

## City – Size Distribution in India

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**Abstract**— The study of distribution of urban places is of paramount importance in analyzing various urban concepts. In every country there are cities of different sizes. In general large cities are small in number and small cities are large in number. Researchers have investigated if there is any pattern in city-size distribution. This has resulted in two main patterns. They are expressed by two laws or rules, namely Law of Primate city, and Rank-size rule. This paper is concerned with city-size distribution of India. An attempt has been made to find out, whether the city-size distribution of India conforms to any of these two patterns stated above. The study has been made in historical perspective so that the changing pattern may also be brought out. The paper has checked the applicability of Rank Size on India taking top thirteen ranking cities of the country. The study is based on population data pertaining to 13 highly populated cities in the year 2001. The cities are Mumbai, Kolkata, Delhi, Chennai, Bangalore, Hyderabad, Ahmadabad, Pune, Surat and Kanpur. The data is obtained from Census of India. Five cities namely Mumbai, Chennai, Pune, Surat and Kanpur have population less than what they should have according to Rank-Size rule. Other cities have more than expected. Rank-Size rule is not applicable as all cities have population less than estimated Rank Size population. Taking Mumbai as 1st city, the primacy index is giving value less than actual population of all the cities prevalent in this town.

**Keywords:** City-size, Law of Rank-size rule, Law of Primate city, Zipf's law

### I. INTRODUCTION

The study of distribution of urban places is of paramount importance in analyzing various urban concepts. In every country there are cities of different sizes. In general large cities are small in number and small cities are large in number. Truly speaking, the problem of varying sizes of urban places is reaction of their nuclei in terms of their functions and organization of the settlement pattern in the region (Dickinson 1967). The city-size distribution has been a major topic of discussion among social scientists. This has attracted the attention of geographers for quite some time. Attempts have been made to find if any pattern exists in such a distribution. This has resulted in pointing out, two laws or rules, namely Law of Primate city and Rank-size rule. This paper is concerned with city-size distribution of India. An attempt has been made to find out, whether the city-size distribution of India conforms to any of the two patterns stated above.

### II. CONCEPT OF RANK-SIZE RULE AND PRIMACY

Living in a third world city today has come to mean living in a very large city of more than 1 million inhabitants; more than 1/3 of urban dwellers now live in such cities (this however is still lower than the situation in the U.s. where about 1/2 of the

population lives in metropolitan areas of more than 1 million. Much of the growth of large cities or megacities relates to the rank size relationship of cities. Intense urbanization focused on a single primate city provides the fuel that enables that city to grow into megacity. Many 3rd that world countries contain a single primate city that is disproportionately large. A simple rule of thumb is that this city is significantly greater than twice the size of the next largest city.

Not all third world countries however are built around primate cities. In India, the four largest cities are primate within their respective regional spheres. There is more to primate cities than their population size. Primacy also indicates a disproportionate sphere of economic activity, cultural dominance and political control. Primate cities tend to overwhelm their countries, becoming the only destination of choice for ambitious people and acting as the primary fulcrum of growth and development. Primate cities also contain the major cultural activities from movies to publishing houses to premier universities. Moreover many primate cities operate as the country's capital with the major of the primate city being a major political force in his or her own right.

### III. THEORETICAL BASE OF CONCEPT

Certain geographers examined the size distribution of settlement and described in the graphical form the relationship between the number and size of settlements. It is a well known fact that in any country or region there are always a few larger settlements (cities) and a larger number of smaller settlements (towns and cities). In other words, the number of settlements in any region is inversely proportional to the size of settlements. A relationship which is observed on the several occasions is called an empirical regularity. The rank size rule is one such empirical regularity.

The rank size rule was first observed by Auerback in 1913 but was proposed and popularized by G.K. Zipf a sociologist in his book "Human Behavior and Principle of Least Effort" in 1945. In the special case of a slope equal to one the rank-size rule is labeled "Zipf's law", named after the Harvard linguistic professor George Kingsley Zipf.

