
UNIT 10 URBAN ECONOMICS

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10.0 INTRODUCTION

Urban economics is a vast subject covering a series of concepts and issues. Scholarly journals publishing on urban economics answers questions like Why do some cities grow faster than others? Why do some generate more wealth? Why do some decline? Cities are *places of* agglomerations of people rather than economic and political units. Cities face fierce competition for mobile resources, money and talent. Cities' size and location are key determinants of wealth. Technological changes most of the time shift cities' growth paths and accessible, well-connected cities exhibit higher growth. In this chapter we will study the main economic forces that lead to the existence

of cities and regional agglomeration. In particular we will study the theory and evidence on the emergence of cities and their effect on worker productivity, urban amenities, and congestion.

In this chapter we are going to study some of the important concepts and issues in urban economics. First we look at the distribution of economic resources in Indian cities. In this we look at the distribution of two major things: one, distribution of labour and two distribution of economic activities and economic output from cities. Second we study the concepts and significance of agglomeration and scale economies. Third we try to understand the concept and significance of economic base theory in urban land use, density gradients and land rent. In the last section we look at the concept of rank size distribution of cities and its applicability in the real world cities.

10.1 OBJECTIVES

After reading this unit, you will be able to:

- Analyse the distribution of economic resources in Indian cities
- Explain the key concepts and definitions of Economic Base Theory
- Determine the concept and significance of Agglomeration and Scale Economies
- Elaborate the concept and implications of Land Use, Density Gradients and Land Rent

10.2 DISTRIBUTION OF ECONOMIC RESOURCES IN INDIAN CITIES

Although the definition of urbanization differs from country to country and from city to city, in general the term Urbanization refers to the process of concentration of people in densely populated settlements where majority of people derive their livelihood from non-primary activities. Although there are several different theories and evidences of city development but it is largely believed that urbanization gained its momentum in nineteenth century after the industrial revolution. Industrial revolution made large scale production benefiting from economies of agglomeration which absorbed the additional rural workforce. This contributed to people migrating to cities for secondary or manufacturing jobs leading to concentration of population. Thus cities attracted more services and trade and transport was also given a boost. As industrial technology progressed, cities attracted more specialized services and more skilled population. Inevitably cities became concentration of wealth and wealthy. Indian cities have shown varied distribution of resources both in terms of wealth and skilled man power. Functional classification of Indian towns was attempted in 1981 by Mitra based on census data of 1961 and 1971. The study took into account three non-agricultural activities –

manufacturing, trading and transport and other services. Since cities are places of agglomeration of economies, economic resources tend to concentrate in the cities in varying proportions commanding more attention in the developmental discourse in India. With liberalisation, Indian cities have gained great economic importance with increasing competition on resource allocation.

10.2.1 Concentration of Human Resources in Cities

According to 2011 census, out of 1.2 billion people in 2011, 387 million or 32 per cent live in urban areas. India's urban population has been consistently on rise and is increasing more rapidly than rural population. Since independence, for the first time in the last decade more people were added to urban areas than rural areas. The distribution of urban population across size classes of cities reveals that the proportion of population living in Class I cities, and large and medium size villages has been increasing since independence. This is called as the 'top heavy' nature of India's urbanisation, where concentration of population in million-plus cities increases with time. Cities gain from agglomeration and scale economies as they grow in size, and on the other hand, larger cities are subject to congestion costs and lead to increases in inequality between megacity regions and the rest of the country.

10.2.2 Concentration of Economic Output and Economic Activities in Cities

In the coming decades, the urban sector will play a critical role in the structural transformation of the Indian economy and in sustaining the high rates of economic growth. Moreover higher proportion of economic output is produced in cities. Internationally, more attention is also focused on the scale of cities in developing countries and their role and importance in the global economy. McKinsey reports point to the fact that 600 cities will generate more than 65 per cent of world GDP by 2025, of which 440 cities will be from the emerging economies like India, Brazil and China which will contribute to 47 per cent of the expected GDP growth between 2010 and 2025. PricewaterhouseCoopers finds three of India's cities among the top 40 in terms of 2025 estimated GDP i.e. Mumbai, Delhi, Kolkata, and predicts that cities in emerging economies will grow faster relative to developed countries. McKinsey estimated that 58 per cent of India's GDP in 2008 was urban and 59 to 70 per cent of GDP is generated by cities. The estimates of Central Statistical Organisation (CSO) of India show that 52 per cent of GDP was produced by cities.

The spatially differentiated development pattern has designated large cities as locations for services and export-led growth and small cities and urban peripheries as sites of manufacturing. Rural areas are imagined as the providers of food security. The uneven structure of urbanisation has implications for how these types of economic structure and processes get distributed across places. Therefore, in multiple ways, settlement structure

has potential implications for the urban and the national economy, and therefore is an important topic of discussion.

