6. URBAN HIERARCHY

6.1. INTRODUCTION

The nature of urbanisation in a particular region may be said to be reflected in the variation in the size relationship of urban centres in that region. Therefore an analysis of this aspect of urbanisation is essential for a clear insight into the urban scene of the state and the following discussion examine in detail the urban size relationship in West Bengal during 1901-81 from the viewpoint of the rank-size rule and primacy.

6.2. METHODOLOGY

6.2.1. Rank-size rule

A study of the available information on city size distribution shows that within a given area there develops a regular hierarchy of urban centres consisting of a few large cities, many towns of intermediate size and a still larger number of smaller towns. This empirical regularity between number population size of urban centres has resulted in a number of attempts to define this number-size relationship in precise terms and the concept of the rank-size rule may be considered a natural outcome of such attempts.

The rank-size rule is an empirical rule used to describe city-size distributions of different countries and regions. Auerbach (1939) was probably the first to note a regular relationship between population size and rank of urban centres. However, Zipf was the first to designate this relationship formally as the rank-size rule and present evidence of rank-size regularities. He attributed these regularities to the force of unification and diversification. Zipf's works have drawn attention to the rank-size problem and since then several others discussed the concept (Vining, 1955; Isard, 1956). Most of them have accepted the rule and gathered further evidence in its support (Madden, 1956; Allen, 1954), some have attempted to explain the relationship by other means (Simon, 1955, explained city-size regularities through a
probability model based on frequency distributions). On the other hand, Stewart (1958) concluded that although the rank-size rule is a reasonable approximation to the actual distribution of towns by size in many cases, it has no logical basis.

The rank-size rule is given by the formula

\[ P_1 = \frac{P}{1} \]

where \( P_1 \) is the population of the \( i \)th town in the series 1, 2, 3, \( \ldots \ldots \ldots \n \) in which all the urban centres in a region are ranked by population size and \( P_1 \) is the population of the largest town. This rule produces an inverted J-shaped relationship between rank and population. If the rule is taken in logarithmic form, i.e.

\[ \log P_1 = \log P_1 - \log 1 \]

then this curve becomes a straight line.

The rank-size rules may also be written as a general Pareto distribution:

\[ P_i = a(i)^{-b} \]

where the population of the \( i \)th ranking city (\( P_i \)) is a function of that rank and \( a \) and \( b \) are constants. For computational purposes, the relationship may be written in a logarithmic form:

\[ \log P_i = \log a - b(\log i) \]

and value of \( a \) and \( b \) may be found as in simple linear regression with the help of the following equations

\[ \sum \log P_i = n \log a - b \sum \log i \]

\[ \sum \log P_i \log i = \log a \sum \log i - b \sum (\log i)^2 \]

It may also be noted that the rank-size rule is regarded as a special case of the Pareto distribution in which \( b = -1 \).

The urban centres of West Bengal for each decade between 1901-81 have been arranged in descending order by population size and plotted in a graph which has logarithm of population along the ordinate and logarithm of rank along the abscissa. In order to analyse the deviations from the rank size rule one exponential line (Exponential-1) has been
drawn in each case showing the ideal rank-size rule with respect to the actual population of the premier city.

Research into rank-size distributions (Allen, 1954; Clark, 1967) shows considerable regional variations in the computed b values from the ideal value of -1. Therefore, the a and b values have been computed for each decade and a second exponential line (Exponential-2) satisfying the solved equation \( P_i = a(i)^{-b} \) has also been drawn in each case. It may be noted here that latter exponential line gives the rank-size rule with respect of the expected population of the premier city since in terms of the above equation \( a = \) computed population of the first ranking city.

6.2.2. Lognormal relationship

A rank-size distribution may also be shown as a lognormal distribution. This may be done by plotting the cumulative percentage of urban centres of different size on logarithmic normal probability paper. If the rank-size rule holds, then the graph should form a straight line. Berry (1961) examined city-size distributions in 38 different countries in this manner and on the basis of Simon's probability explanation of rank-size regularities put forward a developmental model of city-size distribution in which several intermediate stages were recognised between the limiting cases of primacy and lognormality.

To find out whether a lognormal relationship exists in the state, the percentage cumulative frequency of urban centres for each decade between 1901-81 has been computed for 8 size classes (Table 6.1) and plotted on lognormal probability paper (Figure 6.6).

