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A Methodological Exploration of the Dimension of Inter-Town Diversities

THE concentration of population in urban areas is a very old phenomenon. The economic development, industrial revolution and population thrust on agricultural sector generally mobilise the ruralities towards the urban centres and thus give rise to a higher pace of urbanization. In India the process of urbanization has entered a period of growth, reflecting the country's general population increase and rising employment in secondary or tertiary sector of the economy.

During the decade 1961-71, the total population of India increased from 438.94 millions to 547,95 millions; showing an increase of 24.83 percent. In the same period the absolute urban population increased from 78.94 millions to 108,79 millions, depicting an increase of 37.81 percent. This indicates that the proportion or urban population to the total population has increased from 17.98 percent in 1961 to 19.87 per cent in 1971, The increase of 1.89 percent point in the urban proportion of population suggests that the rate of urbanisation during the decade is 37.81 percent; for the earlier decade (1951-61) the rate was 26.41 percent.

Interestingly, the process of India's urbanization has altogether a different impact on the growth of size classes of towns. If we divide the urban continuum into two parts—'Effective Urban' and 'Quasi Urban'[1], we find that during the

1. The size classes of towns, which represent the urban continuum, include the big metropolitans on one end and small tiny towns on the other. To present a relatively comprehensive picture the size classes of towns are divided into two parts "Effective-Urban" and "Quasi Urban" areas. Towns with population 20,000 and more have been labelled as "Effective-Urban" and the remaining towns (i.e., towns with population below 5,000 to 19,999) as "Quasi-Urban."

decade 1961-71, the number of effectively urbanized areas and their population magnitude have shown a considerable rise. Their number has gone up from 735 in 1961 to 957 in 1971, and the population has increased from 62.18 millions to 89.13 millions. Comparing the population magnitude of these areas with the total urban population we find that these areas constitute the significant proportion of urban population; 78.77 percent for 1961 and 81.93 percent for 1971. This phenomenal population concentration in urban agglomeration centres implies that in India the process of metropolization encompasses the

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functions[3]. Thus, it will be of interest to split the various functional and structural properties of the system-entities.

The present study is an attempt to dimensionalize the functional and structural variations in Indian towns and town-groups on the basis of their social, economic and demographic characteristics. This analysis helps us to understand the basic dimensions along which India's urban centres represent the variations.

Methodology

The inter-town variations in the social, economic and demographic characteristics of the towns can simply be accomplished by computing the variance-covariance matrix. It is well known to the students of social-statistics that this variance-covariance matrix is of multivariate in nature and thus attributes towards the multiplicity of the relationships between the town's characteristics. Such complexities in the relationships are to be simplified in terms of number of 'independent dimensions'. The mathematical model employed to resolve the problems of multiplicity and determine the underlying dimensions of variations is known as "Principal Component Model"[3].

The primary concern of the analysis is to investigate as to how much of the total variability (between towns) exhibited in the set of primary variables, can be accounted for, and expressed by, a smaller number of composite dimensions—thus called 'Principal Components'. The technique—Principal Component Ana-

2. **See Brian J. L. Berry,** 'Cities as Systems within Systems of Cities" **in John Friedmann and william Alonso** (eds.) Regional Development and Planning. **M.I.T. Press. Cambridge, 1964.**

3. **The Brief features of the Component** Analysis are mentioned in **the text. For detail readings refer Harry H. Harman,** *Modern Factor Analysis.* University of **Chicago Press, Chicago, 1970; and M.G,** Kendall *A Course in Multivariate Analysis,* Charles **Griffin London, 1957,**

lysis—ensures that the first component accounts for the greatest possible proportion of the total variance; the second component accounts for the greatest proportion of the remaining variance, and so on the other components explain the proportion of variance in descending order.

The mathematical procedure for the Component Analysis is briefly explained below :

The input for the analysis is the data pertaining to social, economic and demographic characteristics of towns, which is further transformed to the correlation matrix.