Post-independence India was largely an agrarian nation with agriculture being the main contributor to national output and employment generation. In 1950 there was a shift towards industrialisation for self-sufficiency. In 1980s the first wave of economic reforms was initiated with a push towards setting up high value generating industries, liberalisation of imports, setting up of export promotion zones, setting up telecommunication infrastructure and so on. The shift towards high technology and capital and services intensive growth became evident post-1991 when new economic policy was initiated. Thereafter, there was a surge in the output produced in urban areas associated with major reforms in trade, fiscal policy and industrial policy. In 2001, a number of sectors were privatised leading to economic growth but witnessed increase in inequality and unorganised employment. The spurt in output growth following economic reforms in 1991 was largely driven by growth in the manufacturing, construction, trade and real estate and business services sectors, largely situated in cities. Currently more rapid growth is seen in the services sector concentrated around large cities.

Urbanisation and Output Growth is one of the traditional ways of understanding the relationship between the process of urbanisation and economic growth. Since 2011, there is a clear positive relationship between urbanisation and growth. The more urbanised states like Maharashtra, Tamil Nadu, Gujarat and Kerala have very high levels of per capita income. The more urbanised states continue to grow faster than others.

The Jawaharlal Nehru National Urban Renewal Mission (JNNURM) was launched in 2005 which is the single largest initiative since Independence to fund infrastructure and service provision in Indian cities. It particularly states the importance of cities for economic growth as a rationale for investing in infrastructure. Since urban economic activities are dependent on infrastructure, such as power, telecom, roads, water supply and mass transportation, coupled with civic infrastructure, such as sanitation and solid waste management, it is pertinent for economic as well as inclusive growth of Indian cities. It was recognised that cities and towns contribute to over 50 per cent of the country's GDP, they are central to economic growth. For the cities to realize their full potential and become effective engines of growth, it is necessary that focused attention be given to the improvement of infrastructure. For cities to become the engines of national development and to sustain India's economic growth momentum, urbanisation needs to be actively facilitated with inclusive growth as an important trend in managing urbanisation for future.

10.2.3 Urban Spaces and Economic Deprivation

With increasing economic wealth in cities, cities have also become spaces for economic disparity and economic deprivation. It is emerging in form of urban

poverty, vulnerability, and inequality. The National Urban Poverty Reduction Strategy remarks on the worsening of urban poverty despite an impressive growth performance of cities as 'cities and towns are unable to provide basic shelter and associated infrastructural services'. They show that interpersonal inequality in urban areas has been steadily increasing in most of the states, and inequality between classes and caste groups has also increased. So, inclusive growth of cities should aim at slum-free cities, improved access to basic services, rights to land, shelter, and low income housing, self-help group formation and financial inclusion.

10.3 ECONOMIC BASE THEORY

The economic base theory is one of the standard and the most well-known theories of regional development. It explains why different regions have different economic levels. While urban areas are considered as engines of economic growth, growth influences the urbanization process, driving the spatial evolution of production and population agglomeration.

10.3.1 Concept and Definition of Economic Base Theory

According to the economic base concept, the regional economy can be divided into two sectors:

- 1) Basic activities which are activities devoted to the production of goods and services ultimately sold to consumers outside the region
- 2) Non-basic activities which include activities involved in producing goods and services consumed locally.

In other words, Basic activities are those which export goods and services to places outside the economic confines of the community. For example large scale industry like iron and steel industry; the products of this industry are supplied to various regions. The non-basic activities are those that provide for the need of the residents within the community's economic limit; like services provided by the local barber, tailor, retail shop etc. An increase in the amount of basic activity within a region will increase the flow of income into the region which in turn will result in an increase in demand for goods and services within the region. Hence the theory assumes an increase in the basic activity will increase export trade, thus highlighting the effect of the development of the community linkage. Therefore the economic base model focuses on regional export activity as the primary source of local-area growth. According to this theory total economic activity is assumed to be dichotomous with a distinction being made between basic economic activity and non-basic economic activity.

10.3.2 Origin of the Economic Base Concept

With the rapid pace of urban growth, planners are continuously trying to anticipate and influence this growth leading to healthy demand for regional

economic models. Economic base model was the only instrument available for regional economic analysis. This model as explained earlier focused on regional export activity as the primary determinant of local-area growth and received the greatest amount of attention from scholars in regional science between 1950 and 1985.