It is theory describing numerical distribution of settlement which recognizes an empirical regularity. This rule states that there is a relationship between the size of a town and its rank. If the towns of a country are ranked in a descending order by population, the largest city (rank one) will be twice as large as the second largest, three times as the third largest, four times as large as the fourth largest. Thus if the rank of a city is known its population can be found out by dividing the population of the largest city of country by the rank of the city in question. It is expressed mathematically:

$$Pr = P1 / rq$$

Where,

Pr = Population of the rth ranking city

$P_1$  = Population of the 1st ranking city

$r$  = Rank of the city

$q$  = Exponent

The value of  $q$  is often assumed to be unity, representing equality of the forces of unification and diversification. Under this condition an integrated and stable system of settlements is supposed to exist. The exponent  $q$  in the rank size equation cannot, however, assume negative values for in that case, the second ranking city will have a population greater than first. When the values of  $q$  range between zero and one, the decline in population with rank are gradual; values greater than unity for  $q$  indicate a very rapid decline in size of settlements with their rank. The former indicates the dominant role of forces of diversification, while the latter exists when the forces of unification are stronger than the forces of diversification.

Thus, the second ranking city of a country has one of the half the population of the largest city, the third ranking city, one third of the largest and so on down the scale. In other words, it says that if all cities in a country are arranged in order of decreasing population size, then the size relationship between the towns of cities of each rank is extremely regular with fewer larger cities/ towns and many small cities/ towns.

#### IV. CONCEPT OF RANK-SIZE RULE

The rank size rule depicts a harmonic progression of rules within the urban hierarchy such that if the population of the largest city is known, the population of all other cities can be derived from the cities of their rank. When the ranks of cities arranged in descending order with rank 1 given to the largest city are plotted against their population in a double logarithmic graph, a rank-size distribution of cities results. A rank-size distribution is expected to indicate political unity, economic development and an integrated urban system (Gregory and Urry, 1985).

This paper makes an attempt to find whether city-size distribution of India fits in any of these patterns. India is a country with medium level of urbanization. In 1901 only 10.84 percent of the total population lived in urban places. After that a steady increase took place. In 1951 urban dwellers were 17.29 percent and in 2001 27.78 percent

| Census year | Urban population (as percentage of total population) | Annual exponential growth of urban population |
|-------------|--|---|
| 1951        | 17.29  | 3.47  |
| 1961        | 17.97  | 2.34  |
| 1971        | 19.91  | 3.21  |
| 1981        | 23.34  | 3.83  |
| 1991        | 25.72  | 3.09  |
| 2001        | 27.78  | 2.73  |

Table 1: India — Urban population (as percentage of total population) & Annual exponential growth of urban population, 1901–2001

The significant growth in urban population took place after the independence (Table 1). After 1947, urban areas of India gained much importance in terms of commercial, industrial, socio-economic and administrative activities. The highest annual exponential urban growth took place during the period 1981-1991 (Table 1), which was the period of industrial expansion in India which resulted in rural

to urban migration and eventual growth of cities. A striking feature of urbanization in India has been the increasing concentration of urban population in relatively large cities, notably Mumbai, Delhi, Kolkata and Bangalore. In India there are large number large cities, fair number of intermediate cities and comparatively only a few numbers of small cities. Within this general framework the city-size distribution in India has been examined by applying two recognized patterns, i.e. Rank-size rule and Law of Primate city.

#### V. SOURCE OF DATA & METHODOLOGY

The study is based on population data pertaining to 13 highly populated cities in the year 2001. The cities are Mumbai, Kolkata, Delhi, Chennai, Bangalore, Hyderabad, Ahmadabad, Pune, Surat and Kanpur. The data is obtained from Census of India. Five cities namely Mumbai, Chennai, Pune, Surat and Kanpur have population less than what they should have according to Rank-Size rule. Other cities have more than expected. Rank-Size rule is not applicable as all cities have population less than estimated Rank Size population. Taking Mumbai as 1st city, the primacy index is giving value less than actual population of all the cities prevalent in this town.