In terms of notation :

$[X]_{N\times n}$: Data matrix containing the complete set of *n* variables for *N* towns;

$\overline{X}_j$: Mean of the_jth variable;

σ_j : Standard Deviation *ofjth* variable;

$[\overline{X}]_{N\times n}$: Matrix containing the *z* scores;

Here $Z_{ij} = (x_{ij} - \bar{x}_j) \mid \sigma_j$; $Z_{ij} \sim \phi\,(0, 1)$:

$[R]_{n\times n}$: Correlation matrix showing correlation coefficients between *n* variables (diagonal values are unity);

$$[Z]'_{n\times N} \;*\; [Z]_{N\times n}$$

[R*]*xn : Reproduced correlation matrix (with communalities[4] in the diagonals).

The problem is to reduce this correlation matrix to a factor-matrix of **smaller** dimensions where the coefficients represent the correlations between the variables and the factors. Since these factors (components) are to be independent the component analysis resolves the reproduced correlation matrix such that

$$[R^*]_{n\times n} = [Q]_{n\times r} \;*\; [Q]'_{r\times n}$$

The method involves an iterative scheme which yields a root of characteristics equation

$$[\,[R^*]_{n\times n} - \lambda\,[I]_{n\times n}\,] \;*\; [q_i]_{n\times i} = 0$$

and simultaneously determines the coefficients of the associated factors. The repetition of the iterative process for r-times results in the following output:

4. "Communalities" refer to sum of the independent common variance of the Component with each variable.

$[q_t]$: ith Eigenvector;

[qi]' *[qi'] : Total amount of variance accounted for by the ith factor (Eigen-values),

[q]nxr : Factor Loading matrix

The coefficients of the factor loading matrix represents the correlation bet'-ween the factor and the variable. The variables which exhibit the high correlations with factor are the main constituents of the factor-structure. Thus the inter-town variation is demonstrated by these small number of r--factors.[3]

Variables and Data.

Arbitrarily an endless number of social, economic and demographic characteristics can be assigned to describe the functional and structural imbalances in towns. In this study we have confined our analysis to only six major characteristics, namely the (i) population size[6] and structure; (ii) housing; (iii) literacy; (iv) economic activities; (v) occupational structure; and (vi) urban amenities. These characteristics are covered by a set of 44 variables.[7] The list of variables and their abbreviated names are presented in the Appendix.

To this list of variables we could have also included the variables concerning the social set-up, physical environment, crime and many other facets of the town's life. The non-availability of data on many of these attributes restricted their inclusion. Secondly, since various agencies and institutions are engaged in collecting different set of statistics, the coverage generally correspond to different sets of geographical areas. Thirdly, these statistics have different time base; the point of reference is not the same. Hence with such drawbacks in the secondary sources of data we could not incorporate these important attributes in our study.

The major data source of variables is the Census of India, 1961. Since data

5. **The analysis** was carried over **IBM-/CO** computing system. Acknowledgements **are due to N.K.** Nijhawan and Shankar **Bose f**or their technical help.

6. **Since population** distribution by city-size follows leg-normal distribution, the **logrithmic value of the** population (Size) parameter is considered here as a variable.

7. In. an earlier attempt Qazi Ahmed has dimentionalised the characteristics of 102 **Indian towns on the** basis of *62* variable. Building on Qazi Ahmed's **study** we have **taken a different set of variables and have** done the analysis for 578 towns. For comparison **of variables, see Qazi Ahmed,** ***Indian Cities:*** *Characteristics and Correlates,* Department of Geography, **University of Chicago,** Research Paper No. 102, Chicago, 1965.

is not available for all the 135 towns (towns with population 20,000 and above) **the analysis of our** present study is **based on 578 towns.**[8]

Towns Diversities and the Spectrum

A tremendous, variation is observed when the towns are arranged and analysed in the light of single variable. Whether we look at population size and structure, urban amenities and assets, housing conditions, literacy or any of the topics studied, the Indian towns represent a wide range of spectrum. For the Study of variation in towns we have adopted some of the conventional measures; the range of the distribution of towns spread, standard deviations and coefficients of variations. The range shows the spread of towns between minimum and maximum values of the attributes; the standard deviation shows the extent of dispersion and coefficient of variation indicates the relative dispersion.