6.2.3. Primacy

Mark Jefferson (1939) was the first to introduce the concept of the primate city. According to him primacy is present when the population of the largest city is several times larger than that second in rank. In his paper he discussed the situation in several countries of the world and also suggested a primacy index in which he considered the populations of the three largest cities of each country as
percentages of the value of the highest ranking city and which were arranged in order of the relative importance of that city.

Berry using a somewhat similar primacy index, namely the ratio of the population of the largest city to the total population of the first four cities arrived at the conclusion that the countries with the highest values have primate city size distributions.

The primacy index in the context of the rank-size rule may be given by \( I_1 = \frac{P_1}{P_2} \) are the populations of the first and second rank cities respectively. Similarly, \( I_2 = \frac{P_1}{P_3} \) where \( P_1 \) and \( P_3 \) are the populations of the first and third ranking cities. If the rank-size rule holds good then \( I_1 = 2, I_2 = 3 \) and so on. If, on the other hand \( I_1 \) is greater than 2, primacy may be said to exist.

It is also possible to find out whether the largest city of the region under study has an optimum population in the following way: the sum of the reciprocals of the ranks of all the urban centres of the region (\( \sum 1/R \)) are found and the total urban population of the region (\( \sum P \)) is divided by \( \sum 1/R \). This will give the expected population of the premier city \( P_{1e} \) on the basis of the total urban population (\( \sum P \)) and number of urban centres (\( N \)) of the region. If \( P_{1e} \) is smaller than the actual population \( P_{1a} \) then the distribution may be said to be primate and vice versa. If \( P_{1e} \) and \( P_{1a} \) are almost equal then the premier city may said to have an optimum population. Table 6.2 gives the actual and expected populations of Calcutta, the premier city of West Bengal during 1901-81 and the index of primacy of the Class I cities of West Bengal for 1981 are shown in table 6.3.

6.3. ANALYSIS

6.3.1. Rank-size rule

A study of Figures 6.1 to 6.3 shows that the distribution of town sizes in West Bengal does not conform to the rank-size rule since throughout the decades the distributions form somewhat S-shaped curves with at least two major breaks separating the upper and lower extremities with distinctly linear trends and steep gradients from a comparatively convex middle part characterised by a gentle gradient.
Figure 6.1 Rank-size relationship of urban centres of West Bengal, 1901-31
with some minor breaks. If the curves are compared to the exponential lines showing the ideal rank-size rules then it becomes obvious that throughout the period under review the actual populations of all the urban centres are smaller than expected in relation to the actual population of the premier city. A detailed analysis of urban rank-size relationship during each decade of the period under review reveals the following trends:

1901

In 1901 there was a total of 78 urban centres of varying sizes in the state and the mathematical relation between rank and population size has worked out to be

$$P_i = 314897 (1) -0.96882$$

The graph for this decade shows that the rank-size distribution of urban centres does not conform to the straight line expected in the ideal case of the rank-size rule. Significance deviations are noticeable especially in the upper and lower ends of the curve where distinct breaks are found at the 3rd and 60th ranked urban settlements respectively.

Comparison of the graph with the exponential line satisfying the computed exponential equation reveals the following facts.

i) Actual population of the first ranking city is much greater than that predicted. This shows that even during the initial decade of this century the city of Calcutta had already established its supremacy as the premier city of the state.

ii) All other large urban centres (ranks 2 to 14) shows less than expected populations.

iii) Towns falling within intermediate size categories generally show more than expected populations.

iv) The smallest sized urban centres (ranks below 66) are once again characterised by less than expected populations. The steep downward bending of the lower end of the curve is especially noticeable, indicating that urban centres at the lower end of the spectrum have little association with the larger cities and towns
in terms of urban hierarchy.

1911

During the next decade the number of urban centres in the state increased to 81 and the computed relationship between rank and population size of urban centres for this decade is

\[ P_i = 423349 (i)^{-1.01735} \]

Again it is noticeable that the graph shows considerable deviations from the expected linear trend even though the value of \( b \) is very close to unity. Comparison with exponential line 2 reveals:

i) Calcutta, the first ranking city still shows much greater population than that predicted by the equation. All other large cities show negative deviations that is less than expected population sizes indicating once again the overwhelming dominance of Calcutta.

ii) In contrast urban centres of intermediate size (ranks between 16 to 67) shows more than expected populations.

iii) Steep slope is again seen in the lower end of the curve where the smallest urban centres again appear to be characterised by much less than expected population sizes.