Further to study city-size distribution in India data about cities and their population in different periods were required. For this purpose population of urban settlements in the census years 1951, 1961, 1971, and 1981, 1991 and 2001 were obtained. To examine the patterns of city-size distribution in India population data of cities of different census years were applied on the Law of Rank-Size rule and the Law of Primate city.

As stated before, the relationship between a city's population size and its regional or national rank gives rise to the rank size rule. The arithmetical formulae used for the calculation are as follows:

Put ranking of all the urban areas in the country in descending order.

$$P_i = P_1 - R_i - 1$$

Where,

$P_i$  = the predicted population of the urban area to be calculated.

$P_1$  = population of the 1st largest urban area.

$R_i - 1$  = rank of the urban to be calculated.

#### VI. RESULTS & DISCUSSION

##### A. Average size of towns in India according to their ranks

In India numbers of towns are continuously increasing with a change in their average population size which has been depicted through table 2 and table 3. Here an effort has been made to seek the changing average population size with the help of total number of towns and their total population of the mega cities of each class for the year 1961-2001. Table 2 clearly indicates that first and second class cities are largely increasing their size. The first class cities have maintained an increase of about 5 lakh in its average size per census year. Second size cities show a less growth in their average size in 1971-81 in comparison to 1961-71. Class III and Class IV cities have recorded a little increase in their average size in

1961-71 decade, but in 1971-81 decade their average population size has decreased. Class V cities have continued with its growth in previous 20 years though this growth is

very little. The situation of Class VI and Class VII cities is like that of Class III and Class IV.

| Rank | Average size    |         |        |         |         |         |
|------|-----------------|---------|--------|---------|---------|---------|
|      | Population Size | 1961    | 1971   | 1981    | 1991    | 2001    |
| I(a) | 10 Lakh >       | 2549652 | 304676 | 3501904 | 3072229 | 3082286 |
| I(b) | 1-10 Lakh       | 2296660 | 240460 | 256226  | 249600  | 178907  |
| II   | 50,000-99,999   | 66168   | 67584  | 67372   | 68355   | 67931   |
| III  | 20,000-49,999   | 30071   | 30621  | 30329   | 30290   | 30520   |
| IV   | 10,000-19,999   | 14748   | 14147  | 14181   | 14565   | 18377   |
| V    | 5000-9999       | 7379    | 7624   | 7603    | 7789    | 7378    |
| VI   | >5000           | 3404    | 3761   | 3420    | 3408    | 3394    |
|      | Average size    | 33228   | 42279  | 48132   | 58982   | 55406   |

Source: Census of India for different years

Table 2: Average size of towns in India according to their ranks

The above table depicts that when the city steps up from lower to upper class it reduces the average population size of high class city. The number of cities with a population of more than 1 lakh but less than 10 lakh has increased from 391 to 723 in the previous decade which has decreased the average population size of these cities from 2.49 lakh to 1.78

lakh. In great metropolitan cities, the increase in average population size seems to be ineffective. Though they have increased their number from 23 to 35. According to Rank-size rule, which class size city has more or less population in 1991-2001 has been depicted in the table 3 below.

| CLASS | 1991              |                        |            | 2001              |                        |            |
|-------|-------------------|------------------------|------------|-------------------|------------------------|------------|
|       | Actual Population | Theoretical Population | Difference | Actual Population | Theoretical Population | Difference |
| I     | 249600            | 152656                 | +96944     | 178907            | 125102                 | +53805     |
| II    | 68355             | 76328                  | -7973      | 67931             | 62551                  | +5380      |
| III   | 30290             | 50885                  | -20595     | 30520             | 41700                  | -11180     |
| IV    | 14565             | 38164                  | -23599     | 18377             | 31275                  | -12904     |
| V     | 7789              | 30531                  | -22742     | 7378              | 25020                  | -18642     |
| VI    | 3408              | 25442                  | -22034     | 3394              | 20850                  | -17456     |

Source: Calculated by the author from Census Data of various years.