The economic base theory was first articulated in 1916 by the German sociologist Werner Sombart, who wrote "actual city founders". He identified people in positions of authority, wealth or occupation who drew income from outside the city as "active, originative, or primary city formers". The "passive or derived or secondary city founders," are those people whose livelihood depended on the city formers. Similarly M. Arrousseau identified the primary and secondary occupations of a town. According to him, the primary occupations are those directly concerned with the functions of the town and the secondary occupations are those concerned with the maintenance of the well-being of the people engaged in those of primary occupation. Frederick Law Olmsted also called such similar occupations as primary and ancillary economic activity in an urban area. Thus by the early 1920s, the economic base concept was recognised as a potential theory to explain the regional growth process. Eventually, economic base model provided a framework for developing plans for city development. A region's export base and economic base was used to calculate a local-area economic base ratio which was further used to forecasts of the future growth of the region. Many scholars used both primary and secondary data of export to cities and its occupation structure to predict city's growth.

Weimer and Hoyt distinguished between "urban growth" and "urban service" industries. They opined that a region's potential for growth depended on the growth industries in urban areas. They used income and employment data and location-quotient methodology to identify economic base of urban areas. Location-quotient methodology compares a region's concentration of economic activity in a particular industry with that of a benchmark economy, usually the entire country in which the region is located. By 1940s, these techniques were used in many cities and states in urban and regional planning and their economic analysis. By 1950, economic base theory became established as the primary tools of regional planning. It was established that for exports to be considered the only exogenous determinant of regional growth, all other factors, related to both demand and supply, must remain fairly constant for the prediction to be accurate. So certain other variables were listed to take into account for a more comprehensive model of regional economic activity; like population levels and interregional migration patterns, regional capital investment levels and annual flows, state and local tax policies, changes in the cost of transportation to reach external markets etc. It was noted that this model might explain economic growth in small or highly specialized economies but it was inadequate to explain the growth of complex urban economies. It was widely agreed that supply factors needed to

be added to the model in order to make it relevant for long-run regional economic analysis.

By the beginning of the 1960s professionals got were divided into three distinct methods of research within the economic base paradigm: those who still considered the economic base model to be a reasonable framework for urban growth analysis; those who questioned its validity but pursued more empirical evidence before discarding the paradigm; and those who rejected the validity of the hypothesis.

10.3.3 Prediction and Assumptions

The division of regional economic activity into these two distinct sectors is the central concept of the economic base theory. Its fundamental behavioural assumption is that non-basic economic activity depends on basic economic activity. The model also assumes that the income injected into the regional economy and the accompanying potential for developing locally oriented, non-basic industries are in proportion to the size of a region's export base. Static and demand oriented assumption ignores factors that affect the supply of a region's output and other changes that affect demands.

10.3.4 Limitations of Economic Base Theory

Over the years many scholars have expressed concern with the narrow focus of economic base theory on exports, just one portion of the demand side of the regional growth equation to the exclusion of important supply-side factors and constraints. Most notably, James P. Lesage and J. David Reed (1989) and Lesage (1990) have provided empirical evidence in support of the economic base hypothesis as both a short-run and long-run theory of regional growth. These authors suggest that their models could be used both for short-term forecasting of regional employment, income, and product and for longer range regional economic planning and policy analysis. Although the model has been enhanced over the years to include additional variables as well as to capture more explicitly the dynamic nature of the regional growth process, most changes have been made within the scope of this simple demand-oriented specification. In general, economic base models have not evolved to acknowledge the potential impact of many important variables that may affect regional growth like interregional capital flows; labour migration patterns; changes in products, tastes, and production processes; demographic shifts; changes in state and local tax laws etc. Because these issues are generally too important to ignore, many regional scientists have concluded that economic base theory lacks the complexity to provide a useful framework for analysing many regional economic issues and policies.

If these claims were valid, then the economic base model will be crucial in decision-making contexts. Because regional economic models play such an important role in planning and policy discussions, it is important to have a clear understanding of their strengths and weaknesses.

Check Your Progress Exercise 1

Note: a) Write your answer in about 50 words.

b) Check your answer with possible answers given at the end of the unit.

1) How does an agglomeration economy influence city growth?

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2) Why do cities show hierarchical distribution as explained in rank size rule?