1921

In 1921, the number of urban centres in the state went upto 81 with the addition of eight new urban centres. The graph for this decade shows very similar trends to those obtained in the two earlier decades, namely, linear trends with steep gradients at the upper and lower extremities of the graph and comparatively gentle slope in the intermediate stretches. A noticeable feature of this decade is an additional sharp break at the 30th ranked urban centre.

The rank-size relationship during this decade is given by

\[ P_i = 458123 (i)^{-1.01831} \]

and the curve shows the following characteristics in relation to exponential line 2:
Figure 6.2 Rank-size relationship of urban centres of West Bengal, 1941-71
i) Positive deviations are noticeable for urban centres with ranks 1 and 18 to 75.

ii) Negative deviations are characteristic of urban centres with ranks 2 to 17 and 76 to 89.

1931

Five new urban centres were added in this decade increasing the total to 94. The exponential equation of rank-size relation for the urban centres is computed to be

\[ P_i = 516811 (1)^{-1.04482} \]

Comparison of the curve with the exponential line drawn on the basis of the above equation shows:

i) Population of the premier city is still much greater than theoretically expected while other large cities of the state (ranks 2 to 16) show less than expected populations.

ii) Urban centres of intermediate size (rank 16 to 78) show positive deviations and negative deviations are characteristic of the smallest urban centres.

In addition, a distinctive feature of the graph for this decade is a number of minor breaks in the intermediate parts of the curve and the most noticeable of these occur at the 6th, 9th, 16th and 25th ranked urban centres.

1941

During this decade 11 new urban centres were added bringing the total to 105. As noted earlier in the chapter on urban growth, the decade 1931-41 showed significant improvements in urban growth primarily as a result of increased industrialisation caused by demands for commodities created by the World War II. Extension of the railway system which improved communication links between different parts of the state resulted in urban growth in the distant parts of the state. It may be noted in this context that with one exception (Garden Reach, whose population had been included in that of Calcutta in the earlier
decade regained separate urban status during this decade) all were located outside the Calcutta Urban Agglomeration.

The graph for this decade shows several irregularities reflecting a lack of integration of urban hierarchy in the state. The computed equation for rank-size distribution for this decade is

$$P_i = 1017071 (1)^{-1.13701}$$

and it shows that during this decade the value of the exponent of rank shows considerable departure from the standard value of -1. The size distribution of urban centres shows the following characteristics in relation to the exponential line 2.

1) Urban centres with ranks 1 and 17 to 87 show more than expected populations.

ii) Less than expected population is characteristic of the remaining urban centres.

1951

The urban size distribution in the state continues to show significant deviations from the ideal rank-size rule. Linear trend with steep slope is again seen for the first three cities as well as at the lower end of the curve. The middle portions of the graph show several breaks at ranks 7, 8, 13, 29, 49 and 88 indicating the prevalence of differential growth rates.

During this decade the number of urban centres in the state increased to 120 and their rank-size relation is given by the equation

$$P_i = 1223825 (1)^{-1.08265}$$

From the equation it becomes obvious that the value of b has declined approaching more closely the standard value of -1.

The characteristics of the size distribution in relation to the exponential line 2 are as follows:

1) More than expected population size is characteristic of urban centres with ranks 1 and 18 to 95.
Figure 6.3 Rank-size relationship of urban centres of West Bengal (1981)
ii) All the remaining urban centres show negative deviations or less than expected population population size.

1961

This decade saw tremendous urban growth in the state and the number of urban centres increased remarkably. The total jumped to 184 and more than half of these new urban centres came up within the Calcutta Urban Agglomeration. A study of the graph shows that while the general trend is still similar to those of earlier decades, intermediate parts of the curve is comparatively smooth indicating better integration of urban hierarchy in the state during this decade.

The computed rank-size relationship is

\[ P_i = 1539787 (i)^{-1.04282} \]

showing that the exponent of rank has declined further and is still closer to unity. Comparison with the exponential line drawn on the basis of the above equation shows the following characteristics of rank-size distribution for this decade:

1. Urban centres with ranks 1 and 21 to 121 show more than expected population.

ii) Less than expected population is seen for remaining urban centres.

1971

The momentum of urban growth begun in the earlier decade was sustained during this decade and the total number of urban centres increased to 223.

