

Determining Rank-Size Distribution of Urban Centres of Eastern Uttar Pradesh, India

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Abstract: *The concept of city-size distribution has riveted the attention of social scientists during the last four decades. The existence of three types of city-size distribution has been noted in the literature on city-size distribution and settlement system. These are central place, rank-size and primate city distributions. This paper is primarily concerned with the last two. The Rank-Size rule is one of the methods of analyzing total settlement network in a region and also a tool for analyzing the settlement system that helps in the description and interpretation of the relationship between rank and population size of urban centres. A city-size distribution, in which the largest, city is several times larger than the second largest is known as the primate city-size distribution. The present study aims to examine the validity of Rank-Size Rule in India's backward region Eastern Uttar Pradesh. A Stochastic model of the actual and expected population of the primate city and its variation from the estimated one provides interesting results that the urban centres in Eastern U.P. do not completely conform to the rank size rule.*

Keywords: *Rank-Size Rule, Zipf's Law, Primacy Index, Primate City*

I. Introduction

When we look into the various sizes of urban places in an area, it is commonly observed that there are a few large cities, many medium sized and host of small centres. This trend is universal and can be observed at national or regional. In other words, The distribution of urban centres of varying sizes at different distances in a region is said to have certain relationship between the population size and rank on the one hand and between the spacing and the hierarchical orders on the other under ideal theoretical conditions.

The concept of "Rank-Size Rule" was first propounded during the first quarter of the present century. Though the geographical interest in the size distribution of rank-size regularity owes much to Zipf's *National Unity and Disunity*, yet as Rosing (1966) has remarked, Zipf was by no means the first person to point towards the regularity of city sizes. This empirical existence of a regular relationship between the size of urban centres and their ranks was first presented by Auerback (1913) in a study of German cities. He was of the opinion that the population of the nth city was 1/nth the size of the largest city. Later on Lotka (1924) observed that the urban concentration indicated by the cities of United States fell in the same pattern.

It is a remarkable fact that the distribution of city-sizes exhibits a degree of regularity across various countries and periods in history. The rank-size rule was first of all put scientifically forward by Zipf (1941) as a theoretical model to express the relationship between observed and empirical regularity in the size of settlement hierarchy either urban or rural. This observed phenomenon is often referred to as *Zipf's Law*, after Zipf (1949) who observed that the logarithm of population size when plotted against the logarithm of the rank of the city produced points close to a straight line, with negative slope. Nowadays (e.g. Brakman et al., 1999, Gabaix, 1999), the term Zipf's Law is often used to refer exclusively to the case of a slope of negative one (rank inversely proportional to size) while for more general negative slope the term *rank-size distribution* is used. The Rank-Size rule is an empirical observation that expresses the relationship between settlement size (Population) and rank (its numerical position in the series erected by ordering all the settlements in the system from large to small. The idea that settlement size and rank have a systematic relationship was popularized by Zipf (1949), expressed it by simple formula as:

$$P_r = P_1/r^k, r = 1, 2, \dots$$

Where q is an exponent approximates to unity. This suggest that if the population of the largest city (P_1) is divided by any city in the same region, the result will approximately be the population of the city (P_r) whose rank number is used as a divisor.

If the population of the largest city is known, the population of all other cities can be derived from the rank of their size. Thus, if the largest city has 100,000,00 population the tenth city will have one-tenth or 100,000 and the hundredth city will have one-hundredth as many or 10,000.

Graphical Representation

If on a double logarithmic graph, the population of cities is plotted on y-axis and their rank on the x-axis, the distribution will tend to be a straight line at an angle of -45° or slope of -1.00 . If the cities of different regions are so plotted, departures from 'normal' distribution are graphically revealed (Harris, 1968). The frequency distribution of urban centres according to their size and hierarchy, plotted on a double logarithmic graph paper gives a curvilinear trend, which is known as the rank-size curve. The placing of all points for actual and estimated population of urban centres above line of actual rank-size distribution show a sign of underdeveloped economy (Fig. 2). In case of developed economy all these points should either run along the line or below in case of over developed. This represents the paucity of service facilities, poor transportation linkages with the area of umland, unbalanced regional development and the availability of meager income and low productivity in most of the urban centres of Eastern Uttar Pradesh.

Primacy Index

The degree of primacy of the largest can be measured by the ratio of its population to that of the second larger city or to those of some other ranks of cities combined (Browning & Gibbs 1966). Primacy is the superlative lead of the largest or primate city over the smaller cities and towns. This may be expressed as a ratio:

$$\text{Primacy Index (1)} = P_1/P_2$$

Where P_1 and P_2 are the populations of the first and second largest settlements respectively or:

$$\text{Primary Index (2)} = P_1/P_3$$

Where P_1 and P_3 are the populations of the first and third settlements respectively. It is necessary under the rank-size rule that the primacy index for P_1 and P_2 settlements be 2; for P_1 and P_3 it must be 3 and so on.

Studies in Rank-Size Rule

A number of scholars- foreign as well as Indian, have examined and utilized the Zipf's rule in analyzing the distribution of urban places in their own own universe. Berry and Garrison (1958), Beckmann(1958), Stewart Jr. (1958), Hagget (1965), Smailes (1967),etc., are some of the principal geographers outside India who have analyzed the principle of size and rank of urban places. Among Indian who have given thought about Zipf's analogy are Qazi Ahmad (1965), A. Ramesh (1965), Mumtaz Khan (1980), S.R. Patil (1969), N.B.K. Reddy (1969), B.L. Singh (1985), Suranjit Kumar Saha (1987), R. Ramachandran (1999), R.B. Mandal (2000), L.N. Verma (2008), etc.

II. Methodology Used

The Rank-Size distribution among urban centres of Eastern Uttar Pradesh is investigated for different selected Census year i.e., 1901, 1911...2001. For each census year, the rank and the respective population size of each of the urban settlements which are arranged in the descending order of their population size are plotted in a log-graph showing ranks on the X-axis and the population size of the urban centres on Y-axis. The plots are connected by smooth lines and the trends of the urban settlement for each census year.

Objectives of the Present Study

The urban centres in a region are believed to have certain relationships, which are supposed to be constant under ideal theoretical conditions. Certain rules have been formulated to explain the relationship between the population size and the rank order on the one hand and between the spacing and hierarchical order on the other. In the present paper, an attempt is been made to examine the validity of such theorizations in respect of urban centres of the study region (Eastern Uttar Pradesh). In order to make the study, more analytical and explicit, an attempt has been made to answer the following questions:

- i) How far the size distribution of the urban centres of Eastern Uttar Pradesh follows the rank-size rule?
- ii) How much does the size of urban centres deviate from the theoretical norm?
- iii) What is the position of each urban place in the theoretical curve?
- iv) Has the rank-size relationship been stable during the last 100 years (1901-2001) or has undergone significant changes?
- v) It has undergone significant changes, what has and been the nature of changes?
- vi) How much is the primacy of the primate city?

