

Urban Hierarchy, Primate city and Rank size rule

Component-I (A) - Personal Details

Role	Name	Affiliation
Principal Investigator	Prof. Masood Ahsan Siddiqui	Jamia Millia Islamia, New Delhi
Paper Coordinator, if any	Dr. Deeksha Bajpai Tewari	Department of Geography, Dyal Singh College University of Delhi
Content Writer/Author (CW)	Dr. Deeksha Bajpai Tewari	Department of Geography, Dyal Singh College University of Delhi
Content Reviewer (CR)		
Language Editor (LE)		

Component-I (B) - Description of Module

Items	Description of Module
Subject Name	Geography
Paper Name	Urban Geography
Module Name/Title	Urban hierarchy, primate city and rank size rule
Module Id	UG-07
Pre-requisites	Understanding of urban hierarchy
Objectives	<p>To comprehend the concept of Urban hierarchy ,primate city and rank size rule.</p> <p>To understand the existence of primacy or rank size rule in India.</p> <p>Factors and forces affecting such a settlement hierarchy.</p>
Keywords	Centripetality, Unification, Diversification

Urban Hierarchy, Primate City and Rank size rule

Introduction

The concept of Urban System was introduced by Brian J.L. Berry (1964) in his noteworthy work “Cities as systems within systems of cities”. Urban places do not exist in isolation. There is a whole series of different types of relationship between separate towns and cities and we use the term urban system to indicate that the individual urban centres are linked to each other (Short 1984). The urban centres play a significant role in social and economic transformation, and geographic shift of population. With the increase of population globally, towns and cities have become magnets of economic, social and political processes. ‘At national level cities are part of a complex system of interrelated urban places and the key elements in economic, social and political organization of regions and nations. The interdependence among towns and cities makes it important to view a country as a systems of urban place rather than as a series of independent settlements’ (Pacione 2009: 121).

Urban system is defined as any network of interdependent urban places. The nature of interdependent urban places. The nature of interdependence among urban place may be economic, political, social or cultural. In the system of cities, the changes taking place in one city such as population, economy, employment structure, etc. will have consequences on other cities in the system. The idea of urban hierarchy is central to the concept of urban system. The urban hierarchy concept considers that the urban places vary in population sizes and economic functions. The analysis of urban hierarchy mainly relates to the ranked order of cities based on different criteria, such as population size, economic power, retail sales and number of industrial workers (Kaplan et al. 2004)

Primate City Concept

The law of the primate city is one of the most basic generalizations regarding the size-distribution of cities introduced by M Jefferson. The law is established on the agglomeration effect by which a city ' over and over again the capital city' grows inexplicably to outshine the rest.

The Law: ‘A country's most important city is always disproportionately large and remarkably expressive of national capacity and feeling’.

It exerts supremacy on all others not only in population size but also in its role as a political, economic and social centre for the country. Examples are following

London – 7 times that of Liverpool

Copenhagen – 9 times that of Aarhus

Mexico City – 5 times that of Guadalajara

Jefferson made a study of 51 countries where he found that in 28 instances, the primate city was over twice the size of the second largest city and in 18 instances, it was more than 3 times.

Factors affecting primacy

Attempts were made by Linsky to classify in more accurate terms the factors probable to produce an elevated degree of primacy or tough domination by the primate city. He further demonstrated that countries with an elevated level of primacy have a tendency to exhibit the subsequent characteristics:

1. Small territorial extent
2. Relatively high population density
3. Low per capita incomes
4. A high degree of dependence upon agricultural exports
5. High rate of population growth and
6. In many cases, a former colonial status

Index of primacy

It is the measure of relative importance of the largest town in a nation or a region.

Index of Primacy = P_1/P_2

Where P_1 = Population of the largest town and

P_2 = population of the second largest town

There are 2 sets of issues that have generally been debated with regard to primate city urban systems.

There are 2 sets of issues which have been by and large debated with respect to primate city urban systems.

1. Concerns with its universal applicability
2. Concerns with its desirability or otherwise

Universal Applicability

It is not universally pertinent as a rule, but only under definite conditions.

- Prevalent in dual economy or where low level of development is there.
- To begin with as a country grows economically, primacy increases. After a definite time, primacy decreases – but Jefferson has not talked about any time factor.

In India – Bombay / Calcutta = 1.1 (1991)

Canada – Toronto / Montreal = 1.1

So, high development does not mean low primacy.

Desirability

Many think that elevated level of primacy is an expression of robust regional disproportion and dearth of development. It has been frequently asserted but not persuasively substantiated that the primate city contributes to regional imbalances and is an disagreeable urban system.