The computed rank-size relation for this decade is

\[ P_i = 2343234 (i)^{-1.0814} \]

The exponent of rank appears to have increased again and it may be seen that rank-size distribution continues to show considerable deviations from the best fit exponential line. It may be noted in this context that
Figure 6.4 Rank-size relationship (1901-81) of urban centres of West Bengal.
The first ranking city continues to show significantly larger population than theoretically predicted. Similarly towns of intermediate size (ranks 24 to 152) also show larger than expected population sizes. Other large cities as well as the smallest urban centres comprising the tail end of the graph show less than expected population sizes.

An interesting feature of the rank-size distribution for this decade is that the usual break at the 3rd ranking urban centre is not so sharp. This seems to indicate that the growth rate of the 3rd city is increasing. Intermediate stretches of the curve again show irregularities (a distinct break is particularly noticeable at the 13th ranked urban centres), again indicating the occurrence of differential growth rates.

During this decade the rapid pace of urbanisation continued so that West Bengal showed a total of 291 urban centres, but there were definite changes in the spatial pattern of growth since maximum urban growth occurred not in the Calcutta Urban Agglomeration but in the Asansol-Durgapur region. Decentralisation policy adopted by the government also resulted in the emergence of a number of urban centres away from these two zones; as for example, a number of new urban centres came up in districts of Jalpaiguri and Maldah. The effect of the growth of various individual urban sub-systems in reflected in the rank-size graph. The computed rank-size relationship for this decade is

$$P_i = 3970245 \times 1.13239$$

showing that the value of the exponent of rank has increased further. With respect to the best fit exponential line, the following characteristics of urban size distribution may be noted.

i) All the large cities (ranks 1 to 26) show less than expected population sizes. Similar trend is also noticeable for the smallest units of the urban spectrum.
Figure 6.5 Variation of urban centre size-rank exponent (b values) during 1901-81.
Medium-sized urban centres (ranks 27 to 231) show more than expected population sizes.

From the above statements a remarkable fact becomes evident; for the first time Calcutta shows less than expected population size indicating quite clearly that growth rate of the premier city of state has slowed down considerably. Gradient in the upper part of the curve has lessened further and the steep break of slope between the third and fourth settlements is not so apparent.

A steep, almost vertical nature of the tail end of the curve is obvious and may be said to have resulted from the inclusion of some very small urban centres with less than 1000 population such as the Digha township (population 894), Bakreswar (population 185) and others in the distribution.

Another interesting departure of the rank-size distribution for this decade is that a very small stretch of the curve (urban centres with ranks 47 to 50) shows more than expected population in relation to the exponential line depicting the ideal rank-size rule in terms of the actual population of the premier city. Until now, all urban centres had been invariably characterised by less than expected populations in relation to this exponential line.

6.3.2. Temporal variations of rank-size rule (1901-81)

If the temporal variations of the rank-size rule during 1901-81 is considered, it is seen that since 1941 the curves show a more or less parallel trend indicating that the nature of rank-size relationship remained more or less similar; only the population sizes of urban centres increased over succeeding decades (Figure 6.4).

Throughout the period under review, Calcutta and Haora have maintained their positions as the first and second ranking cities of the state, but the third and fourth positions have been occupied by different cities. However, since 1971 South Suburban has occupied the third position and Durgapur has ranked fourth. Decadewise analysis has also revealed that the rate of population growth of the first and second
Figure 6.6 Log-normality of urban centres of West Bengal (1901-81)
ranking cities have slowed down in recent years, while the populations of the third and fourth ranking cities have been increasing rapidly. This is indicated by a lessening of the steep gradient in the upper part of the curve in the last two decades.

Lastly, another point that deserves mention here, is the variation of b values over time. Figure 6.5 where b values have been plotted against time, shows that the value of the exponent increased gradually until 1941 (when it attained the maximum value of 1.13239), then declined until 1961, and then again increased in the last two decades. Infact, in 1981 the b value increased to almost the 1941 level. Therefore it may be said that no definite trend may be distinguished with respect to the temporal variations of the b value.

6.3.3. Lognormal relationship

Figure 6.6 shows the lognormal relationship of the urban centres of West Bengal. It presents a more generalised and simplified picture of urban rank-size relationship in the state. A study of the figure shows quite clearly that a lognormal pattern does not prevail in the state. If the line for 1981 is considered both the upper and lower parts show primacy, while an approximately lognormal trend is seen for urban centres of intermediate size. This picture is more or less in conformity with the case presented by the rank-size rule.