Study Area

Eastern Uttar Pradesh, a peripheral region covering 27 districts of Uttar Pradesh namely Allahabad, Azamgarh, Ambedkar Nagar, Bahraich, Ballia, Basti, Balrampur, Chandauli, Deoria, Faizabad, Ghazipur, Gonda, Gorakhpur, Jaunpur, Kaushambi, Kushinagar, Maharajganj, Mau, Mirzapur, Pratapgarh, Siddharth Nagar, Sant Kabir Nagar, Sant Ravi Das Nagar, Shravasti, Sonbhadra, Sultanpur and Varanasi extends from 23°

50' North to 28° 45' North latitudes and 81° 36' East to 84° 50' East longitudes covering an area of 85,845 km², which is nearly 29.2% of geographical area of Uttar Pradesh¹.

Its northern limit corresponds with the Indo-Nepal International boundary whereas Bihar-Jharkhand in eastern and Madhya Pradesh-Jharkhand in southern limits of the region. The western boundary of this region is demarcated by the western limits of Bahraich, Gonda, Faizabad, Sultanpur, Pratapgarh and Allahabad districts, as depicted in Fig 1. It comprises of 117 Tahsils, 356 Blocks, 50632 Villages and 202 urban/urban agglomerations.

Decadal Rank-Size Distribution of Urban Centers

In order to examine the rank-size distribution of urban centres of the study area, 8 double logarithmic graphs showing population size on the ordinate and rank on the abscissa, were drawn for all the centres defined as urban at each census from 1901-2001 (Fig. 2, Fig. 3 & Fig.4 and Table 1). As is evident from these graphs, the size distribution of urban centres of the study area does not conform to the rank-size rule. An analysis of the deviations from the theoretical rank-size relationship can be made with reference to the exponential lines (E-1 and E-2) which represents the theoretical size distribution of urban centres of the study area calculated on the basis of observed and expected population of the primate city respectively. The expected population of the primate city has been derived by dividing the total population of all the urban centres with the sum of the reciprocals of their ranks.

The curves for the census year 1901 and 1911 do not suggest any conformity with the rank-size rule as depicted in fig.2. All the urban centres are larger in size which is obvious from the fact that all of them lie above the exponential line-1 (E-1). The variation from exponential line-2 (E-2) is also significant. Varanasi the primate city of the study area, had a population of 215223 and 205420 in 1901 and 1911 respectively while according to the rank-size rule its population should have been 244976 and 208574 respectively. Thus, the actual population fell short of 29753 and 3159 to its expected population; the deficiency was -12.15 and -1.15 per cent respectively. While the second largest town Allahabad lies above the exponential line-2. Class Vth size towns are much bigger than their expected size. The exponential line E-2 located in all the previous graphs has come very close to the exponential line E-1, thus rank size distribution in 1921 shows that the variation between the actual and estimated population of the primate city is very small. Varanasi the primate city had a deficiency of -5.70 and -17.28 per cent to its expected size in 1921 and 1931 respectively. Allahabad, Faizabad and Mirzapur-cum-Vindhyachal are much larger than their expected size and smaller towns are much smaller than their expected size.

The exponential line E-1 and E-2 has gone little bit far away from each other signifying larger variation in actual and estimated. Varanasi the primate city of the study area, had a population of 203372 and 262838 in 1931 and 1941 respectively while according to the rank-size rule its population should have been 245859 and 297265 respectively. Thus, the actual population fell short of 42487 and 34427 to its expected population; the deficiency was -17.28 and -11.58 per cent respectively. While the second largest town Allahabad lies above the exponential line-2. Class Vth and VIth size towns are much bigger than their estimated size. The primate city, Varanasi had a population of 262838 and 351234 in 1941 and 1951 respectively while according to the rank-size rule its population should have been 297265 and 361219 respectively. Thus, the actual population fell short of 34427 and 9985 to its expected population; the deficiency was -11.58 and -2.76 per cent respectively and again the second largest town Allahabad lies above the exponential line-2. Class VIth size towns are much smaller than their expected size in census 1941.

In fig. 3 the graphs of census 1951, shows that a few large towns lies either on or near the line E-1. While the second largest town Allahabad lies above the exponential line-2. Varanasi the primate city, had a population of 351234 in 1951, while according to the rank-size rule its population should have been 361219. Thus, the actual population fell short of 9985 to its expected population; the deficiency was -2.76 per cent respectively. Excluding only few towns are all most all the towns are much smaller than their estimated size. The rank-size distribution in 1961 is transitional in character. The exponential line E-2, hitherto located to the right of line of line E-1 in all the previous graphs has not only come very close to it but has moved to the left of it. Thus, it is apparent that the variation between the actual and expected population of the primate city is very small. The population of the primate city Varanasi was 485083 in 1961 and which according to the rank-size rule its population should have been 459553. Thus, the observed population exceeded the expected population by 25530 persons or 5.56 per cent. The exponential line-E-2 located for the first time, to the left of line E-1 clearly indicates that the observed population size of urban centres of the study area is larger than their expected size. It is significant to mention that the rank-size distribution in 1961 is relatively closer to the exponential lines as compared to previous graphs. Towns above 50000 to below 5000 are smaller than their expected size. The graphs showing the rank-size distribution for 1971 indicates that the curve depicting the size distribution is gradually shifting from the right to the left of line E-1. The population of the primate city Varanasi was 588608 in 1961 and which according to the rank-size rule its population should have been 557761. Thus, the actual

population exceeded the estimated population by 30847 persons or 5.53 per cent. Urban centres of above 100000 to below 5000 population are much smaller than their expected size. Azamgarh, Deoria and Balrampur having a population varying between 50000 and 30000 persons are lying between the actual and the theoretical lines.

The rank-size distribution in 1981 is again in transitional in character as depicted in fig. 4. The exponential line E-2, located to the right of line of line E-1 in the previous graphs has moved to the right of it. Thus, the variation between the actual and expected population of the primate city is very large. The population of the primate city Varanasi was 716641 in 1981 and which according to the rank-size rule its population should have been 770005. Thus, it had a deficiency of 53410 or -6.94 per cent to its expected size. The exponential line-E-2 located to the right of line E-1 clearly indicates that the observed population size of urban centres of the study area is smaller than their expected size. Towns above 300000 to 600000 and between 13000 and 5000 are larger than their expected size and urban centres varying between 120000 to 60000, 30000 to 13000 and below 5000 persons are smaller than their expected size.