Table 3 Average size of towns in India according to their ranks

According to average size, India's Class I cities are large, but their size has reduced in 2001 in comparison to 1991 whose effect reflects on lower class cities. Class II cities became positive cities in 2001 in comparison to 1991 and the negative percentage of Class III, IV, V and VI cities has reduced in this decade. Now these are not as much negative as they used to be in 1991. Clearly, the urban sprawl is effectively visible in small cities.

censuses also. Rank-size rule envisages that there should be a continuum of cities from the highest to the lowest rank.

**B. Rank- Size of India's 13 Mega Cities (2001)**

Rank-Size rule when applied to India brings out that in 2001, the third largest city (Delhi) was about 2.55 times smaller than the largest (Mumbai), and the 10th (Kanpur) was about 6 times smaller (Table 4). This was the situation in previous

In a region or country exhibiting rank-size distribution of cities, primacy is non-existent. Rank size rule does not apply at all on Indian metropolitan cities as the population of two largest cities is as close as both are competing to be the Primate city. Both are industrial, commercial and transport city. In 2001, Delhi has also joined this race. Mumbai has become the largest city and Kolkata the second largest. Delhi being third in this race seems to have a little margin with the second largest city. The difference between Delhi and Chennai is almost the same as between Mumbai and Kolkata.

| City      | Rank | Ac Actual Population | Theoretical Population | R=P1/Pr |
|-----------|------|----------------------|------------------------|---------|
| Mumbai    |      | 163.88               | -----                  |         |
| Kolkata   |      | 132.16               | 81.94                  | 1.24    |
| Delhi     |      | 127.91               | 54.63                  | 1.28    |
| Chennai   |      | 64.24                | 40.97                  | 2.55    |
| Hyderabad |      | 55.23                | 32.78                  | 2.97    |
| Bangalore |      | 56.86                | 27.31                  | 2.88    |
| Ahmedabad |      | 45.19                | 23.41                  | 3.63    |
| Pune      |      | 37.55                | 20.48                  | 4.36    |
| Kanpur    | 10   | 26.90                | 16.39                  | 6.09    |
| Nagpur    | 13   | 21.22                | 12.61                  | 7.72    |
| Lucknow   | 12   | 22.66                | 13.66                  | 7.23    |
| Surat     | 9    | 28.11                | 18.21                  | 5.83    |

|        |    |       |       |      |
|--------|----|-------|-------|------|
| Jaipur | 11 | 23.41 | 14.89 | 7.00 |
|--------|----|-------|-------|------|

Source: Calculated by the author from Census of India, 2001

Table 4: Rank- Size of India’s 13 Mega Cities (2001)

In 1971, the population of Kolkata is about 74 lakh. According to Rank size rule the population of second rank city should be about 37 lakh. The population of Delhi is 36.3 lakh which is almost half of Kolkata’s population. Thus if we

leave Mumbai, then Delhi gets the second rank. As per this rule (Considering Mumbai as primate city like Kolkata and taking Kolkata’s population as a base) the population of other cities will be like this.

| City      | 2001   | Rank | 1991   | Rank | 1981  | Rank | 1971  | Rank | 1961  | Rank |
|-----------|--------|------|--------|------|-------|------|-------|------|-------|------|
| Mumbai    | 163.88 | 1    | 125.71 | 1    | 82.43 | 2    | 59.70 | 2    | 41.52 | 2    |
| Kolkata   | 132.16 | 2    | 109.16 | 2    | 91.94 | 1    | 74.20 | 1    | 59.83 | 1    |
| Delhi     | 127.91 | 3    | 83.75  | 3    | 47.29 | 3    | 36.47 | 3    | 23.59 | 3    |
| Chennai   | 64.24  | 4    | 53.61  | 4    | 42.89 | 4    | 31.69 | 4    | 19.44 | 4    |
| Hyderabad | 55.23  | 5    | 42.80  | 5    | 25.45 | 7    | 17.96 | 5    | 12.49 | 5    |
| Bangalore | 56.86  | 6    | 40.86  | 6    | 29.21 | 5    | 16.64 | 7    | 12.07 | 6    |
| Ahmedabad | 45.19  | 7    | 32.97  | 7    | 25.48 | 6    | 17.52 | 6    | 12.06 | 7    |
| Pune      | 37.55  | 8    | 24.85  | 8    | 16.86 | 8    | 11.35 | 9    | 7.90  | 9    |
| Kanpur    | 26.90  | 10   | 21.11  | 9    | 16.39 | 9    | 12.75 | 13   | 9.71  | 13   |
| Nagpur    | 21.22  | 13   | 16.61  | 10   | 13.02 | 10   | 9.30  | 10   | 6.90  | 10   |
| Lucknow   | 22.66  | 12   | 16.42  | 11   | 10.07 | 12   | 8.13  | 11   | 6.55  | 11   |
| Surat     | 28.11  | 9    | 15.17  | 12   | 9.13  | 15   | 4.93  | 18   | 3.17  | 18   |
| Jaipur    | 23.41  | 11   | 15.14  | 13   | 10.15 | 11   | 6.36  | 14   | 4.10  | 16   |