With regard to both the issues, the debate is still open to doubt. Nonetheless, primate city urban systems do occur in quite a lot of countries of the world and several states of India. The theory fundamental primate city development cannot entirely be disregarded by urban geographers.

Indian context

No city in India exercises supremacy over the whole nation. There is no primate city in India at present. The absence of a primate city is partly explained by the large size of the country, its colonial heritage, and weaknesses in the forces of nationalism in the country.

The absence of a primate city has its roots in Indian history. India was never a politically unified nation until 1947. Primate city development is essentially a politically directed process and it takes time to assert itself under conditions of political stability. Further, primate city development at the national level is characteristic of unitary states with strong central governments.

The Constitution of India envisages a partially federal political set-up with the states and the Union sharing power. This permits the development of national as well as state level primate cities.

Primacy at the state level

1. West Bengal – Calcutta/Asansol	= 25.08
2. Sikkim – Gangtok/Singtam	= 9.10
3. Karnataka – Bangalore/Hubli	= 5.53
4. Maharashtra – Mumbai / Pune	= 4.88
5. Tamil Nadu – Madras / Coimbatore	= 4.66
6. Andhra Pradesh – Hyderabad/Vishakhapatnam	= 4.25
7. Gujarat – Ahmedabad / Surat	= 2.75
8. Orissa – Cuttack / Rourkela	= 1.02
9. Madhya Pradesh – Indore /Jabalpur	= 1.09
10. Bihar – Patna/Dhanbad	= 1.35
11. Assam – Guwahati/Dibrugarh	= 1.54
12. Uttar Pradesh – Kanpur/Lucknow	= 1.68
13. Rajasthan – Jaipur/Jodhpur	= 2.03

Table 3: Population of India's largest urban places, 1981-2011

Cities	1981	1991	2001	2011
Mumbai	8,243,405	12,596,243	16,368,084	18,414,288
Kolkata	9,194,018	11,021,918	13,216,546	16,314,838
Delhi	8,729,283	8,419,084	12,791,458	11,412,56
Chennai	4,289,347	5,421,985	6,424,624	86,96,010

Source: Census of India, 1981-2011

Regional Primacy in India

The four largest urban places of India Mumbai, Kolkata, Delhi and Chennai are located in four regions: Western, Eastern, Northern and Southern region correspondingly. Each state wants the development of its own metropolitan city. In this Situation the regional level primacy subsist in Indian urban system. The four mega cities are the largest in their respective regions. In western region Mumbai remained the largest city and the second largest city is Ahmadabad.

In Northern region Delhi remained the largest city and Kanpur was the second largest city. In eastern and Southern regions the second ranked cities have changed positions. In the southern region Hyderabad was the second largest city in 1951,1961,1971, while Bangalore fail to notice it in 1981,1991 and 2001.

Kolkata is exhibiting the situation of urban primacy in eastern region. Till 2001 Kolkata was almost seven times bigger than the second largest city of eastern region. At regional level, Kolkata remained a primate city and experienced an increase in primacy level in 2011. It was argued by Ramachandaran (1989), that the case of primacy of Calcutta is even comparable to that of the United Kingdom or other cities of world with primate city characteristics. West Bengal's second largest city, Asansol, was indeed very small in relation to Calcutta: it was 1/25th the size of Calcutta in 1981 (Ramachandaran 1989).

Kolkata was established by the colonizers as a strategic location for the administrative, military and business activities. It became the chief reason for primacy of Kolkata. For so many years it remained the most industrialized metropolis of India and hence there was a continuous flow of population towards this city.

Kolkata merged as the largest city of Eastern region: it further produced the agglomerative effect to the whole region. Being the largest urban place of the region, Kolkata became an important city in terms of employment, education and a centre of many such opportunities for the migrants. These processes contributed to Kolkata's emergence as a primate city. The high level of primacy of Kolkata show the way to the situation of scarcity of other big towns in the eastern regions and at the same time resulted in the low level of urbanization in Eastern India. In fact is was observed by Ramachandran (1989) that in Calcutta's hinterland there are so few towns. And cities that one town of at least 20,000 populations serves a rural population of 500,000 or more. Calcutta remained the only million-plus metropolis in the region until 1981. Each of the three other regions of India, North, West and south had at least two million-plus cities in 1981. Kolkata historically got very slight competition from any other city of eastern

region because of its economic and administrative importance and this made Kolkata the largest city of eastern region. The case of Kolkata also explains the relationship between primacy and low level of urbanization in the region (Das and Dutt 1993).

Primacy exists in the Western region, although comparatively less than that of the eastern region. The level of urbanisation in western region is much higher in comparison to the eastern region. Since 1961 there is a slow decline in the primacy of Mumbai in western region, the exception was period 1991 when the primacy value increased, but it decreased again in 2001. This is primarily because of the increasing number and size of million plus cities in this region. In western region Ahmadabad and Pune are the two major million plus cities which are competing with Mumbai.