In 1991, curve depicting the rank-size distribution is gradually shifting from the right to left to the right. Urban centres between 500000-800000, 59000-77000 and 6300-17000 are larger than their expected size. Towns varying between 17000-45000 and below 6000 persons are smaller than their expected size. Varanasi the primate city of the study area, is much smaller than the expected size having a actual population of 932399, while according to the rank-size rule its population should have been 1048116. Thus, the actual population fell short of 115717 to its expected population; the deficiency was -11.04 per cent respectively. The graphs of census 2001, shows that a few large towns lies between E-1 and E-2 or near the line E-1. While the second and third largest town Allahabad and Gorakhpur respectively lies above the exponential line E-2. Urban centres between 600000-1000000, 70000-100000 and 7000-22000 are larger than their expected size. Towns varying between 100000-220000, 22000-60000 and below 7000 persons are smaller than their estimated size. Varanasi the primate city had a population of 1103952 in 1951, while according to the rank-size rule its population should have been 1321571. Thus, the actual population fell short of 217619 to its estimated population; the deficiency was -16.47 per cent against the -11.04 per cent recorded in 1991. It speaks of a very slow growth of Varanasi, the primate city, on the contrary the second and third largest towns Allahabad and Gorakhpur respectively are gaining rapid growth.

A Stochastic model of the actual and estimated population of the primate city and its variation from the estimated one provides interesting results as given in Table 1. Thus, it is evident from the above discussion that the urban centres in Eastern Uttar Pradesh do not completely conform to the rank-size rule.

Primate City

Varanasi is the primate city of Eastern Uttar Pradesh since the beginning of the present century. Its actual population is 1103952 while its expected population according to the rank size rule is 1321571 in 2001, thus recording 16.47 percentage less. It signifies that the actual population of all the urban centres of the study region is less than the expected population. Allahabad the second primate city, according to the 'rank-size rule' its ratio must be 1:2 but its actual ratio is 1:1.25, likewise actual ratio of every urban centres is less than the expected ratio.

Rank Fluctuations of Urban Centres

"No Phenomenon illustrates the significance of changing geographical values more profoundly than the relative status of town" (Smailes, 1967, p.62). The rank of the urban centres is decided by the population size of that centre vis-à-vis other centres. The change in the rank may be positive or negative as it is purely relative; a change in rank occurs only in relation to other urban centres of the region. However, the degree of freedom to change rank within the urban hierarchy vary from one rank to the other. For example, the largest urban centres cannot increase its rank; it can either maintain its first position or come down to a lower rank. Conversely, the smallest urban centres can only retain its rank or increase it; it cannot move further down in rank.

Table 2, shows the rank of 202 urban centre of the study area and changes in their rank over a period of ten decades (1901-2001). Table reveals that Varanasi, the largest city in 1901 and Allahabad the second primate city maintained their rank throughout the whole period. Gorakhpur starting in the fifth rank in 1901 had risen to third position from 1911 onwards. There was a great fluctuations found in Maunath Bhanjan, where in 1901 it was on 12th rank in, 1911, it came to 10th rank again it fell to 11th rank in 1921, and again it was on 10th position and after that, it rises to 8th position from 1951 to 1981 and again it rises to score 5th in 1941 and 4th position in 2001 Census. Mirzapur maintained its 4th rank in 1901 but fell to 5th in 1911 and again retained its fourth position from 1931 to 1991 but, fell down to 5th position in 2001. Bahraich gained its 7th position in 1911 to 1991 and again rises to 6th position in 2001 Census. Jaunpur ranked 6th position from 1901 to 1971 and rises to 5th and again in 1991 fell to 6th and 7th rank in 1991 and 2001 respectively. Faizabad witnessed a fall from 3rd in

1901 to 8th place in 2001. Gonda moved from 11th to 9th position in 1901 and 2001 respectively. Basti witnessing many fluctuations maintained at 10th position from 1951 onwards.

Ghazipur, Azamgarh, Tanda, Balrampur, Mubarakpur, Ayodhya, Nanpara, Ramnagar, Rudauli, Gaura Barhaj, Chunar, Muhammadabad Gohna, Rasra, Rudrapur, Lar, Mehdawal, Shahganj, Colonelganj, Allahabad city, Ahraura, Machhlisahar, Reoti, Sikanderpur, Saidpur, Tulsipur, Phulpur, Bhinga, Chitbara Gaon, Mariahu, Bansdih, Sewarhi, Barhalganj, Sahatwar, Siswa Bazar, Maniyar, Maruadih Raiway Settlement, Mau Aima, Gopiganj, Mongra Badshahpur, Varanasi, Majhauri Raj, Belthara Road, Jhusi Kohna, Bahadurganj, Nawabganj, Maghar, Sarai Aquil, Sarai Mir, Bharatganj, Pipraich, Kachhwa, Pachperwa, Bhatni Bazar, Manjhanpur, Bansgaon, Faizabad city, Chakia, Jhusi, Manikpur, Ramkola, Pipri, Ikauna, Amethi, Koraoon, Gosaiganj, Bhatpar Rani, Kerakat, Pratapgarh city, Chopan, Bikapur, Nizamabad, Gyanpur, Adari, Phulwaria, Kurthi Jafarpur, Katghar lalaganj, Dostpur, Barhani Bazar, Dudhi, Kaptainganj, Sirsa, Pipiganj, Bhadarsa, Illtifatganj, Atraulia, Hata, Ledwa Mahua, Didarnagar Fatehpur Bazar, Risia Bazar, Ajmatgarh, Gola Bazar, Sadat, Jiyanpur, Dohrighat, Rampur Karkhana, Hariharpur, Khargupur, Mankapur, Patti, Jafarabad, Churk Ghurma, Shohratgarh, Phulpur, Katra Medniganj, Kandwa, Maharajganj, Ghorawal, Katra, Gangapur and Amila witnessed a tremendous fall in their ranks. On the contrary, Deoria, Ballia, Sultanpur, Bela Pratapgarh, Padrauna, Akbarpur, Robertsganj Mohammadabad and Utraulia are those urban centres that moved considerably in the urban hierarchy during 100 years of the present century.

The fluctuations in the rank of urban centres may be attributed to several factors responsible for urban growth such as industrialization, developments of transport and accessibility, administration, etc.