Source: Calculated by the author from Census Data of various years.

Table 5: Size and Rank of India’s 13 Largest Cities of India

Population in lakh

In 1971, putting Kolkata at first rank, the rank size rule is applicable up to 4 cities of India. The population of Delhi, Chennai and Hyderabad is very near to their expected population having a very little difference. If Hyderabad, Bangalore and Ahmadabad are considered the city of fourth rank (as the population figures for these cities are very close), then Kanpur may get the fifth rank as it has the population of 12.7 lakh whereas the expected one is 14 lakh.

In 1981, there are 12 metropolitan cities having population more than 10 lakh. The new entrants in this category are Nagpur (12.97), Lucknow (10.6) and Jaipur (10.4) which possess 10th, 11th and 12th rank respectively. In 1971, Kanpur and Pune joined this category. Today these cities have 8th and 9th rank respectively.

According to 1981 census Kolkata and Mumbai have created domain in their respective areas. The population gap between the two is decreasing slowly. In last 50 years, these two metropolises have come close to each other in respect of total population. Kolkata had a population of 91.65 lakh in 1981. As per Rank size rule, the population of second

rank city should be 45.82. If we consider Delhi as second rank city, then it possesses 11.31 lakh more persons than the expected ones. Chennai seems to be very close to the expected population of second ranked city. Here actual population is 2.06 lakh less than the expected population. Bangalore is the city of third rank, whose actual population 1.43 lakh less than the expected population. Hyderabad and Ahmadabad seems to be very close to the expected population of rank fifth city. Both these metropolises possess 2.39 lakh and 2.26 lakh more population than the expected population 22.89 lakh. As per rule the expected population of rank fifth city should be 18.33. Kanpur and Pune seems to be very near to rank sixth. This possesses about 1.45 lakh less population than the expected. Nagpur seems to be sixth and Lucknow and Jaipur to be near to the expected population of ninth rank city. Thus it is clear that this rule does not apply on large metropolises of India in 1981. Actually all these cities are of great significance in their respective areas and vary in economic development.

| City      | Rank | Actual Population (1991) | Expected Population (1991) | Actual Population (1981) | Expected Population (1981) | Actual Population (1971) | Expected Population (1971) |
|-----------|------|--------------------------|----------------------------|--------------------------|----------------------------|--------------------------|----------------------------|
| Mumbai    | 1    | 125.71                   | I 125.71                   | 82.43                    |                            | 59.70                    |                            |
| Kolkata   | 2    | 109.16                   | I                          | 91.94                    | I 91.94                    | 74.20                    | I 74.20                    |
| Delhi     | 3    | 83.75                    | 62.9                       | 47.29                    | 45.8                       | 36.47                    | II 37.1                    |
| Chennai   | 4    | 53.61                    | II                         | 42.89                    | II                         | 31.69                    | III 24.7                   |
| Hyderabad | 5    | 42.80                    | 42.0                       | 25.45                    | IV 22.9                    | 17.96                    | IV 18.5                    |
| Bangalore | 6    | 40.86                    | III                        | 29.21                    | III 30.6                   | 16.64                    | IV                         |
| Ahmedabad | 7    | 32.97                    | IV 31.4                    | 25.48                    | IV                         | 17.52                    | IV                         |
| Pune      | 8    | 24.85                    | V 25.1                     | 16.86                    | V 18.3                     | 11.35                    | V                          |
| Kanpur    | 9    | 21.11                    | VI 21.0                    | 16.39                    | VI 15.3                    | 12.75                    | V 14.8                     |
| Nagpur    | 10   | 16.61                    | 18.0                       | 13.02                    | VII 13.1                   | 9.30                     | VI 12.4                    |
| Lucknow   | 11   | 16.42                    | VII                        | 10.07                    | VIII 11.5                  | 8.13                     | VII 10.6                   |
| Surat     | 12   | 15.17                    | 15.7                       | 9.13                     | IX 10.2                    | 4.93                     |                            |