If the temporal variation of the relationship is considered, it is interesting to note that in 1901, the small towns showed a lognormal relationship while the larger ones indicated a primate distribution. A more or less similar trend prevailed until 1931. The trend appeared to change since 1941 and in the last few decades there was clearly a tendency for urban centres of intermediate size to approach lognormality.

6.4.3. Primacy

A study of the rank-size rule and lognormal relationship in West Bengal thus seems to indicate that the size distribution of urban centres in the state tends to approach a primate distribution rather than a
Table 6.1 Percentage cumulative frequency of urban centres of West Bengal, 1901-81

<table>
<thead>
<tr>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Less than 10,000</td>
<td>31(39.7)</td>
<td>31(38.3)</td>
<td>37(41.6)</td>
<td>40(42.6)</td>
<td>35(33.3)</td>
<td>29(24.2)</td>
<td>61(33.2)</td>
<td>68(30.5)</td>
<td>83(28.5)</td>
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<td>Less than 20,000</td>
<td>60(79.6)</td>
<td>56(69.1)</td>
<td>58(65.2)</td>
<td>67(71.3)</td>
<td>62(59.1)</td>
<td>70(58.3)</td>
<td>106(57.6)</td>
<td>128(57.4)</td>
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<td>77(95.1)</td>
<td>83(93.3)</td>
<td>90(95.7)</td>
<td>92(87.6)</td>
<td>99(82.5)</td>
<td>154(83.7)</td>
<td>177(79.4)</td>
<td>227(78.0)</td>
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<td>76(97.4)</td>
<td>79(97.5)</td>
<td>87(97.8)</td>
<td>92(97.9)</td>
<td>102(97.1)</td>
<td>113(94.2)</td>
<td>172(93.5)</td>
<td>208(93.3)</td>
<td>267(91.8)</td>
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<td>77(98.7)</td>
<td>80(98.8)</td>
<td>88(98.9)</td>
<td>93(98.9)</td>
<td>103(98.1)</td>
<td>118(98.3)</td>
<td>182(98.9)</td>
<td>220(98.7)</td>
<td>285(97.9)</td>
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<td>80(98.8)</td>
<td>88(98.9)</td>
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<td>104(99.1)</td>
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<td>289(99.3)</td>
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<td>Less than 1,000,000</td>
<td>78(100)</td>
<td>81(100)</td>
<td>89(100)</td>
<td>93(98.9)</td>
<td>104(99.1)</td>
<td>119(99.2)</td>
<td>183(99.5)</td>
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<td>78(100)</td>
<td>81(100)</td>
<td>89(100)</td>
<td>94(100)</td>
<td>105(100)</td>
<td>120(100)</td>
<td>184(100)</td>
<td>223(100)</td>
<td>291(100)</td>
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</table>

Figure within brackets indicate percentages.
Table 6.2 Population of the premier city of West Bengal (1901-81)

<table>
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<th>Census Years</th>
<th>N</th>
<th>(\sum 1/R)</th>
<th>(\sum P)</th>
<th>(P_{1a})</th>
<th>(P_{1e})</th>
<th>(P_{1a} - P_{1e})</th>
<th>(\frac{P_{1a} - P_{1e}}{P_{1e}} \times 100)</th>
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<td>1901</td>
<td>78</td>
<td>4.940321</td>
<td>2,066,550</td>
<td>847,793</td>
<td>418,303</td>
<td>+429,490</td>
<td>102.67</td>
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<tr>
<td>1911</td>
<td>81</td>
<td>4.9778249</td>
<td>2,349,608</td>
<td>896,067</td>
<td>472,015</td>
<td>+424,052</td>
<td>89.94</td>
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<td>1921</td>
<td>89</td>
<td>5.0714594</td>
<td>2,517,874</td>
<td>907,851</td>
<td>496,479</td>
<td>+411,372</td>
<td>82.86</td>
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<td>1931</td>
<td>94</td>
<td>5.12582</td>
<td>2,695,867</td>
<td>1,196,734</td>
<td>564,957</td>
<td>+631,777</td>
<td>111.83</td>
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<td>1941</td>
<td>105</td>
<td>5.2359302</td>
<td>4,740,223</td>
<td>2,108,891</td>
<td>905,326</td>
<td>+1,203,565</td>
<td>132.94</td>
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<td>1951</td>
<td>120</td>
<td>5.3688681</td>
<td>6,281,642</td>
<td>2,548,677</td>
<td>1,170,012</td>
<td>+1,378,665</td>
<td>117.83</td>
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<td>1961</td>
<td>184</td>
<td>5.7948661</td>
<td>8,540,842</td>
<td>2,927,209</td>
<td>1,473,864</td>
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<td>1971</td>
<td>223</td>
<td>5.9866276</td>
<td>10,967,033</td>
<td>3,148,746</td>
<td>1,831,922</td>
<td>+1,316,824</td>
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<td>1981</td>
<td>291</td>
<td>6.2522558</td>
<td>14,446,721</td>
<td>3,305,006</td>
<td>2,310,641</td>
<td>+994,365</td>
<td>43.03</td>
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</table>
Table 6.3 Index of Primacy (1981) of Class I Cities of West Bengal