III. Conclusion

Thus, the study of spatial distribution pattern of urban centres of the study area reveals the following conclusions:

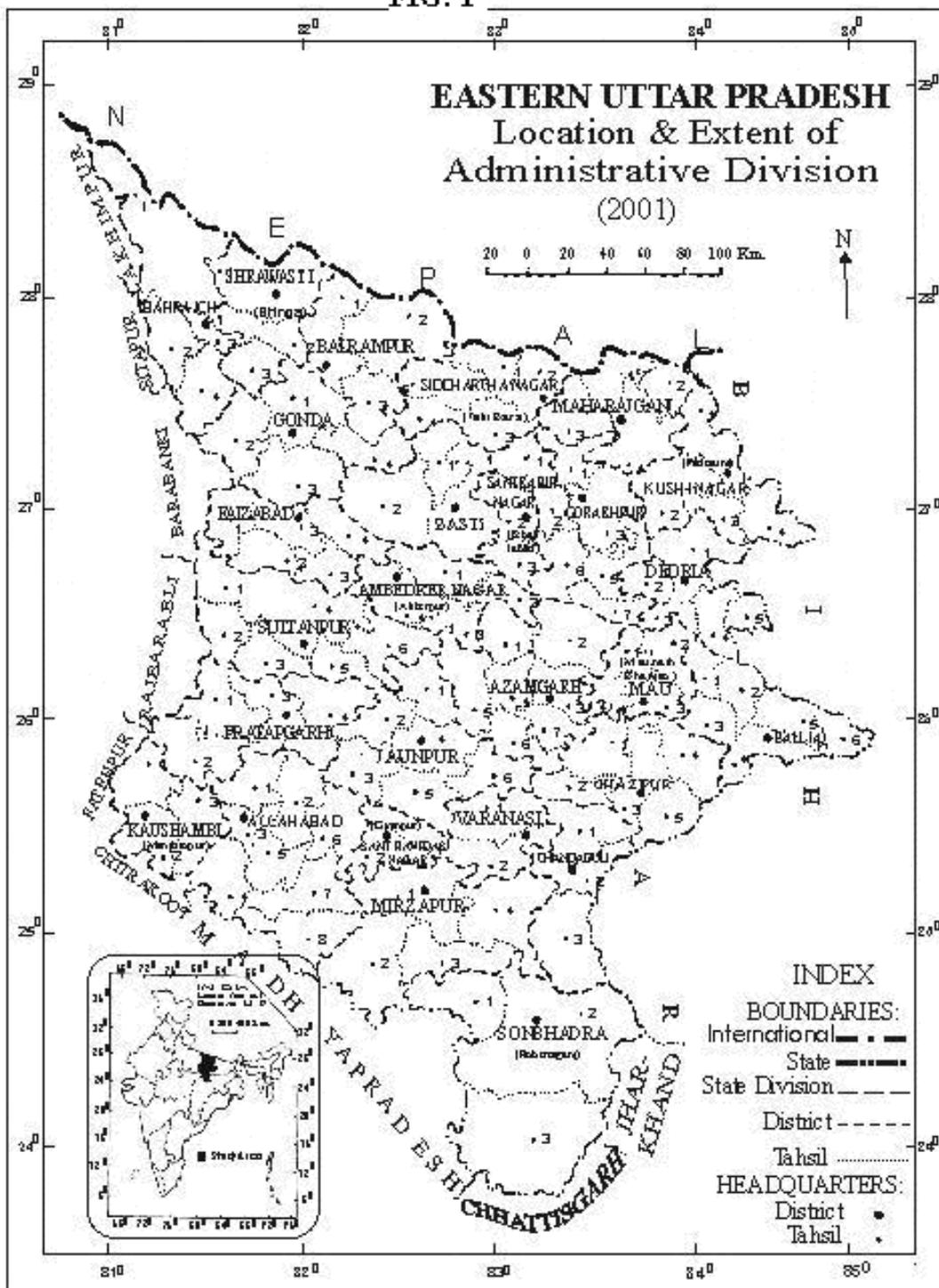
- i) The urban centres in Eastern Uttar Pradesh do not completely conform to the rank size rule. The actual population of all the urban centres of the study region is less than the expected population.
- ii) The actual population and expected population of Varanasi city is 1103952 and 1321571 respectively in 2001, thus recording 16.47 percentage less.
- iii) Varanasi, the primate city and Allahabad maintained its rank through out the whole period. The rank of 202 urban centre shows continuous changes in their rank over a period of ten decades (1901-2001) only due to urbanization

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FIG. 1



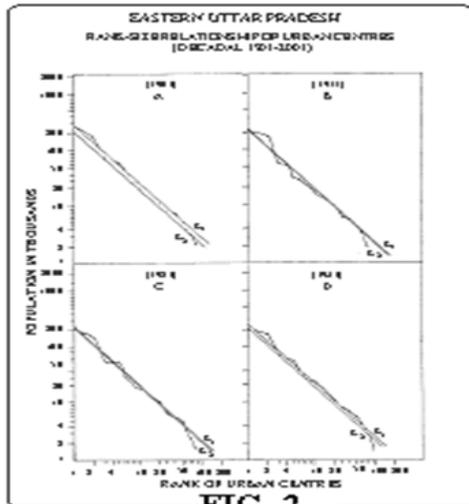


FIG. 2

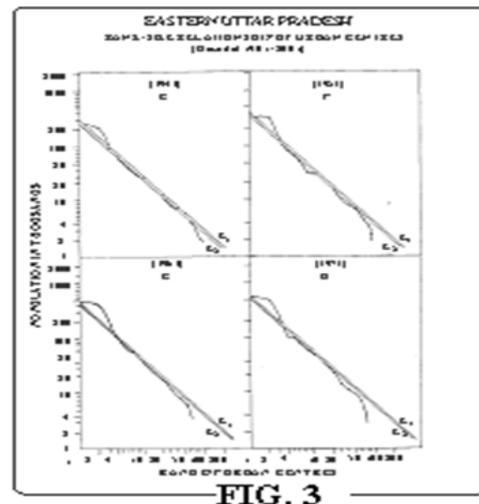


FIG. 3

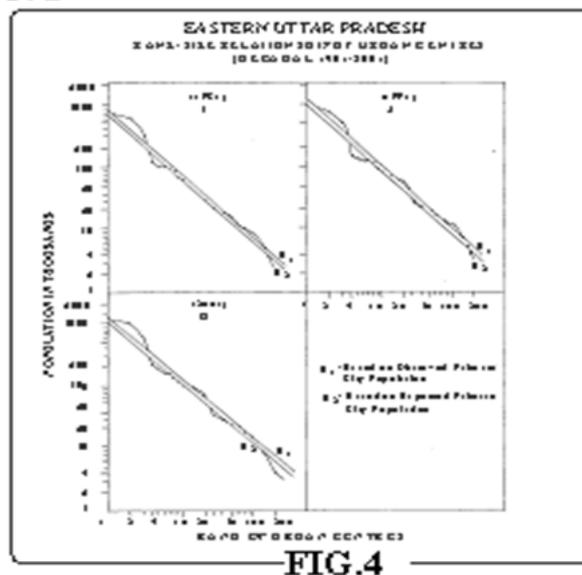


FIG. 4

Table 1: Stochastic model of the population of primate city in Eastern Uttar Pradesh (1901-2001)