|          |       |      |       |      |      |  |
|----------|-------|------|-------|------|------|--|
| Jaipur13 | 15.14 | VIII | 10.15 | 11.5 | 6.36 |  |
|----------|-------|------|-------|------|------|--|

Source: Calculated by the author from Census Data of various years.

Table 6: As per Rank-size rule --Expected population size of India’s Metropolitan Cities in different census Years (Considering Mumbai & Kolkata as Primate City) Population in lakh

According to 1991 Census, the number of megacities having population more than 10 lakh became 23. This year Surat (15.14), Kochi (11.39), Coimbatore (11.35), Barodra (11.15), Indore (12.04), Patna (10.98), Madurai (10.93), Bhopal (10.63), Vishakhapatnam (10.61), Varansi (10.26), and Ludhiana (10.12) have joined this category.

The R-S Rule of Zipf does not show positive relationship. India may be looked upon as country with two primate cities Mumbai and Delhi. Of the two Mumbai is more dominant and its dominance is getting accentuated. In 1991, it had a population of more than 125 lakh. By virtue of its population Mumbai is the first rank biggest metropolis. But next lower population city of Delhi had much bigger size than one-half of Mumbai. Not only the second largest city but even the fifth ranking city in India shows much more concentration of people than one fifth of Mumbai. If we examine a reverse order and estimate the population of the largest first-rank city given the population of the nth rank, then also the R-S case of India seems impractical, Bangalore

in 1991 had more than 26.5 lakh population and its rank was sixth. This too confirms the same statement that Indian cities do not show positive relationship as was postulated theoretically by Zipf. Mumbai was 1.3 times larger than Delhi in 1991 and 1.7 times in 1971 (Table 3). It was almost double of the third largest city in 1971 and 2/3rd in 1991.

In 1991, Mumbai got the rank of largest metropolis of the country leaving behind Kolkata. Delhi is rapidly moving forward in this direction whereas Chennai has 9.3 lakh persons less than Delhi. Hyderabad and Bangalore are very near to third rank. Ahmedabad is fourth rank city. The fifth rank city consists of the same trait. Kanpur has become the sixth rank city. Nagpur and Lucknow are proceeding towards the expected population of seventh rank. Their population is below expectations. Surat and Jaipur are the cities of eighth rank. This clearly indicates that the rank size rule is applicable partially or fully on remaining low ranked cities except for metropolitan cities.

| City      | Actual Population | Rank | Expected Population | Population Difference | % Difference |
|-----------|-------------------|------|---------------------|-----------------------|--------------|
| Delhi     | 127.91            | I    | -----               | -----                 | -----        |
| Chennai   | 64.24             | II   | 63.95               | 0.29                  | 0.45         |
| Bangalore | 56.86             | III  | 42.63               | 14.23                 | 25.02        |
| Hyderabad | 55.33             | III  | 42.63               | 12.70                 | 22.95        |
| Ahmedabad | 45.19             | IV   | 31.98               | 13.21                 | 29.23        |
| Pune      | 37.55             | IV   | 31.98               | 5.57                  | 14.83        |
| Surat     | 28.11             | IV   | 25.58               | 2.53                  | 9.00         |
| Kanpur    | 26.90             | V    | 25.58               | 1.32                  | 4.91         |
| Jaipur    | 23.41             | VI   | 21.32               | 2.09                  | 8.93         |
| Lucknow   | 22.66             | VI   | 21.32               | 1.34                  | 5.91         |
| Nagpur    | 21.22             | VI   | 21.32               | -0.10                 | -0.47        |

Source: Calculated by the author from Census Data of various years.