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10.4 AGGLOMERATION AND SCALE ECONOMIES

10.4.1 Concept of Agglomeration and Scale Economies

Agglomeration in simple term can be defined as concentration of people and their activities in space. The economic advantage of spatial concentration is called agglomeration economies. Scale economies are defined as the economic advantage of producing a good or service at a large scale. The scale economies are divided into two categories: internal scale economies and external scale economies

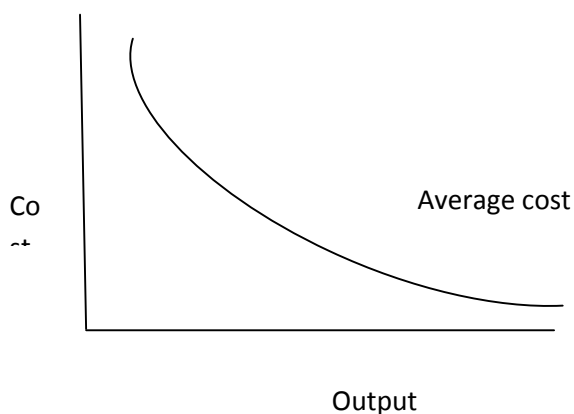


Figure 3.1 Internal scale economies

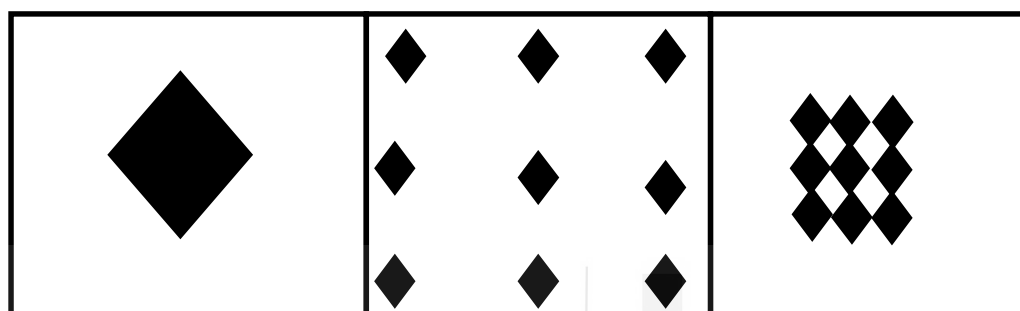
Internal scale economies are the economic advantages of an increasing rate of output of a single production unit like firm, factory etc. These are represented in form of an inverse relationship between the per unit or average cost of production and scale of production or output (Figure 3.1).

So what causes of internal scale economies? There are several causes for internal scale of economies to function. First and most famous cause is the explanation given by Adam Smith in 1776 called as the *division of labour*. Drawing from the process of manufacturing pins in an industry, he concluded that if a single person (or single labour) is used to do a particular task, the produced output can be much higher with the same input of labour hours. In other words, there is an apparent economic advantage of the large production unit over a smaller one. *Capital indivisibility* is another explanation for internal scale economies. Consider a farmer wants to install a tube-well (an indivisible piece of capital) to irrigate his farm. He needs a lot of capital to do so but installing the tube-well will increase his output to manifold and he can irrigate his land in much less time. His farm size is small and production is not much to suffice for the investment. So in this case a large farmer with greater output will have better advantage to invest in indivisible capital and augment production. Another example of internal scale of economy is software industry where fixed costs do not have to involve capital. Most of the cost in developing software is in research and development. Once the software is made, copying and distributing the code is very low. There are again some types of production process that are not efficient in the small scale. For example blast furnaces where iron is extracted. Thermal efficiency of large blast furnaces is higher with small fuel use than small furnaces. In other words if there are many blast furnaces or many iron smelting plants, it is economically disadvantageous than having a single high capacity blast furnace with a large iron smelting plant. For many goods, one of the keys to profitability is producing just enough to meet an uncertain pattern of demand. For example, some goods like shoes, one has to produce more a variety of shoes with different sizes to fit the distribution of foot sizes in the population of potential customers. Moreover, since shoes are from the fashion industry, some shoes which will not be sold at the end of season will have to be sold in heavy discount. The statistical theory tell us that larger the sample, more closely it will confirm to the population distribution. So a larger producer finishes with smaller proportion of unsold shoes. This phenomenon is known as *statistical scale economies* and is applicable to a broad range of industries.

External scale economies are economic advantages that arise from the size of an industry or group of firms rather than from the scale of any single firm. Often external economies of scale are spatial in nature, meaning that firms benefit from the combined scale of production in a group of firms that are clustered in space which is often town or cities.

Figure 3.2 illustrates the difference between internal and external scale of economy in space or spatial context. In the central frame there are nine

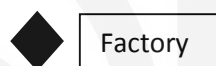
factories or production units scattered in a region, in left frame all nine factories are located together benefiting from the internal economies of scale and in the right frame all nine factories are clustered together but not combined signifying external economies of scale. If external scale economies are available in this particular industry, this clustered pattern of production should be more efficient than the dispersed production. In other words, external scale economies occur because each firm benefits from the close proximity of the other firms. Thus spatially defined scale economies constitute a class of agglomeration economies.