| Census Year | Number of Towns | Sum of Reciprocal or Ranks | Sum of Urban Population | Actual Population of Primate City | Estimated Population | Difference of Actual & Estimated Population | Difference as % of the |
|-------------|-----------------|----------------------------|-------------------------|-----------------------------------|----------------------|---|------------------------|
| 1901 | 82 | 5.0218 | 1230221 | 215223 | 244976 | -29753 | -12.15 |
| 1911 | 79 | 4.9847 | 1039703 | 205420 | 208579 | -3159 | -1.51 |
| 1921 | 89 | 5.1032 | 1082496 | 200022 | 212121 | -12099 | -5.70 |
| 1931 | 94 | 5.1576 | 1268040 | 203372 | 245859 | -42487 | -17.28 |
| 1941 | 94 | 5.1576 | 1533173 | 262838 | 297265 | -34427 | -11.58 |
| 1951 | 97 | 5.1888 | 1874294 | 351234 | 361219 | -9985 | -2.76 |
| 1961 | 56 | 4.6254 | 2125616 | 485083 | 459553 | 25530 | 5.56 |
| 1971 | 75 | 4.9331 | 2751489 | 588608 | 557761 | 30847 | 5.53 |
| 1981 | 166 | 5.724 | 4407774 | 716641 | 770051 | -53410 | -6.94 |
| 1991 | 180 | 5.8047 | 5412297 | 1048118 | 932399 | 115717 | -12.41 |
| 2001 | 202 | 5.9197 | 7823303 | 1103952 | 1321571 | -217619 | -16.47 |

Source : Census of India, 2001, Uttar Pradesh, Volume-I, Primary Census

Table-2: Rank fluctuations of urban centres in Eastern U.P. (1901-2001)

Table-2
Rank fluctuations of urban centres in Eastern U.P. (1901-2001)

| RANK | URBAN CENTRES | 1901 | 1911 | 1921 | 1931 | 1941 | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 |
|------|------------------------|------|------|------|------|------|------|------|------|------|------|------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 1 | Varanasi (M.Corp+OG.) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | Allahabad (M.C.+OG) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 3 | Gorakhpur (M.Corp.) | 5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 4 | Maunath Bhanjan (MB) | 12 | 10 | 11 | 11 | 10 | 8 | 8 | 8 | 8 | 5 | 4 |
| 5 | Mirzapur (Vindhyachal) | 4 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 |
| 6 | Bahraich (MB) | 8 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 6 |
| 7 | Jaunpur | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 6 | 7 |
| 8 | Faizabad (MB) | 3 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 6 | 8 | 8 |
| 9 | Gonda (MB) | 11 | 12 | 13 | 9 | 11 | 11 | 9 | 9 | 9 | 9 | 9 |
| 10 | Basti (MB) | 16 | 17 | 12 | 10 | 14 | 10 | 10 | 10 | 10 | 10 | 10 |
| 11 | Deoria (MB) | 79 | 63 | 43 | 41 | 16 | 16 | 16 | 15 | 14 | 12 | 11 |
| 12 | Ghazipur(M.B.+O.G.) | 7 | 8 | 8 | 8 | 9 | 9 | 12 | 12 | 13 | 14 | 12 |
| 13 | Ballia (MB) | 15 | 11 | 9 | 14 | 15 | 12 | 11 | 11 | 12 | 11 | 13 |
| 14 | Sultanpur (MB) | 27 | 21 | 21 | 22 | 20 | 18 | 17 | 17 | 17 | 15 | 14 |
| 15 | Azamgarh (MB) | 10 | 18 | 15 | 15 | 13 | 14 | 14 | 14 | 11 | 13 | 15 |
| 16 | Mughalsarai | - | - | 73 | 72 | 56 | 50 | 32 | 32 | 18 | 17 | 16 |
| 17 | Tanda (MB) | 9 | 9 | 10 | 12 | 12 | 13 | 13 | 13 | 15 | 16 | 17 |
| 18 | Bhadohi (MB) | - | - | 82 | 24 | 90 | 19 | 19 | 19 | 20 | 19 | 18 |
| 19 | Balrampur (MB) | 13 | 13 | 14 | 13 | 8 | 15 | 15 | 16 | 19 | 20 | 19 |
| 20 | Bela pratapgarh (MB) | 34 | 37 | 25 | 25 | 23 | 21 | 18 | 18 | 16 | 18 | 20 |
| 21 | Mubarakpur | 14 | 14 | 16 | 17 | 24 | 22 | 21 | 20 | 24 | 22 | 21 |
| 22 | Renukoot | - | - | - | - | - | - | 28 | 27 | 21 | 21 | 22 |
