium of Population", Geographical Review, Vol. 37.

47. ____________ (1950) : "Potential of Population and its Relationship to Marketing", in Theory of Marketing, Reavis Cox and W. Alderson (ed.), Chicago.

48. Stone, R. (1961) : "Social Accounts at the Regional Level : A Survey", in Regional Economic Planning, W. Isard and J. H. Cumberland (ed.). European Productivity Agency, Paris.

49. Theil, H. (1958, 1961) : Economic Forecasts and Policy, North-Holland Publishing Co., Amsterdam.

50. Thurstone, L. L. (1931) : "Multiple Factor Analysis", Psychological Review, Vol. 38.

51. Vaidyanathan, A. (1978) : "Labour Use in Indian Agriculture", in Labour Absorption in Indian Agriculture : Some Explanatory Investigations, P. K. Bardhan, A. Vaidyanathan, Y.K.Alagh, G. S. Bhalla and A. Bhaduri, ILO, Asian Regional Programme for Employment Promotion, Bangkok.

52. Venugopala Reddy, Y. (1974) : "A Note on Regionalization and Regional Development with Reference to Multilevel Plans Process in India", Indian Journal of Regional Science, Vol. 6.

53. Vinning, R. (1945) : "Regional Variation in Cyclical Fluctuation Viewed as a Frequency Distribution", Econometrica, Vol. 13.

54. __________ (1946) : "The Region as a Concept in Business-Cycle Analysis", Econometrica, Vol. 14.

55. __________ (1949) : "The Region as an Economic Entity and Certain Variations to be Observed in the Study of Systems of Regions", American Economic Review, Vol. 39.

56. __________ (1953) : "Delimitation of Economic Areas : Statistical Conceptions in the Study of the Spatial Structure of an Economic System", Journal of the American Statistical Association, Vol. 48.

57. Wald, A. (1950) : Note on the Identification of Economic Relations, in Statistical Inference in Dynamic Economic Models, Cowles Commission Monograph 10, John Wiley and Sons, New York.

58. Warantz, W. (1956) : "Measuring Spatial Association with Special Consideration of the Case of Market Orientation of Population", Journal of the American Statistical Association, Vol. 51.

59. Williamson, J. G. (1975) : "Regional Inequality and the Process of National Development : A Description of the Patterns", Economic Development and Cultural Change, Vol. 23.

60. Wilks, S. S. (1938) : "Weighting System for Linear Functions of Correlated Variables When There is No Independent Variables", Psychometrika, Vol. 3.

61. Whittle, P. (1963) : Prediction and Regulation by Linear Least Squares Methods, The English University Press Ltd., London.

62. Wolfowitz, J. (1953a) : "The Minimum Distance Method", Annals of Mathematical Statistics, Vol. 28.

63. ______________ (1953b) : "Estimation by the Minimum Distance Method", Annals of the Institute of Statistical Mathematics, Vol. 5.

64. Zellner, A. (1971) : An Introduction to Bayesian Inference in Econometrics, John Wiley and Sons, New York.