Internal scale

Figure 3.2. Scale economies in space

External scale or
Agglomeration
economies



10.4.2 Type of economy of scale and their Examples

Internal economy of scale: It can be either Pecuniary or Technological. Pecuniary economy of scale is about being able to purchase intermediate inputs at volume discounts. Technological economy of scale can be of two types: Static technological and dynamic technological. Static technological happens due to falling average costs because of fixed costs of operating a plant and Dynamic technological scale is due to learning to operate a plant more efficiently over time.

External economies of scale or agglomeration: it can be either *localization or urbanization*. Both localization and urbanization can be both static and dynamic.

Static localization can be drawn from three types of examples like:

- 1) Shopping - Shoppers are attracted to places where there are many sellers
- 2) “Adam Smith” specialization - Outsourcing allows both the upstream input suppliers and downstream firms to profit from productivity gains because of specialization
- 3) “Marshall” labour pooling - Workers with industry-specific skills are attracted to a location where there is a greater concentration

Dynamic localization can be drawn from the example of “Marshall-Arrow-Romer” which is learning by doing reductions in costs that arise from repeated and continuous production activity over time and which spill over between firms in the same place.

Static Urbanization can be drawn from examples like:

- 1) “Jane Jacobs” innovation - The more that different things are done locally, the more opportunity there is for observing and adapting ideas from others
- 2) “Marshall” labour pooling - Workers in an industry bring innovations to firms in other industries but the benefit arises from the diversity of industries in one location.
- 3) “Adam Smith” division of labour - Outsourcing allows both the upstream input suppliers and downstream firms to profit from productivity gains is made possible by the existence of many different buying industries in the same place

Dynamic Urbanization can be drawn from examples like:

“Romer” endogenous growth - The larger the market, the higher the profit; the more attractive the location to firms, the more jobs there are; the more labour pools there, the larger the market and so on.

“Pure” agglomeration is spreading fixed costs of infrastructure over more taxpayers; diseconomies arise from congestion and pollution.

10.4.3 Relationship between Agglomeration Economies and Internal Scale Economies

Internal scale economies are related to the agglomeration economies in the sense that if production is at a large scale it will be concentrated at fewer points in the landscape.

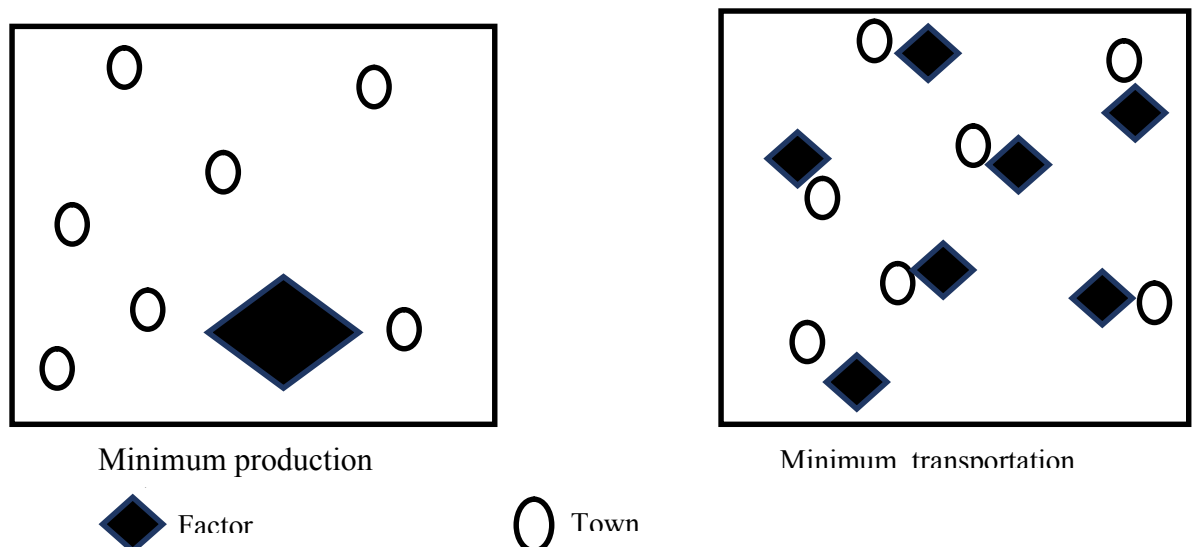


Figure – 3.3: Trade-off between internal scale economy and transport

In figure 3.3, the diamonds represent factories and circles represent towns. On the left side, the box represents one big factory to serve all towns and on the right side there are factories located near each town. Scale economies will favour the first one. But there is a trade-off between internal scale economies and transportation costs. If transportation costs are so high as to offset any scale economies gained by concentrating all production in one factory, the more dispersed distribution of production may actually be more efficient.