| 23 | Obra | - | - | - | - | - | - | - | 40 | 29 | 23 | 23 |
| 24 | Ayodhya | - | - | - | - | - | - | - | - | 22 | 24 | 24 |
| 25 | Padrauna (MB) | 43 | 47 | 26 | 28 | 28 | 27 | 26 | 22 | 26 | 26 | 25 |
| 26 | Nanpara (MB) | 21 | 20 | 22 | 20 | 21 | 25 | 25 | 24 | 25 | 27 | 26 |
| 27 | Ramnagar (MB) | 19 | 16 | 18 | 18 | 22 | 23 | 22 | 26 | 27 | 29 | 27 |
| 28 | Khalilabad (MB) | - | - | - | - | - | - | - | 33 | 35 | 32 | 28 |
| 29 | Rudauli (MB) | 17 | 23 | 19 | 19 | 19 | 24 | 23 | 23 | 28 | 28 | 29 |
| 30 | Ghosi | - | - | - | - | - | - | - | - | 33 | 31 | 30 |
| 31 | Bansi (MB) | - | - | - | - | - | - | - | 37 | 47 | 35 | 31 |
| 32 | Gaura Barhaj (MB) | 23 | 15 | 17 | 16 | 17 | 20 | 24 | 25 | 30 | 30 | 32 |
| 33 | Chunar(M.B.) | 25 | 19 | 29 | 33 | 30 | 42 | 39 | 44 | 31 | 33 | 33 |
| 34 | Akbarpur | 40 | 24 | 41 | 36 | 45 | 41 | 37 | 36 | 34 | 34 | 34 |
| 35 | Kopaganj | 42 | 41 | 38 | 43 | 31 | 44 | 31 | 30 | 38 | 39 | 35 |
| 36 | Robertsganj (MB) | - | - | - | 83 | 82 | 82 | 47 | 61 | 46 | 47 | 36 |
| 37 | Mohammadabad | 38 | 35 | 37 | 44 | 40 | 34 | - | 34 | 40 | 40 | 37 |
| 38 | Muhamadabad Gohna | 31 | 32 | 28 | 35 | 57 | 60 | 46 | 53 | 75 | 71 | 38 |
| 39 | Jalalpur | 39 | 52 | 55 | 64 | 87 | 35 | 30 | 29 | 36 | 36 | 39 |
| 40 | Zamania | 50 | 60 | 54 | 53 | 49 | 40 | - | - | 45 | 44 | 40 |
| 41 | Nautanwa (MB) | - | - | - | 66 | 52 | 46 | - | - | 44 | 45 | 41 |
| 42 | Rasra (MB) | 26 | 22 | 27 | 31 | 27 | 28 | 27 | 31 | 37 | 41 | 42 |
| 43 | Mugalsarai Rly. Settl. | - | - | - | - | - | 43 | 33 | 28 | 32 | 37 | 43 |
| 44 | Chandauli (N.P.) | - | - | - | - | - | - | - | 70 | 95 | 104 | 44 |
| 45 | Utraula (MB) | 46 | 34 | 35 | 40 | 38 | 37 | 35 | 35 | 42 | 38 | 45 |
| 46 | Rudrapur | 30 | 26 | 24 | 32 | 34 | 38 | - | - | 43 | 43 | 46 |
| 47 | Maharajganj (MB) | - | - | - | - | - | - | - | - | - | 58 | 47 |
| 48 | Lar | 37 | 30 | 50 | 51 | 48 | 87 | - | - | - | 177 | 48 |
| 49 | Shahjanwa | - | - | - | - | - | - | - | - | - | - | 49 |
| 50 | Mehdawal | 22 | 25 | 23 | 21 | 26 | 26 | - | - | 39 | 42 | 50 |
| 51 | Shahganj (MB) | 47 | 54 | 48 | 49 | 47 | 52 | 40 | 41 | 48 | 48 | 51 |
| 52 | Colonelganj (MB) | 44 | 45 | 39 | 45 | 42 | 39 | 36 | 38 | 49 | 46 | 52 |
| 53 | Allahabad (CB) | - | - | - | 23 | 18 | 17 | 20 | 21 | 23 | 25 | 53 |
| 54 | Khamaria | - | - | - | - | - | - | - | - | 73 | 55 | 54 |
| 55 | Ahraura | 18 | 49 | 20 | 26 | 25 | 30 | 34 | 42 | 53 | 51 | 55 |
| 56 | Lal Gopalganj Nindaura | - | - | - | - | - | - | - | - | 59 | 49 | 56 |
| 57 | Machhlishahr | 32 | 40 | 34 | 42 | 33 | 51 | 41 | 50 | 65 | 56 | 57 |
| 58 | Anpara | - | - | - | - | - | - | - | - | - | - | 58 |
| 59 | Kunda | - | - | - | - | - | - | - | - | 71 | 67 | 59 |
| 60 | Reoti | 33 | 39 | 40 | 30 | 35 | 36 | - | 39 | 52 | 54 | 60 |
| 61 | Tetri Bazar (MB) | - | - | - | - | - | - | - | - | 64 | 57 | 61 |
| 62 | Amilo | - | - | - | - | - | - | - | - | 69 | 59 | 62 |
| 63 | Sikanderpur | 36 | 42 | 42 | 46 | 44 | 47 | - | - | 55 | 68 | 63 |
| 64 | Saidpur | 58 | 53 | 75 | 70 | 50 | 53 | 42 | 45 | 60 | 52 | 64 |
| 65 | Parasi (C.T) | - | - | - | - | - | - | - | - | - | - | 65 |
| 66 | Phulpur | 35 | 28 | 46 | 57 | 54 | 57 | 45 | 52 | 70 | 64 | 66 |
| 67 | Bhinga | 49 | 33 | 36 | 38 | 43 | 45 | 38 | 46 | 58 | 66 | 67 |
| 68 | Tulsipur | - | - | - | - | 46 | 49 | - | 47 | 67 | 53 | 68 |