These measures on Indian towns for the respective variables under study arc shown in Table 1. None of these variables represent any closeness in the distribution of towns. There is a wide range of variation. Especially the variables such as'Sex Ratio , 'Density', 'Literacy Rates', and 'Power Units Consumed' show a marked variation; their range is spread over five hundred units. Similarly 'Rate of Population Growth', 'Proportion Workers as Agricultural Labourers', 'Proportion Workers in Household Industry', 'Proportion Female Child Workers' and 'Power Units Consumed' show a coefficient of variation of more than hundred.

All these measures indicate that the towns not only vary greatly on these variables but also include a marked skewness in their distribution. In other words, a large number of relationships involved are non-linear and non-homosedatic.

With such amplitude in the distribution of variables the compactness in the measures was represented by transforming the variables into their Z-scores. The transformed Z-scores are distributed with mean zero and standard deviation unity. These Z-scores thus reduce the variation in towns to a smaller range and the distributions become very compact.

The Component Analysis

Theoretically, the Principal Component solution extracts as many factors (components) as the number of variables are. But for analytical purpose the factors are determined on the basis of the root of the characteristic equation.

8. Since tables for data and correlation matrix are huge in dimensions, it is not possible to attach these here.

TABLE 1—SUMMARY TABLE SHOWING THE DIVERSITIES OF TOWNS ON EACH OF 44 VARIABLES

Variables	*Mean*	*5. D.*	*C. V**	*Min.*	*Max.*	*Range*
Population Size and Strutcture						
1. In (POP'61)	*4.696*	0.361	7.687	4.301	*6.466*	2.165
2. SR	892.280	90.537	10.146	497.000	1100.000	603.000
3. PMPM 1	32.343	3.373	10.429	22.300	49.120	26.820
4. PMPM 2	34.279	3.516	10.257	27.270	56.660	29.390
5. PMPM 3	21.580	1.993	9.235	16.620	31.320	14.700
6. PMPM 4	4.757	1.049	22.051	1.580	12.260	10.680
7. PFPF 1	41.349	3.983	9.633	14.200	89.250	75.050
8. PFPF 2	34.024	3.152	9.264	11.210	76.430	65.220
9. PFPF 3	19.569	2.295	11.728	7.010	41.960	34.950
10. PFPF 4	5.415	1.077	19.889	1.630	14.530	12.900
Population Change						
11. GRAT	3.979	10.207	256.522	—1.550	226.610	228.160
Housing Conditions						
12. DENS	11695.809	9411.270	80.467	620.000	90290.000	89664.000
13. RHPOP	175.195	30.855	17.612	85.410	386.680	301.270
14. HHRH	1142.350	197.748	16.873	452.590	2370.060	1917.470
Education						
15. LITE	453.061	85.086	18.780	133.520	732.160	598.640
Economic Activity and Occupational Structure						
16. WTPOP	32.384	4.886	15.088	24.000	53.820	29.820
17. WACY	6.781	6.182	91.166	0.000	47.290	47.290
18. WAAG	3.720	5.293	142.285	0.000	42.140	42.140
19. WMQE	1.944	3.116	160.288	0.050	53.550	53.500