10.4.4 Causes and Classes of Agglomeration Economies

There are two main classes of agglomeration economies: Urbanization economies and Localization economies.

Urbanization economies arise from the benefits that accrue to a broad diversity of firms and households concentrated in an urban area. An urbanization economy may arise due to various reasons. Certain type of infrastructure can be most efficiently provided for large clusters like water and sewage systems. A large investment in water and sewage network is more economically efficient to serve densely populated urban areas than comparatively dispersed households in rural areas. Similarly infrastructure of bus and train terminus and airport is only viable where there are large population base and large economic activity. In other words there are a variety of infrastructure services that are only available to spatial concentrations because they would be exorbitantly expensive to provide for a dispersed population.

Another type of urbanization economy is called as *juxtaposition economies*. In this case industries benefit from locating near each other because output of certain industries becomes input for the other. So by locating near each other they can save on transportation cost also and benefit from agglomeration. For example automotive assembly plants receive inputs from firms that make glass, electronics, fabricated material etc. So diverse but highly inter connected firms come at one place forming *spatial industrial complex*.

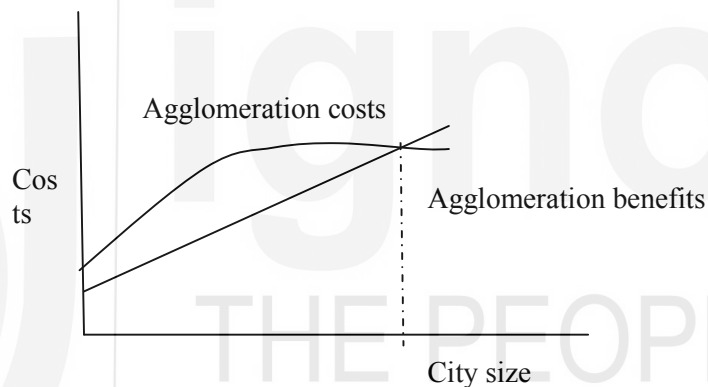
Urbanization economies also arise from the very fact that big places tend to be more diverse than small places. Jane Jacobs pointed out that the very diversity of big cities forms a culture of innovation and rapid adoption of new technologies and institutions that is conducive to higher productivity. Big cities also offer greater variety of goods and services to buy with the incomes they earn.

Localization economies arise from the benefits that accrue exclusively to firms in the same or similar industries that are located in proximity; for example microelectronics in Silicon Valley, steel in Detroit and steel in Pittsburgh. Such industries located near each other because of factors like availability of skilled or specialised pool labour at the same place giving rise to specialised labour markets. Some industries are information intensive like fashion industry which gain from locating together. Another reason is the

presence of highly specialised producer services that cater to a specific industry.

10.4.5 Urbanization and Agglomeration Economies: the Optimum City Size

Urbanization is the evidence of agglomeration economies. Further urban agglomeration becomes increasingly important because of the globalization of world economies. But there is a “fundamental trade-off” between agglomeration economies, which make wages and productivity increase with city size, and crowding diseconomies, which makes commuting and housing costs increase with city size. So as cities get bigger, some things such as productivity and variety improve, while others such as pollution and congestion gets worse. So there is a trade-off between agglomeration costs and benefits which is dependent of the size of the city (Figure 3.4). When the costs exceed benefits, planners and policy makers should plan for dispersion for a more planned and balanced city development.



10.5 LAND USE, LAND RENT AND DENSITY GRADIENTS

There are several uses of land in the urban spaces. Since land is fixed, there is constant competition among different sectors to use the land. In a world with only economic considerations, land will be devoted to the uses to the best possible use fetching maximum profit. Accordingly the land rents will be determined and whichever activity pays the maximum would get to use the land. Density of land use thus will vary according to the rents the parcel of land demands and the activity that can afford it.

10.5.1 Land Use and Competition for land

Land can be utilized by any of several activities. Land being a fixed resource is always under competition for different uses. Moreover, land having good soil, climate, better accessibility, and areas suitable for agglomeration under the influence of local external economies, are in further demand. The price of land, which depends on demand and competition for land, varies with quality

and access. Thus land use or location of different activities on a particular parcel of land is dependent on its competitive use. Owners of the land will, (if they want to) maximize their economic welfare or use it for the purpose that will pay a higher rent. However, we must keep in mind that land markets are not so perfect in their allocation, nor are owners only looking for profit. If land is put to use only taking into account profit, then social welfare and environmental concerns will be surrendered. Many governments thus control land use by the process of land use zoning and demarcation through ordinances, urban renewal subsidies and reservation of land for public use.