Table 7: Considering Delhi as Primate City in 2001 Population in lakh

According to 2001 Census, the number of megacities having population more than 10 lakh has become 35. This year Agra, Merrut, Nasik, Jabalpur, Jamshedpur, Asansol, Faridabad, Dhanbad, Allahbad, Amritsar, Vijayawada and Rajkot have joined this category. This year Kolkata has been left behind by Mumbai from a great margin. Whereas Delhi has reached very near to Kolkata. It seems that in the next census year it will supersede Kolkata. All three metropolises have established their supremacy in their own regions. If these three metropolises are put in first rank, then Chennai in spite of being on fourth rank it can be ranked first according to rank size rule. For considering Delhi as primate city, its expected population should be 63.95 lakh whereas Chennai’s actual population is 64.24 lakh which is nearly 29,000 more than the expected population of the primate city. Hyderabad and Bangalore are very close to each other, though Bangalore has left Hyderabad behind. If both the cities are put in third rank, then expected population should be 42.63 lakh. Thus both are positive cities and both possess nearly 14 lakh more persons.

On the contrary primacy in India is on the increase. Mumbai the largest and Delhi is the second largest city. They

dominate the urban scene. With the passage of time they are leaving behind other cities. Between Mumbai and Delhi, Mumbai is growing at a faster rate and the gap between the two is increasing (Table 3). As such we came to the conclusion that Rank-size rule does not apply to India. An examination of the cities of India bring out that Mumbai and Delhi are the two cities which dominate the urban scene (2011 Censuses). They together accounted for more than one-third of the urban population of India. The numbers of intermediate size cities having population (20,000- 99,999) were 1008 in 1981 which increased to 1889 in 2001. Their percentage share in the total number of cities in 1981 was 33.6 which increased to 47.7. The numbers of small cities (Less than 20,000) were 223 in 1981 which decreased to 186 in 1998 whereas its share decreased from 58.6 percent in 1981 to 41.3 percent (Table 3).

The R-S Rule of Zipf does not show positive relationship. India may be looked upon as country with two primate cities Mumbai and Delhi. Of the two Mumbai is more dominant and its dominance is getting accentuated. In 1991, it had a population of more than 125 lakh. By virtue of its population Mumbai is the first rank biggest metropolis.

But next lower population city of Delhi had much bigger size than one-half of Mumbai. Not only the second largest city but even the fifth ranking city in India shows much more concentration of people than one fifth of Mumbai. If we examine a reverse order and estimate the population of the largest first-rank city given the population of the nth rank, then also the R-S case of India seems impractical, Bangalore in 1991 had more than 26.5 lakh population and its rank was seventh. This too confirms the same statement that Indian cities do not show positive relationship as was postulated theoretically by Zipf. Mumbai was 1.3 times larger than Delhi in 1991 and 1.7 times in 1971 (Table 3). It was almost double of the third largest city in 1971 and 2/3rd in 1991.

The primacy index for India (the ratio of population of largest city to the combined population of the four largest cities) has also registered increase from 1951 to 1998 (Table 3). In 1951 it was 45.8 and in 1998 it was 52.3. This shows that India is shifting more towards primate city-size distribution.

| year | Ratio between Population of first City (Mumbai) & Second City (Delhi) | Primacy Index: Population of Mumbai as Percent of the combined population of four largest cities | Population of Mumbai as Percent of the total Urban Population |
|------|---|--|---|
| 1951 | 1.7   | 4.37   | 4.79  |
| 1961 | 1.6   | 4.79   | 5.26  |
| 1971 | 1.5   | 5.02   | 5.47  |
| 1981 | 1.3   | 4.79   | 5.17  |
| 1991 | 1.05  | 4.26   | 4.56  |
| 2001 | 0.86  | 3.93   | 4.18  |

Source: Calculated by the author from Census Data of various years.