Table I *(contd.)*

20. WHHI	9.511	9.729	102.292	0.000	69.010	69.010
21. WMOH	16.667	10.462	62.771	0.410	86.770	86.360
22. WCON	3.494	2.138	61.191	0.230	25.410	25.180
23. WTCO	17.535	4.817	27.471	2.430	33.640	31.210
24. WTSC	7.859	5.305	67.502	0.610	43.700	43.090
25. WOTS	32.384	4.886	15.088	24.000	53.820	29.820
26. WMWM 1	3.782	2.208	58.382	0.460	19.060	15.600
27. WMWM 2	76.293	8.344	10.937	47.130	172.240	125.110
28. WMWM 3	93.676	6.586	7.031	62.220	223.970	161.750
29. WMWM 4	60.285	13.077	21.692	3.830	266.990	263.160
30. WFWF 1	1.767	2.325	131.579	0.030	22.220	22.190
31. WFWF 2	16.483	11.610	70.436	2.440	70.690	68.250
32. WFWF 3	23.405	12.884	55.048	3.340	75.660	72.320
33. WFWF 4	11.861	7.171	60.459	0.380	58.350	57.970
Revenue						
34. STPOP	17.285	12.978	75.082	1.330	117.270	115.940
35. ETPOP	1.894	1.227	64.784	0.160	11.790	11.630
Urban Amenities						
36. ROPOP	23.754	13.773	57.982	5.010	137.100	132.090
37. TLPOP	3.429	2.802	81.715	0.060	29.560	29.500
38. PCPOP	2.844	2.518	88.537	0.140	26.160	26.020
39. SBPOP	0.069	0.035	50.725	0.010	0.330	0.320
40. DRPOP	0.574	0.285	49.652	0.050	2.560	2.510
41. CIPOP	0.052	0.024	46.154	0.010	0.140	0.130
42. DEPOP	4.391	2.661	60.601	0.440	27.290	26.850
43. PUCDC	3.083	2.325	75.414	0.350	41.630	41.280
44. PUCIC	65.641	1078.000	1642.266	0.150	25800.000	25799.848

*C.V. (Coefficient of Variation) = S.D./Mean × 100

NOTE : For the detail names of the variables, see Table

From a set of 44 variables, nine factors were considered to represent the dimensions of the inter-town variations.[9] These nine components were further subjected to normal varimax rotation.

The importance and significance of these components lie in their proportionate inter-town variations accounted for by each of these components. Table 2

TABLE 2-PERCENTAGE OF TOTAL VARIANCE EXPLAINED **BY EACH** COMPONENT

Component	*Eigenvalue*	*Percentage of total variance*
I	8.2898	18.8
II	4.8844	11.1
III	2.9036	6.6
IV	2.5142	5.7
V	2.1876	5.0
VI	1.9895	4.5
VII	1.8.140	4.2
VIII	1.5123	3.4
IX	1.3744	3.1
MX		62.4

represents the proportion of total variance explained by each of the nine factors independently. This shows that the first component accounts for 18.8 percent, the second for 11.1 percent and the other components subsequently follow them. The nine components put together account for 62.4 percent of the total variation. These variations (accounted for by individual component) are the sum of the variation in the variables attributed towards the components (communalitics). The comtmmalities suggest that the variation contained in 44 variables is fairly represented by the nine components (see Table 3). Thus, it can be concluded that the variation between the towns can be regarded as attributable to nine principal components, while the remaining components may be treated as minor terms of specific or random variation.

9. Generally the factors are determined by ihe cut off criterion of eigenvalue equal to unity but for recognizable significance of the factors we had to confine our analysis with the cut-off criterion of eigenvalue **1.4.**

TABLE 3-PERCENTAGE OF VARIANCE (COMMUNALITY) OF EACH OF THE 44 VARIABLES ACCOUNTED FOR BY ALL THE NINE COMPONENTS

Variable	*Commitnality* (in percentage)	*Variable*	*Communality* (in percentage)
POP61	65.79	CIPOP	65.32
DENS	47.48	STPOP	49.40
SR	79.45	ETPOP	66.04
WACV	59.28	DEPOP	49.21
WAAG	44.69	PUCDC	41.12
WMQE	38.78	PUCIC	17.77
WHHI	72.52	PMPM 1	82.29
WMOH	73.07	PMPM 2	82.76
WCON	14.65	PMPM 3	68.02
WTCO	62.34"	PMPM 4	64.51
WTSC	25.10	PFPF 1	55.90
WOTS	64.88	PFPF2	43,15
WTPOP	92.01	PFPF 3	76.57
GRAT	20.63	PFPF 4	63.35
RHPOP	81.02	WMWM 1	62.44
HHRH	71.75	WMWM2	81.52
LITE	67.04	WMWM 3	79.88
ROPOP	51.78	WMWM 4	80.79
TLPOP	72.94	WFWF 1	78.27
PCPOP	62.06	WFWF2	89.46
SBPOP	48.59	WFWF 3	89.15
DRPOP	64.74	WFWF 4	82.15

NOTE : **For the detail names of** the variables, see Appendix.