In order to understand in what way land is allocated to various land use activities, we will have to understand what determines how strong a bid any particular activity can make for the use of the land. In other words, what is the maximum rent per acre that the activity could pay for land in various locations. However, you must note that this logic can explain land use pattern only if one is using prices, costs, and profits as a principal mechanism for allocating land resources.

10.5.2 Land Rent

Generally land use is governed through a price system. The price of using land is identified as *rent*. In economic terms, parcel of land goes to the highest bidder or to the person who can pay the maximum rent. We have already studied in the earlier section that there is an evident economic advantage to agglomeration, leading firms and household to compete for scarce supply of urban land. This competition creates rent disparities across space. The price of advantageously located property is bid up relative to other areas. To understand how this happens urban economists have given a theory of bid rent gradient which we will discuss in this next section.

10.5.3 Rent Gradient

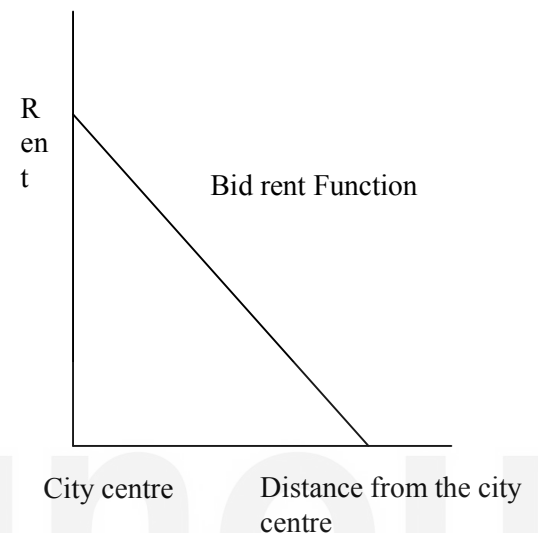
The theory of bid rent gradient states that, the (land) rents are declining function of distance from the city centre. The theoretical model of rent gradient examines what the rent gradient should look like as a result of competition from different land uses considering only distance and price, all other factors remaining constant. Though unrealistic in the sense that it only considers distance and price, it serves as the basic framework for the real bid rent gradient. The empirical models are built based on this simple theory taking multiple variables to calculate the real bid rent gradient and real rent curve of cities. This theory thus is a crucial tool for the real estate analysis for understanding the spatial structure of land rent in cities.

10.5.3.1 The Basic Bid Rent Theory

The bid rent theory was given by Alonso and Muth and it explains the relationship between distance from the city centre and house prices. The theory states that the rents are bid upwards close to the city centre as

households attempt to minimise transportation costs. In simple terms, residents living close to the city centre will have to travel less to get work or entertainment centres and this decreased disutility. Conversely, rents are lower away from the city centre because transportation costs for residents are high. Thus, though competition to minimise transport costs, rents become a negative function of distance from the city centre.

Figure 3.5.1 explains the basic bid rent function. This model shows that the rent is highest in the city centre and it decreases as one move away from the city centre. Residents who live away from the city centre enjoy lower rent but also spend more on the transport cost. Similarly residents living at the city centre or near the city centre pays higher rent but are able to save on the transport cost. The transportation cost is not merely the money spent; it also involves time and energy in commuting long distances.



The simple bid curve of Alonso makes three assumptions. Firstly, cities exist on a featureless plain, without any geographic obstacles like hills and rivers. Secondly, transportation cost is proportional to the distance travelled and thirdly, central business district or the city centre contains the vast majority of employment and other employments are evenly distributed throughout the metropolitan area. These basic assumptions form the basis of the criticisms of this theory. For example in real world transport costs are determined by a complex range of factors and are not proportional to distance. Most cities are polycentric with more than one city centre whose range of influence definitely overlaps with one another. Nevertheless, the bid rent theory demonstrates the nature of the land market and emphasises the notion of efficiency in the use of urban land.

10.5.4 Significance of Land Rent and Density Gradients

The world population has grown substantially over the last century and so are the cities. The disparity in density of population of cities over space and time can mostly be explained by the changing nature and availability of transport and transport costs. For example, in 18th and 19th century cities developed around central transportation nodes like railway junctions and ports because of easy accessibility. Prior to industrial revolution, main mode of transportation was horse drawn carts which were slow, expensive and inefficient. Thus location of industries was determined by transport costs as high cost was involved in moving the good from the raw material site to the factory and from the factory to the market. Along with industrial firms,

commercial firms also clustered around the city centre in order to minimize transportation and communication costs. Consequently, since jobs got concentrated in one place households also had to locate near the city centres to access employment. Since in those days only mode of transportation was horse; both wealthy and poor commuted by horse or by foot. In order to reduce transport cost, the wealthy started living near the city centre paying higher rent and poor were pushed to the fringe. That is why the house prices fell dramatically with distance from the city centre. So, because of transportation cost, rents changed across space. Therefore, we can say that in the era of slow transportation, the bid rent gradient of cities was steep and strongly negative, much like the theoretical model as shown in the figure above. If nothing had changed since then, we would expect the rent gradient to be same till this date.