In the southern region Chennai was never a primate city, although the relative primacy of Chennai has declined after 1981. The other two major cities of this region are giving close competition to Chennai, these cities are Bangalore and Hyderabad. These two cities became very significant in this region because of their importance as IT hub in post liberalization period.

Delhi in the Northern region is continuously rising as the primate city. It is the only city among the four largest cities whose primacy index has not declined since 1951. Delhi is the capital city of India and the central government is focusing more for the infrastructure, industrial and over all development of the city. Delhi also has many educational institutions, all these leading to its increasing steps towards primacy.

Rank-Size Settlement Systems

The concept of rank-size settlement system was suggested by G K ZIPF in 1949.

He proposed that if all urban settlements in an area are arranged in descending order of their population, the population of the n th ranking town will be $1/n$ of the largest city.

Thus the population series will be $p, p/2, p/3 \dots P/n$ where

P = population of the largest city (Primate city).

$P_n = P_1/n$

P_1 = Primate city population

N = rank

P_n = Population of n th ranking city

The rank-size rule addresses itself to two vital questions:

1. Why larger settlements are fewer in number?
2. What is the relationship between larger and smaller settlements?

The explanation to both these questions is based on the appreciation of forces of diversification and unification.

Forces of Diversification

The location of small settlements is generally determined by nearness to the source of raw materials. In such a situation, where primary economic activities predominate, land becomes the basic raw material or resource. Land is tilled by farmers to produce food and other basic necessities of life. A present society rooted to the land merges with a large number of village settlements within walking distance of each other. Similarly, apart from agriculture, other primary activities such as mining, fishing and forestry also generate dispersed settlements of small size at regular intervals of distance. As society advances, secondary production makes it possible to locate settlements of greater distances from the source of raw materials. Thus, the settlements specializing in secondary production can be located farther apart, and also be larger in terms of population. Nevertheless, a wide range of secondary economic activities must be located near the source of raw materials so that the costs of transportation can be minimized. Secondary economic activities generate settlements of large size and greater distances apart as compared to primary activities.

Forces of Unification

In contrast to the forces of diversification, the forces of unification result in the emergence of few large settlements. Here, the focus is on tertiary economic activities. Nearness to the market, rather than the source of raw materials, is the determining factor in the location of settlements. The size of market is measured by the population of the settlement itself. Thus, a large settlement in itself constitutes a large market. Tertiary activities, such as education, health and administration, are all consumer-oriented and tend to be concentrated in large cities. In recent times, a wide range of secondary activities have acquired a market orientation (for example, electronic and engineering goods and information technology industries). These secondary economic activities also tend to concentrate in large metropolitan cities. These forces lead to the emergence of a few very large cities.

Higher degree of primacy suggests the presence of strong centripetal forces and hence greater tendency towards agglomeration and unification. ($i > 1$.) Absence of primacy suggests the existence of centrifugal forces and their greater tendency towards diversification. ($i > 0$, $i < 1$).

A balance between the two forces i.e. of unification and diversification could result into the creation of an ideal urban system ($i = 0$), which is possibly desirable and may be aimed at by the urban planners and policy makers.

Rank-Size rule and application

Zipf studied urban pattern in many countries before propounding this law. It works better in larger countries like the US and Soviet Union. It also works well in countries with long urban history and in areas that have a more complex social and economic system.

Exceptions

1. Where primate cities are there in smaller countries – This pattern could disrupt at least (1) & (2) levels – e.g. France, Mexico
2. When one or more of the city size groupings are missing
e.g. Australia – only big cities are there, no small cities Canada – only big and small cities, no intermediate ones. So, the rule will not apply.

Rank-Size Relationship in India.

The rank-size relationship is absent in India at the national level as the population size of Mumbai, Kolkata and Delhi is very close to each other. Moreover, a great majority of states in India also do not conform to the rank-size rule. In fact, primacy exists in at least 15 out of the 29 states of India and in another eight states (Bihar, Kerala, M.P., Punjab, Orissa, Goa, Arunachal Pradesh and Nagaland) the leading city is only just larger than the second city. In Kerala, the three cities of Cochin, Calicut, and Thiruvananthapuram (Trivandrum) have nearly the same population size; this is also the case with cities of Indore, Jabalpur and Bhopal in Madhya Pradesh, and Ludhiana, Amritsar and Jalandhar in Punjab. Rank-size relationships appear to hold good in the state of Rajasthan. In brief, rank-size rule in India is an exception rather than a rule.