Components and Their Interpretations

The inter-town functional and structural variations are thus explained by the newly derived nine dimensions. The logical interpretation for the component

TABLE 4—NORMAL VARIMAX ROTATED FACTOR MATRIX

Variables	factor loading on components								
	1	2	3	4	5	6	7	8	9
POP61	—0.10485	0.10678	0.00437	—0.09701	0.43690	—0.29339	-0.55447	-0.17461	0.10573
DENS	—0.07876	0.08567	0.09040	0.03298	0.09927	-0.23891	—0.15235	—0.17579	0.57528
SR	0.35532	0.03286	0,53283	—0.11613	—0.58475	—0.06977	0.02197	—0.06950	—0.13280
WACV	0.20747	—0.13619	—0.09949	0.17843	—0.57991	0.01578	0.15155	—0.22153	—0.28445
WAAG	0.38969	—0.11411	0.04947	0.13028	—0.20849	0.04056	0.25981	0.12447	—0.33862
WMQE	—0.02930	0.03365	0.14184	0.05476	0.02721	—0.06567	-0.07988	0.06916	—0.58862
WHHI	0.74070	—0.17608	0.09108	0.05319	-0.13763	0.02156	—0.12614	0.04415	0.31172
WMOH	—0.11603	0.15666	—0.10491	—0.02532	0.06602	—0.04057	-0.18249	—0.78053	0.18028
WCON	—0.23620	—0.18511	—0.18507	—0.04596	0.05297	0.10038	0.01896	—0.04300	—0.07039
wrco	—0.52015	0.04885	0.10586	0,02594	—0.05752	—0.04881	0.25000	0.20567	0.47751
wrsc	—0.35101	—0.04971	-0.10242	—0.06694	0.30607	0.00043	—0.10809	—0.02261	—0.06661
WOTS	—0.42419	0.18034	0.00574	—0-17919	0.37017	0.01420	0.03338	0.49899	—0.12856
WTPOP	0.83353	—0.04402	—0.03380	0.24420	0.31233	0.02713	0.19892	—0.10780	—0.12145
GRAT	0.21747	—0.03561	—0.20936	—0.17620	0.14908	0.15890	—0.14775	0.06511	0.06031
RHPOP	O.C8857	—0.04828	0.07585	0.09356	0.19753	0.84286	0.10252	—0.13147	—0.09068
HHRH	—0.03877	—0.07785	0.10090	—0.01163	0.04653	—0.83312	—0.01137	—0.05519	0.01467
LITE	—0.21321	0.53462	0.11482	—0-32132	0.41515	0.21788	—0.01664	—0.00795	0.05009
ROPOP	—0.21089	0.57694	0.04614	0.14417	0.20207	0.19614	0.19723	—0.10436	0.09486
TLPOP	—0.10616	0.65324	—0.09134	—0,02933	0.51517	—0.07259	—0.09492	0.03451	0.03595
PCPOP	—0.00357	0.69560	—0.21358	0.00835	0.19807	0.13968	—0.01630	0.14983	—0.09753
SBPOP	—0.11275	0.43161	—0.21565	0.01734	—0.13966	0.04707	0.45238	—0.02133	0.11498