<table>
<thead>
<tr>
<th>Rank</th>
<th>Urban Centres</th>
<th>Actual Population</th>
<th>Observed Index of Primacy</th>
<th>Expected Index of Primacy</th>
<th>Deviation</th>
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<tbody>
<tr>
<td>1</td>
<td>Calcutta</td>
<td>3,305,006</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Haora</td>
<td>$P_{a2} = 744,429$</td>
<td>$P_{a1}/P_{a2} = 4.44$</td>
<td></td>
<td>2.44</td>
</tr>
<tr>
<td>3</td>
<td>S. Suburban</td>
<td>$P_{a3} = 394,916$</td>
<td>$P_{a1}/P_{a3} = 8.37$</td>
<td></td>
<td>5.37</td>
</tr>
<tr>
<td>4</td>
<td>Durgapur</td>
<td>$P_{a4} = 311,798$</td>
<td>$P_{a1}/P_{a4} = 10.6$</td>
<td></td>
<td>6.5</td>
</tr>
<tr>
<td>5</td>
<td>Bhatpara</td>
<td>$P_{a5} = 265,419$</td>
<td>$P_{a1}/P_{a5} = 12.45$</td>
<td></td>
<td>7.45</td>
</tr>
<tr>
<td>6</td>
<td>Jadavpur</td>
<td>$P_{a6} = 251,968$</td>
<td>$P_{a1}/P_{a6} = 13.12$</td>
<td></td>
<td>7.12</td>
</tr>
<tr>
<td>7</td>
<td>Kamarhati</td>
<td>$P_{a7} = 234,951$</td>
<td>$P_{a1}/P_{a7} = 14.07$</td>
<td></td>
<td>7.07</td>
</tr>
<tr>
<td>8</td>
<td>S. Dum Dum</td>
<td>$P_{a8} = 230,266$</td>
<td>$P_{a1}/P_{a8} = 14.35$</td>
<td></td>
<td>6.35</td>
</tr>
<tr>
<td>9</td>
<td>Panighat</td>
<td>$P_{a9} = 205,718$</td>
<td>$P_{a1}/P_{a9} = 16.07$</td>
<td></td>
<td>7.07</td>
</tr>
<tr>
<td>10</td>
<td>Garden Reach</td>
<td>$P_{a10} = 191,107$</td>
<td>$P_{a1}/P_{a10} = 17.29$</td>
<td></td>
<td>7.29</td>
</tr>
<tr>
<td>11</td>
<td>Asansol</td>
<td>$P_{a11} = 187,039$</td>
<td>$P_{a1}/P_{a11} = 17.67$</td>
<td></td>
<td>6.67</td>
</tr>
<tr>
<td>12</td>
<td>Baranagar</td>
<td>$P_{a12} = 170,343$</td>
<td>$P_{a1}/P_{a12} = 19.40$</td>
<td></td>
<td>7.4</td>
</tr>
<tr>
<td>13</td>
<td>Burdhaman</td>
<td>$P_{a13} = 167,363$</td>
<td>$P_{a1}/P_{a13} = 19.75$</td>
<td></td>
<td>6.75</td>
</tr>
<tr>
<td>14</td>
<td>Siliguri</td>
<td>$P_{a14} = 154,378$</td>
<td>$P_{a1}/P_{a14} = 21.41$</td>
<td></td>
<td>7.41</td>
</tr>
<tr>
<td>15</td>
<td>Kharagpur</td>
<td>$P_{a15} = 150,475$</td>
<td>$P_{a1}/P_{a15} = 21.96$</td>
<td></td>
<td>6.96</td>
</tr>
<tr>
<td>16</td>
<td>Bally</td>
<td>$P_{a16} = 147,735$</td>
<td>$P_{a1}/P_{a16} = 22.37$</td>
<td></td>
<td>6.37</td>
</tr>
<tr>
<td>17</td>
<td>Hugli-Chinsurah</td>
<td>$P_{a17} = 128,918$</td>
<td>$P_{a1}/P_{a17} = 25.64$</td>
<td></td>
<td>8.64</td>
</tr>
<tr>
<td>18</td>
<td>Serampore</td>
<td>$P_{a18} = 127,304$</td>
<td>$P_{a1}/P_{a18} = 25.96$</td>
<td></td>
<td>7.96</td>
</tr>
<tr>
<td>19</td>
<td>Nabadvnp</td>
<td>$P_{a19} = 118,972$</td>
<td>$P_{a1}/P_{a19} = 27.78$</td>
<td></td>
<td>8.78</td>
</tr>
<tr>
<td>20</td>
<td>Barrackpur</td>
<td>$P_{a20} = 115,516$</td>
<td>$P_{a1}/P_{a20} = 28.61$</td>
<td></td>
<td>8.61</td>
</tr>
<tr>
<td>21</td>
<td>Naihati</td>
<td>$P_{a21} = 114,607$</td>
<td>$P_{a1}/P_{a21} = 28.84$</td>
<td></td>
<td>7.84</td>
</tr>
<tr>
<td>22</td>
<td>Balurghat</td>
<td>$P_{a22} = 112,621$</td>
<td>$P_{a1}/P_{a22} = 29.35$</td>
<td></td>
<td>7.35</td>
</tr>
<tr>
<td>23</td>
<td>Titagarh</td>
<td>$P_{a23} = 104,534$</td>
<td>$P_{a1}/P_{a23} = 31.62$</td>
<td></td>
<td>8.62</td>
</tr>
<tr>
<td>24</td>
<td>Chandannagar</td>
<td>$P_{a24} = 101,925$</td>
<td>$P_{a1}/P_{a24} = 32.43$</td>
<td></td>
<td>8.43</td>
</tr>
</tbody>
</table>
rank-size one. Primacy of the premier city of the region, that is Calcutta is proved beyond doubt by Table 6.3, which gives the index of primacy of the Class I cities of West Bengal for 1981. In 1981, there were 24 cities with over 100,000 population each and in all of these the primacy indices are much larger than they should have been, as for example Calcutta's population is more than four times greater than that of Haora, the second ranking city.