Assessment of the Rank – size of Primates-city systems

The rank-size rule and primate city concept, both are empirical constructs and their objective is to give explanation of the real world structure of settlement. Although the rank-size rule covers the whole settlement system at the same time as the law of primate city focuses only on the leading cities, the rank-size rule has lesser empirical legitimacy.

In the Indian context, rank-size relationships are exceptions, while primate city characteristics appear to be important in a majority of Indian states. The rank-size rule is fundamentally economic to a certain extent than a sociological theory of settlement system. The desirability of both is a matter of debate and inconclusively so. On the other hand, both concepts can be constructive to the planners.

The rank-size rule given by Zipf is considerably unbending and rarely found in an exact empirical fit. Furthermore, it attaches great importance to the population size of the largest city in a region or country. The population size of every other settlement depends on the size of the largest city. The application of rank-size rule is difficult because there is no universal definition of city sizes. There are many cities where the built-up area extends outside the

administrative boundaries of the city and where many city workers live further than the edge of the built-up areas.

Having a look at the problem of application of rank-size rule, it can be better used for comparative purposes. The rank-size rule is more descriptive rather than explanatory or predictive.

PostScript

The rank size rule introduced by Zipf and the concept of primate city by Jefferson facilitates in comprehending the distribution of cities and hierarchy in the midst of cities in an urban system. Economic development and an Integrated urban system characterizes perfect rank size of cities distribution in an urban system while the primate city size distribution indicate point towards underdevelopment and disparity, unevenness, inequality in the distribution of cities.

When one looks at the Indian urban system and the distribution of cities in it, one finds that that class I cities have grown at a higher rate than the small cities. The rank size distribution of cities as introduced by Zipf (1949) in which the unification forces and diversification forces have maintained a balance, The Indian urban system was unable to achieve it ever, it pointed out that to a great extent the large cities of India are on the rise at a faster rate when compared to the small cities, it forbids the small cities to keep to a log linear relationship along with the large cities of Indian urban system. The rank size rule in addition elucidates the size of distribution of settlements with respect to economic activities..

Indian urban system shows non presence of rank size rule in the distribution of cities therefore the Indian Urban system is much susceptible to the menace of Primacy So far if one analyses the Indian urban system one finds that, Primacy in India doesn't exist at the national level but Indian urban system does not remain unaffected by primacy at the regional level.

The urban primacy at national level has not been seen since at the national level there are more than one generously proportioned not only economically but politically important metropolitan cities existing in Indian urban system. Namely Mumbai, Delhi, Chennai and Kolkata recognized as megacities basically forbid the concentration of urban population only in one urban centre.

Following the liberalization period Pune, Hyderabad and Bangalore have also emerged as other economically significant metropolises. The magnitude of the budding metropolises as major IT hubs of India has resulted in the absorption of urban population in these urban centers as well, therefore at the national level, not even a single city in India put into effect

supremacy over the whole nation, since as an outcome of colonial past and the period of liberalization . India has multiple dominant cities of national importance. Consequently urban population is concentrated in these various noteworthy urban centres rather than restricting to one center only.

At the regional level primacy becomes apparent since except the southern region all the three regions confirmed primacy . Kolkata in the Eastern region is the archetypal example of primate city , In Western region Mumbai is the primate city

The major reason behind primacy at the regional level is the colonial past of India . when India was a colony under the Britishers the port cities of Bombay, Calcutta and Madras became not only the leading administrative but also commercial and industrial cities.

During the colonial period these port cities made noteworthy contribution in the maritime trade due to their strategic geographical location. In the year 1911 Delhi once again became the capital of British Indian empire. It resulted in the development of New Delhi. Delhi in the northern region as a primate city is expanding swiftly. In southern region one finds that Chennai is the biggest urban centre nonetheless was never the primate city and for the fact of the matter relative primacy of Chennai has declined after 1981, in this region there is no presence of primacy since other cities like Bangalore and Hyderabad experienced swift growth as IT hubs. Chennai, Bangalore and Hyderabad are till today the major cities of Southern .

As far as primacy is concerned India faces a dichotomous situation .Though there is no primacy at the national level which is a good sign but there is primacy at the regional level and that is a sign of unequal Urban development .

Way forward

The way forward to deal with primacy is to leave the myopic view of development wherein the focus is on developing fewer areas due to vested interests. Over all urban development can only be achieved through sustainable reflective and inclusive approach

Zipf. George Kingsley. 1947. The Hypothesis of the Minimum Equation as a Unifying Social Principle: with Attempted Synthesis, American Sociological review. Vol. 12 (6). Pp: 627-650.

Zipf. George. Kingsley. 1949, Human Behaviour and the Principle of Least Effort: An introduction to human Ecology, New York: Addison-Wesley and Hafner Publishing Company.

Data Sources: Census of India.





A Gateway to All Post Graduate Courses