DRPOP	-0.23987	0.38707	—0.12698	—0.10617	0.53682	0.17818	0.03955	0.27100	0.13283
CIPOP	0.21566	0.09490	—0.04990	—0.03308	0.02829	0.11704	0.75864	—0.02151	—0.06001
STPOP	0.06248	0.64620	—0.11517	0.01911	0.05866	—0.12271	0.14372	0.08278	—0.11361
ETPOP	0.06481	0.24589	—0.01225	0.06454	0.40406	—0.13134	0.63278	—0.01778	0.09954
DEPOP	-0.11736	0.58511	0.08848	—0.15227	—0.02125	0.14617	—0.00537	—0.25807	0.1282S
PUCDC	0.00904	0.19945	—0.04388	0.02581	0.47214	—0.29462	—0.20089	0.12556	0.05405
PUCIC	—0.01224	—0.09349	—0.07498	0.00678	0.04592	0.05895	0.07303	—0.37936	—0.09140
PMPM 1	—0.01411	—0.08698	—0.03425	0.00388	—0.88338	—0.05259	—0.16967	0.02402	0.03834
PMPM 2	—0.06766	0.18209	—0.45236	—0.04023	0.73010	0.13885	0.08683	—0.09304	— 0.12282
PMPM 3	0.14004	—0.06422	0.64903	0.05536	0.42394	-0.11198	0.15943	—0.10263	—0.06299
PMPM 4	—0.00445	—0.17946	0.43713	—0.02244	—0.39125	—0.09282	—0.03033	0.36490	0.35427
PFPF 1	—0.28123	0.05347	—0.49650	0.34741	—0.10997	0.18789	—0.10580	0.06252	0.21744
PFPF 2	0.03072	0.12257	0.13969	0.17195	0.47045	0.22738	0.05513	—0.27256	0.13828
PFPF 3	0.15460	—0.03495	0.81239	0.09363	—0.10797	0.10536	—0.03780	0.21441	—0.04082
PFPF 4	0.09286	—0.09047	0.55973	—0.02670	— 0.28697	0.18260	-0.19182	0.38122	0.06959
WMWM I	0.58602	—0.11380	—0.03026	0.26005	—0.03844	—0.23873	0.37512	0.01288	0.00992
WMWM 2	0.26415	—0.03819	0.00200	0.79367	—0.01980	0.00730	0.07664	—0.31753	—0.08974
WMWM 3	0.02146	0.03543	0.00379	0.00311	0.02508	0.11127	—0.05952	—0.02417	—0.00695
WMWM 4	0.20029	—0.18660	0.05137	0.81022	—0.03710	—0.03733	0.10777	0.24388	—0.00555
WFWF I	0.86901	—0.02694	0,10969	0.04940	—0.08360	0.01171	0.05308	—0.04706	—0.01110
WFWF 2	0.92161	0.00005	0.05370	0.00176	—0.14673	0.07525	0.03263	0.00709	-0.11835
WFWF 3	0.90782	—0.04246	0.10519	0.01126	—0.07799	0.08865	0.07331	0.02534	—0.18544
WFWF 4	0.85386	—0.16177	0.15705	0.05214	—0.02775	0.06218	0.04860	0.17191	—0.04797

NOTE : For the detail names of the variables, see Appendix.

structure is derived from the factor-loading matrix. These loadings represent the correlations of each one of the 44 variables with components. For a convenient interpretation of the component structure we have underlined the variables which are loading high on the component[10] (see Table 4).

The first component—'Female Labour* predominates and identifies itself with the Female Labour Force by age, and Secondary Occupational Structure of the population. Since large proportion of variance is attributed by this component, it is considered as the most important dimension of variation. The highest correlation coefficients are associated with the 'Age Composition of Female Participation in the Labour Market', 'Proportion of Workers to Total Population' and 'Workers Engaged in Household Industry*. Since the component structure is dominated by the 'Female Labour Force', the negative correlation of the component with 'Proportion of Workers in Trade and Commerce Industry*, 'Transportation, Storage and Communication Industry' and 'Other Services* suggest that cities with higher female participation in labour force are not commercial cities. The female labour force is significantly engaged in household industry and cultivation. The 'Sex Ratio' also shows positive correlation with the component.

The second component—'Urban Accessibility', accounts for the next highest proportion of total variance. The high correlation coefficients represented by this component are related with 'Urban Assets and Communication Set-ups'. 'Proportion Literates and Educated', and 'Banks' and 'Doctors' per thousand of population also show high correlation with the component. The respective coefficients reveal an interesting fact that towns which inhabit higher proportion of literates enjoy higher amount of urban amenities.