Table 8: Indices of Primacy for India

India however does not conform to Law of primate city fully. The Law of primate city envisages that the primate city dominates the scene in a decisive manner such as Bangkok, Wellington and Lima. Mumbai does not possess this dominating position. Berry also came to the same conclusion. (Berry, 1961) studied the city-size distribution of 38 countries. He concluded that there are some countries which conform to Primate-city distribution and there are some countries which conform to rank-size rule. There is a third category of countries which are intermediate in character and India is one of them.

At present, in India, there is no primate city. India being a federal state, the situation does not warrant to give fillip to only one centre agglomerated voluminously leaving far behind other centres. The large areal extent of India, the colonial legacy of the past as well as the disintegration because of the rule of princely states have been some of the major causes disallowing urban primacy.

In 1991, the population of Greater Mumbai was more than 12.5 million, and it was the leading metropolis. But, at the same time, Delhi which was the second in the rank had more than 8.4 million people. Thus there was no case of primacy. In 1981, Delhi was the national capital, but it has third rank after Kolkata and Mumbai, their respective

population being 5.7, 8.2 and 9.19 million. This was again not the case of primacy. Even in 2001, Mumbai had about 11.9 million against the second city of Delhi which was having the population of 10.5 million. Since then Delhi has been growing fastly and it is very likely that it will surpass Mumbai in the coming decade. The absence of primacy in India can be held both by political as well as geographical reasons. Geographically its extent in area did not favour centralization of infrastructure-economic, cultural and even social to bring about a unitary growth at one –point. India was never a politically unified nation until 1947. Even after six decades of independence, the country has not come out of crude regionalism and lot of confusion has been going on over sharing the essential resources of water, energy, forests etc. This is primarily because India is not politically a unitary state. It is partially federal and partially unitary. Each federal state of India is seeking the development of its own prime city. This can be inferred that in India it is only the strong the central political power which would generate primacy. Some efforts have now been made to provide political as well as economic bases for Delhi to see at as a real primate capital of the Indian Union .But around Delhi there have developed a large number of low-index towns, and to some extent they are characterized for commerce and industries. This might be proving a constraint for Delhi’s primacy vis-à-vis Mumbai. Delhi is yet to display its dominance.

Above tables indicate that the ranks of cities have not changed in 1961-1971. The cities have maintained the positions attained economic and political development after independence. The ranks got changed in 1981. During 1981 and 1991 Kolkata slipped to second rank, Hyderabad from fifth to sixth rank and Bangalore attained the fifth rank. Ahmedabad and Pune maintained their ranks. Kanpur slipped to tenth rank from the ninth and Surat jumped to 9th rank from the 12th. Jaipur and Lucknow have improved their ranks whereas Nagpur has been down to 13th rank from the 10th rank.

In the decade of 1991 to 2001 Delhi has reached near Kolkata. Chennai has maintained its rank whereas Hyderabad has slipped to sixth rank from the fifth one and the fifth position has occupied by Bangalore. Ahmedabad and Pune are on the previous ranks. Surat has hopped to twelfth place from the ninth. Jaipur and Lucknow have improved their ranks whereas the rank of Nagpur has stepped down from tenth place to thirteen.

## VII. CONCLUSION

It is a common observation that cities differ in size. The distribution of cities by size has been explained by two laws, namely Rank-size rule and Law of Primate City. India is a country of medium level of urbanization, poor economic structure and poor transport network. With these India neither conforms to the Rank-size rule nor to the Law of Primate city.

To conclude, there is a little difference among the population of cities with fifth; sixth, seventh and eight rank as the metropolitan cities of India have a concentration of administrative and economic functions and thus emerged as primate cities in their respective regions but are also parasitic in nature .They dominate at the national as well as at the state level. But as a whole some metropolitan cities’ population is

so close that the applicability of rank-size rule seems to be absent. There are very less studies of this type in our country. New studies can throw more light and give new fruitful result in this direction. Geographers accept the significance of these rules for studying the distribution of towns and seek for the economic characteristics in this context.

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