Determining Rank-Size Distribution of Urban Centres of Eastern Uttar Pradesh, India

| | | | | | | | | | | | | |
|-----|-----------------------|----|----|----|----|----|----|----|----|-----|-----|-----|
| 69 | Chitbara Gaon | 28 | 51 | 70 | 27 | 36 | 32 | - | - | 50 | 65 | 69 |
| 70 | Mariahu | 61 | 68 | 68 | 73 | 70 | 70 | 50 | 55 | 77 | 72 | 70 |
| 71 | Bansdih | 24 | 27 | 32 | 29 | 29 | 31 | - | - | 54 | 60 | 71 |
| 72 | Sewarhi | - | - | - | - | - | - | - | 56 | 66 | 61 | 72 |
| 73 | Lohata | - | - | - | - | - | - | - | 68 | 94 | 90 | 73 |
| 74 | Barhalganj | 51 | 56 | 52 | 58 | 75 | 55 | 44 | 49 | 63 | 70 | 74 |
| 75 | Sahatwar | 20 | 44 | 33 | 34 | 32 | 29 | - | - | 56 | 63 | 75 |
| 76 | Siswa Bazar (N.P.) | 72 | 46 | 44 | 47 | 41 | 48 | - | - | 57 | 69 | 76 |
| 77 | Amethi | - | - | - | - | - | - | - | - | 114 | 107 | 77 |
| 78 | Maniyar | 29 | 29 | 30 | 37 | 39 | 33 | - | - | 61 | 76 | 78 |
| 79 | Maruadih Rly. Settl. | - | - | - | - | - | - | - | 43 | 41 | 50 | 79 |
| 80 | Kushinagar | - | - | - | - | - | - | - | - | 85 | 78 | 80 |
| 81 | Mau Aima | 45 | 36 | 45 | 55 | 53 | 59 | 48 | 54 | 81 | 81 | 81 |
| 82 | Gopiganj (MB) | - | - | 61 | 54 | 68 | 62 | 52 | 59 | 79 | 75 | 82 |
| 83 | MongraBadshahpur(MB) | 48 | 43 | 49 | 56 | 51 | 54 | 43 | 48 | 68 | 73 | 83 |
| 84 | Suriyawan | - | - | - | - | - | - | - | - | 92 | 92 | 84 |
| 85 | Varanasi (CB) | - | - | - | 59 | 76 | 68 | 53 | 51 | 51 | 74 | 85 |
| 86 | Majhauri Raj | - | - | - | - | - | - | - | - | 74 | 79 | 86 |
| 87 | Bilthra Road | - | - | - | - | - | - | - | - | 62 | 62 | 87 |
| 88 | Salempur | - | - | - | - | - | - | - | - | 99 | 86 | 88 |
| 89 | Handia | - | - | - | - | - | - | - | - | 104 | 83 | 89 |
| 90 | Kheta Sarai | - | - | - | - | - | - | - | - | - | - | 90 |
| 91 | Jhusi Kohna | - | - | - | - | - | - | 55 | 73 | 165 | 175 | 91 |
| 92 | Bhadurganj | 55 | 75 | 59 | 68 | 61 | 61 | - | -- | 83 | 87 | 92 |
| 93 | Ghosia Bazar | - | - | - | - | - | - | - | - | 98 | 82 | 93 |
| 94 | Nawabganj | 41 | 50 | 47 | 48 | 55 | 56 | 49 | 58 | 72 | 77 | 94 |
| 95 | Maghar | - | - | - | - | - | - | - | - | 78 | 84 | 95 |
| 96 | Jarwal | - | - | - | - | - | - | - | - | 100 | 98 | 96 |
| 97 | Sarai Aquil | 73 | - | 71 | 67 | 59 | 69 | - | - | 87 | 96 | 97 |
| 98 | Saiyad Raja (N.P.) | - | - | - | - | - | - | - | - | 97 | 94 | 98 |
| 99 | Nichlaur | - | - | - | - | - | - | - | - | 103 | 105 | 99 |
| 100 | Sarai Mir | 62 | 64 | 60 | 75 | 73 | 74 | - | - | 108 | 108 | 100 |
| 101 | Pachperwa | - | - | - | - | - | - | - | - | 89 | 88 | 101 |
| 102 | Bharatganj | 70 | 65 | 65 | 77 | 64 | 64 | - | 63 | 93 | 89 | 102 |
| 103 | Pipraich | 66 | 57 | 58 | 79 | 60 | 63 | - | - | 82 | 91 | 103 |
| 104 | Bharwari | - | - | - | - | - | 85 | - | - | 84 | 103 | 104 |
| 105 | Kachhwa | 64 | 58 | 62 | 74 | 63 | 65 | 51 | 60 | 86 | 85 | 105 |
| 106 | Ajhua | - | - | - | - | - | - | - | - | 102 | 97 | 106 |
| 107 | Bhatni Bazar | - | - | - | - | - | - | - | - | 91 | 101 | 107 |
| 108 | Khadda | - | - | - | - | - | - | - | - | - | 113 | 108 |
| 109 | Manjhanpur | 69 | - | 86 | - | - | - | - | - | 131 | 141 | 109 |
| 110 | Bansgaon | 53 | 31 | 31 | 39 | 37 | 80 | - | - | 80 | 110 | 110 |
| 111 | Faizabad (CB) | - | - | - | 50 | 84 | 97 | 54 | 62 | 76 | 95 | 111 |
| 112 | Chakia | - | - | 67 | 76 | 77 | 79 | - | 64 | 101 | 109 | 112 |
| 113 | Jhusi | 81 | 62 | 78 | 91 | 80 | 90 | - | - | 153 | 153 | 113 |
| 114 | Kota | - | - | - | - | - | - | - | - | - | - | 114 |
| 115 | Manikpur | 60 | 38 | 53 | 61 | 58 | 66 | - | - | 96 | 100 | 115 |
| 116 | Ashrafpur Kichhauchha | - | - | - | - | - | - | - | - | - | 118 | 116 |
| 117 | Ramkola | - | - | - | - | - | - | - | - | 88 | 99 | 117 |
| 118 | Mehnnagar | - | - | - | - | - | - | - | - | 121 | 120 | 118 |
| 119 | Pipri | - | - | - | - | - | - | 29 | 69 | 90 | 93 | 119 |
| 120 | Shankargarh | - | - | - | - | - | - | - | - | 120 | 106 | 120 |
| 121 | Ikauna | - | - | - | - | - | 58 | - | - | 118 | 112 | 121 |
| 122 | Karari | - | - | - | - | - | - | - | - | 115 | 127 | 122 |
| 123 | Gosaiganj | 68 | 76 | 81 | 85 | 81 | 77 | - | 67 | 80 | 102 | 123 |
| 124 | Bhatpar Rani | - | - | - | - | - | - | - | - | 117 | 119 | 124 |
| 125 | Kerakat | 65 | 67 | 69 | 80 | 92 | 81 | - | 65 | 105 | 132 | 125 |
| 126 | Kotwa | - | - | - | - | - | - | - | - | 136 | 131 | 126 |
| 127 | Pratapgarh City | 52 | 59 | 63 | 71 | 66 | 67 | - | - | 130 | 125 | 127 |
| 128 | Chopan | - | - | - | - | - | - | - | 75 | 128 | 138 | 128 |
| 129 | Bikapur | - | - | - | - | - | - | - | - | 109 | 110 | 129 |
| 130 | Sirathu | - | - | - | - | - | - | - | - | 138 | 130 | 130 |
| 131 | Koraon | - | - | - | - | - | - | - | - | - | 155 | 131 |
| 132 | Nizamabad | - | - | 77 | 93 | 72 | 78 | - | - | 133 | 146 | 132 |
| 133 | Gyanpur | - | - | 89 | 63 | 93 | 88 | - | 71 | 119 | 136 | 133 |
| 134 | Khairabad | - | - | - | - | - | - | - | - | 134 | 137 | 134 |
| 135 | Adari | - | - | - | - | - | - | - | - | 123 | 126 | 135 |
| 136 | Phulwaria | - | - | - | - | - | - | - | - | 140 | 121 | 136 |
| 137 | Katghar Lalganj | - | - | - | - | - | - | - | - | 125 | 128 | 137 |
| 138 | Bilariaganj | - | - | - | - | - | - | - | - | 146 | 139 | 138 |
| 139 | Nai Bazar | - | - | - | - | - | - | - | - | 151 | 150 | 139 |
| 140 | Dostpur | - | - | - | - | - | - | - | - | 116 | 117 | 140 |
| 141 | Barhani Bazar | - | - | - | - | - | - | - | - | 129 | 143 | 141 |
| 142 | Dudhi | - | - | - | - | - | - | - | 72 | 113 | 133 | 142 |