The third component -'Population Structure[1], represents the demographic structure of the population of Indian towns. The higher coefiicients are associated with 'Age and Sex Composition of the Population'. Interestingly enough that except for Male and Female Population Proportions aged (15-34) years and (0-14) years respectively, all variables indicate positive relationship with the component. The correlation coefficient between these two variables is positive whereas with other set of variables they bear negative correlation coefficients. Such a situation implies that 'Female Child Mortality' in these towns is high and young male labour force has migrated to other towns. The towns with high scores on the component show *that* the population in these towns is rejuevanating at the apex.

10. The sign attached with factor-loadings only represents the direction in which the variables contribute to the component structure.

The fourth dimension of inter-town variation—'Male Labour', is recognized by the age composition of male labour. The fascinating structure of the component is that inspite of such higher correlation between the component and 'Male Labour Force by Age-groups', it shows a negative correlation with literates and educated population of towns. Further, the correlation coefficients between the 'Occupational Structure of Population' and the component depict that 'Proportion Workers as Cultivators and Agricultural Workers' are the only two which signify little high positive coefficients. This phenomenon of the occupational distribution of labour force indicates the rural characteristics of towns.

The fifth dimension — 'Urban Agglomeration', isolates towns where population composition shows an outward bulge at age groups (15-34) years. The Male Population (0-14)' shows a high negative correlation with the component and the population sex ratio of this group of towns is in favour of males. The urban accessibilities, like the availability of number of'Telephones,' and number of'Doctors' per thousand of population and 'Domestic Power Connections* also bear a high positive correlation with the 'Workers Engaged in Transportation, Storage and other Unclassified Services', The 'Population Size' also loads high on this component. The overall structure of the component emphasizes the group of urban agglomeration centres where migrants are attracted from other groups of towns.

The next dimension of towns diversities—-'Shelter', is governed by the household and housing situation of the population. Both the variables—'Occupied Residential Houses' and 'Households per thousand of Occupied Residential Houses[1] load very high on the component. The other set of variables show very low correlation coefficients,.

The seventh differentiation of Indian towns—'Entertainment[1], is associated highly •with urban social and economic components; such as 'Cinemas', Entertainment Tax Collection'., and the 'Availability of Bank Facilities'. Surprisingly, the 'Population Size' also shows a high negative correlation coefficient whereas other variables show a weak association with the component. This essentially implies that these are the depopulation towns. Economically, these towns do not have their own industrial or agricultural base.

The eighth component—'Economic Structure', diverses inter-town variations along the economic functions of towns. The factor loadings on the component by the variables such a.s 'Workers Engaged in Manufacturing Other than Household Industry', 'Workers Engaged in Other Services', and 'Power Units Consumed by the Industrial Connections' suggest that these are non-manufacturing towns where population is engaged in other types of unclassified services. The positive correlation with variables 'Male Population aged 60 years and above* and the component implies that male population in these towns is aging. The young labour force participation rate also shows negative coefficient with the component.

The ninth dimension—'Commercial and Industrial Structure', which attributes only 3-1 percent of the total variation, characterises the significant urban structure of the towns. The rural component like 'Proportion of Agricultural Workers', 'Workers Engaged in Mining, Quarrying etc.* load highly negative on the component; whereas 'Workers Engaged in Household Industry*, 'Trade and Commerce' show high positive correlations. This dimension represents the commercial structure of towns with significantly higher population density.

The analysis has thus resulted in nine dimensions of variations, namely the (i) Female Labour; (ii) Urban Accessibility; (iii) Population Structure; (iv) Male Labour; (v) Urban Agglomeration; (vi) Shelter (vii) Entertainment; (viii) Economic Structure; (ix) Commercial and Industrial Structure.