In addition, during the entire period under review, that is 1901-81, the actual population of the premier city has always been considerably greater than the optimum population as presented in table 6.2. However, maximum deviation between actual and expected populations occurred in 1941 (132.94%), but since then the amount of percentage deviation shows a decreasing trend and in 1981, the figure has come down to 43.03%. In this context it may be noted that the results obtained earlier by solving Pareto's equation correspond quite closely to those given in table 6.2. The only departure is that in the former case expected population of the premier city (a value) is greater than the actual population in 1981 while in the latter \( P_{1e} \) remained greater than \( P_{1e} \).

6.4. CONCLUSION

From the above analysis, it is possible to conclude that the size relationship of urban centres in the state comes closest to a primate distribution. The overwhelming importance of Calcutta is the major cause behind this. Calcutta has dominated the urban scene of West Bengal throughout the period under review and in reality, it is not only the premier city of the state, but is also the premier city of entire eastern India (if the Calcutta Urban Agglomeration is considered, then this is the premier urban agglomeration of the country). As a result, it is not surprising that Calcutta enjoys a considerable lead over the other cities of the state. It may also be noted that throughout 1901-81, the second and third ranking cities have been constituents of the Calcutta Urban Agglomeration.
On the other hand, certain facts such as decrease of percentage deviation between actual and expected population of the premier city, presence of an almost rank-size trend in cities of intermediate size, and so on seem to indicate a tendency towards a more rank-size distribution especially during the last decade. However, in the light of the evidence presented by increasing b values in the last two decades, it seems most unlikely that an ideal rank-size rule will be obtained in the near future.

REFERENCES