Determining Rank-Size Distribution of Urban Centres of Eastern Uttar Pradesh, India

| | | | | | | | | | | | | |
|-----|------------------------|----|----|----|----|----|----|----|----|-----|-----|-----|
| 143 | Kaptanganj | - | - | 64 | 52 | 69 | 76 | - | - | 107 | 123 | 143 |
| 144 | Sirsa | 59 | 61 | 66 | 78 | 74 | 73 | - | - | 110 | 135 | 144 |
| 145 | Shivdaspur | - | - | - | - | - | - | - | - | - | 158 | 145 |
| 146 | Pipiganj | - | - | - | - | - | - | - | - | 137 | 145 | 146 |
| 147 | Bhadarsa | 57 | 66 | 56 | 69 | 67 | 75 | - | - | 112 | 156 | 147 |
| 148 | Iitifatganj Bazar | - | - | - | - | - | - | - | - | - | 144 | 148 |
| 149 | Atraulia | 76 | 72 | 80 | 87 | 89 | 91 | - | - | 145 | 116 | 149 |
| 150 | Hata | - | - | - | - | - | - | - | - | 124 | 124 | 150 |
| 151 | Ledwa Mahua (CT) | - | - | - | - | - | - | - | - | 122 | 114 | 151 |
| 152 | Mundera Bazar | - | - | - | - | - | - | - | - | 166 | 115 | 152 |
| 153 | Dildarnagar F.Bazar | - | - | - | - | - | - | - | - | 126 | 129 | 153 |
| 154 | Risia Bazar | - | - | - | - | - | - | - | - | - | 140 | 154 |
| 155 | Jhangipur | - | - | - | - | - | - | - | - | - | - | 155 |
| 156 | Ajmatgarh | - | - | - | - | - | - | - | - | 141 | 149 | 156 |
| 157 | Gola Bazar | 54 | 55 | 57 | 65 | 62 | 72 | - | - | 111 | 122 | 157 |
| 158 | Bargaon | - | - | - | - | - | - | - | - | - | - | 158 |
| 159 | Sadat | 74 | - | - | - | - | - | - | - | 127 | 147 | 159 |
| 160 | Ghughuli | - | - | - | - | - | - | - | - | - | 142 | 160 |
| 161 | Jiyanpur | - | - | - | - | - | - | - | - | 149 | 159 | 161 |
| 162 | Jarnshila | - | - | - | - | - | - | - | - | - | - | 162 |
| 163 | Dohrighat | 63 | 73 | 76 | 82 | 78 | 83 | - | - | 135 | 151 | 163 |
| 164 | Anandnagar | - | - | - | - | - | - | - | - | 142 | 157 | 164 |
| 165 | Kurthi Jafarpur | - | - | - | - | - | - | - | - | - | 134 | 165 |
| 166 | Khariya (C.T.) | - | - | - | - | - | - | - | - | - | - | 166 |
| 167 | Air Force Area (CT) | - | - | - | - | - | - | - | - | - | - | 167 |
| 168 | Rampur Karkhana | 56 | 48 | 51 | 62 | 65 | 71 | - | - | 132 | 154 | 168 |
| 169 | Indian Telep. Industry | - | - | - | - | - | - | - | - | - | - | 169 |
| 170 | Hariharpur (NP) | - | - | - | - | - | - | - | - | 139 | 148 | 170 |
| 171 | Bijpur | - | - | - | - | - | - | - | - | - | - | 171 |
| 172 | Khargupur | 67 | 74 | 83 | 89 | 91 | 84 | - | - | 144 | 161 | 172 |
| 173 | Mankapur | - | - | - | - | - | - | - | - | 155 | 163 | 173 |
| 174 | Patti | - | - | - | - | - | - | - | - | 147 | 164 | 174 |
| 175 | Jafarabad (N.P.) | 71 | 69 | 72 | 81 | 79 | 86 | - | - | 148 | 152 | 175 |
| 176 | Churk Ghurma | - | - | - | - | - | - | - | 57 | 106 | 111 | 176 |
| 177 | Haraiya | - | - | - | - | - | - | - | - | - | 165 | 177 |
| 178 | Shohratgarh | - | - | - | - | - | - | - | - | 143 | 160 | 178 |
| 179 | Phulpur | 75 | 70 | 74 | 86 | 83 | 89 | - | - | 150 | 162 | 179 |
| 180 | Katra Medniganj | 80 | 77 | 85 | 90 | 85 | 95 | - | - | 158 | 171 | 180 |
| 181 | Dulhipur | - | - | - | - | - | - | - | - | - | - | 181 |
| 182 | Chail | - | - | - | - | - | - | - | - | 152 | 167 | 182 |
| 183 | Antu | - | - | - | - | - | - | - | - | 154 | 166 | 183 |
| 184 | Kandwa | - | - | - | - | - | - | 56 | 74 | 164 | 178 | 184 |
| 185 | Musafirkhana | - | - | - | - | - | - | - | - | - | 169 | 185 |
| 186 | Koreripur | - | - | - | - | - | - | - | - | 156 | 168 | 186 |
| 187 | Maharajganj | 78 | 78 | 87 | 92 | - | - | - | - | 160 | 173 | 187 |
| 188 | Kadipur | - | - | - | - | - | - | - | - | - | 174 | 188 |
| 189 | Ghorawal | 82 | 79 | 88 | 94 | 94 | 96 | - | - | 163 | 179 | 189 |
| 190 | Katra | 77 | 71 | 84 | 84 | 88 | 93 | - | - | 162 | 172 | 190 |
| 191 | Ibrahimpur | - | - | - | - | - | - | - | - | - | - | 191 |
| 192 | Gangapur | - | - | 79 | 88 | 86 | 94 | - | - | 157 | 170 | 192 |
| 193 | Dhanauha | - | - | - | - | - | - | - | - | - | - | 193 |
| 194 | Gauri Bazar | - | - | - | - | - | - | - | - | 159 | 176 | 194 |
| 195 | Hafizpur | - | - | - | - | - | - | - | - | - | - | 195 |
| 196 | Korwa | - | - | - | - | - | - | - | - | - | - | 196 |
| 197 | Bharuhana (CT) | - | - | - | - | - | - | - | - | - | - | 197 |
| 198 | Bhulepur | - | - | - | - | - | - | - | - | - | - | 198 |
| 199 | Amila | - | - | - | 60 | 71 | 92 | - | - | 161 | 180 | 199 |
| 200 | Chak Imam Ali (CT) | - | - | - | - | - | - | - | - | - | - | 200 |
| 201 | Bakibad | - | - | - | - | - | - | - | - | - | - | 201 |
| 202 | Kataria | - | - | - | - | - | - | - | - | - | - | 202 |

Source : Kumari, Kiran (2008): "Urbanization and Regional Development in Eastern Uttar Pradesh" Unpublished Ph.D. Thesis, Chapter 4, p. 106-154.