Scope of the Study

The methodology presented in this study can be further extended for the classification of towns into groups.[11] Indeed there are many studies that deal with the classification of towns but the serious limitation in the methodologies Of these studies is the classification rendered on univariate dimension. None of these attempts have been designed to exhibit the towns grouping on a multi-dimensional space. The dimensions spelled under this methodology can be adopted to represent the towns structure in the space and all those towns which show similarities can be grouped together.

11. For the detail analysis on classification of towns, see Ravinder Kumar, *Characteristics and Correlates of Indian Towns.* Centre for the study of developing Societies, Delhi.

APPENDIX

Variables Used in the Study

1.	Population of the town, 1961.	POP 61
2.	Density per Sq. Mile, 1961	DENS
3.	Sex Ratio, 1961	**SR**
4.	Proportion of the total workers as cultivators 1961	WACV
5.	Proportion of the total workers as agricultural Labourers, 1961	WAAG
6.	Proportion of the total workers engaged in mining, quarrying, livestock, forestary, fishing, hunting and plantation, 1961	WMQE
7.	Proportion of the total workers engaged in household industry, 1961	WHHI
8.	Proportion of the tola! workers engaged in manufacturing, other than house-hold industry, 1961	WMOH
9.	Proportion of the total workers engaged in Construction, 1961	WCON
10.	Proportion of the total workers engaged in trade and commerce, 1961	WTCO
11.	Proportion of the total workers engaged in transportation, storage and communication industry, 1961	WTSC
12.	Proportion of the total workers engaged in other services, 1961	WOTS
13.	Proportion of workers to total population, 1961	WTPOP
14.	Rate of growth of population, 1951-61	GRAT
15.	Number of occupied residential houses per thousand population, 1961	RHPOP
16.	Number of house-holds per thousand occupied residential houses, 1961	HHRH
17.	Number of literates and educated persons per thousand population, 1961	LITE
18.	Number of domestic radio sets per thousand population, 1961	ROPOP
19.	Number of telephones per thousand population, 1961	TLPOP
20.	Number of private cars per thousand population, 1961	PCPOP
21.	Number of scheduled Banks per thousand population, 1961	SBPOP
22.	Number of doctor per thousand population, 1961	DRPOP
23.	Number of cinemas per thousand population, 1961	CIPOP
24.	Sales Tax collection (Rs. 100) per hundred population, 1961	STP6P
25.	Entertainment Tax Collection (Rs. 100) per hundred population, 1961	ETPOP
26.	Domestic electricity connections per hundred population, 1961	DEPOP

27. Number of Power units consumed per hundred domestic connections, 1961 PUCDC
28. Number of power units consumed per thousand industrial connections, 1961 PUCIC
29. Proportion of male population aged (0-14) years to total male population, 1961 PMPM 1
30. Proportion of male population aged (15-34) years to total male population, 1961 PMPM 2
31. Proportion of male population aged (35-59) years to total male population, 1961 PMPM 3
32. Proportion of male population aged 60 years and above to total male population, 1961 PMPM 4
33. Proportion of female population aged (0-14) years to total female population, 1961 PFPF 1
34. Proportion of female population aged (15-34) years to total female population, 1961 PFPF 2
35. Proportion of female population aged (35-59) years to total female population, 1961 PFPF 3
36. Proportion of female population aged 60 years and above to total famale population, 1961 PFPF 4
37. Proportion of male workers aged (0-14) years to male population aged (0-14) years, 1961 WMWM 1
38. Proportion of male workers aged (15-34) years to male population aged (15-34) years, 1961 WMWM 2
39. Proportion of male workers aged (35-59) years to male population aged (35-59) years, 1961 WMWM 3
40. Proportion of male workers aged 60 years and above to male population aged 60 years and above, 1961 WMWM 4
41. Proportion of female workers aged (0-14) years to female population aged (0-14) years, 1961 WFWF 1
42. Proportion of female workers aged (15-34) years to female population aged (15-34) years, 1961 WFWF 2
43. Proportion of female workers aged (35-59) years to female -population aged (35-59) years, 1961 WFWF 3
44. Proportion of female workers aged 60 years and above to total female population aged 60 years and above, 1961 WFWF 4