With improvement in transportation, thus bid rent gradient is different in modern times and urban landscapes of modern cities are dramatically different. With the emergence of streetcars as mode of city transports which were relatively cheaper than stagecoach, rich people who could afford this transport rent started occupying suburban property and moved away from the congested city centre while poor still lived in the city fringe. Had streetcars been affordable to all, rent gradient might have remained unchanged. By mid-19th and 20th century, rent gradient curve flattened as upper and middle income citizens chose to move farther away from the city centre. Gradually the urban spatial structure got increasingly complex making the simple model of bid rent curve model less effective in predicting real world scenario. Mass production of cars significantly reduced the transportation costs associated with living in the city's periphery further moderating the effect of bid rent model. We can say that the automobile revolution moderated the bid rent gradient and made the urban spatial structure increasingly complicated. Because the modern bid rent gradient is complex, urban economists use multivariate models to test the existence of bid rent gradient.

10.6 RANK SIZE DISTRIBUTION OF CITIES

If we study the various sizes of urban places in an area or a country, it is commonly observed that there are a few large cities, many medium sized and multitude of small centres. This trend is universal and can be observed at national or regional level. So we can say that 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. Here size refers to the population of a city.

To illustrate this, suppose there is a country with 10 cities and a total urban population of 10 million. If the cities were uniformly distributed then each city would have had same population which is 1 million. If there is a primate distribution, then more than double population would have lived in the first

largest city than that of the second. If it is an intermediate distribution then there will be a ratio between the largest city with all other cities with a steady decline in population among the cities in between. However we must note that there is no 'ideal' city size distribution. However, city size distribution provides evidences for urban hierarchy in terms of their population size and in evidently their size of the economy.

10.6.1 Concept of Rank Size rule

The empirical existence of a regular relationship between the size of urban centres and their ranks was first presented by Auerback in 1913 in a study of German cities. He was of the opinion that the population of the n^{th} city was $1/n^{\text{th}}$ the size of the largest city. Later on Lotka in 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. The rank-size rule was first of all put scientifically forward by Zipf in 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 is referred to as Zipf's Law where 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.

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, expressed it by simple formula as: $P_r = P_1 / r^q$, $r = 1, 2, \dots$. 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 10,000 and the hundredth city will have one-hundredth as many or 10,000.

10.6.2 Causes of Rank Size Distribution

Rank size rule in general predicts a distribution of cities in an urban system which is highly if not completely polarised. This suggests that agglomeration forces are strong enough to attract a very large proportion economic activity to the largest city, but not all of it. But because of the negative effects of agglomeration like congestion many people will prefer to still live in small and medium towns. This will result in a city size distribution resembling rank size rule. But the levels of polarization may vary from country to country depending on several factors like size of the country, political and administrative factors and economic factors. Big countries tend to have many

large cities whereas small countries tend to have a primate city. Like in small countries like Bhutan, Sri Lanka, Nepal Thailand etc, their capital cities of Thimpu, Kathmandu, Colombo, Bangkok form the primate cities. Dictatorial governments tend to concentrate administrative functions and nationalized industries in the capital so that they can be easily controlled. Sometimes cities develop due to historical reasons like cities developed in the colonial time in India e.g. Kolkata, Delhi and Mumbai are larger than the other cities.

10.6. Rank Size and the Urban Hierarchy

Rank size rule provides an approximation of hierarchy of cities in a country or an urban system. In a hierarchical urban system, there would not be a smooth decline in the population of cities with decreasing ranks. Instead there would be a cluster of cities in similar size groups, or with the number of cities in each group getting bigger as the population get smaller. This is not exactly consistent with rank size rule, but a rank size distribution provides a good approximation of a distribution that is actually hierarchical.

Such urban hierarchy is as a result of several reasons like transportation hierarchy, administrative hierarchy, and service hierarchy and so on. These may have overlapping effects on the city size and their distribution.

Check Your Progress Exercise 2

Note: a) Write your answer in about 50 words.

b) Check your answer with possible answers given at the end of the unit.

1) How does an agglomeration economy influence city growth?

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2) Why do cities show hierarchical distribution as explained in rank size rule?

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10.7 LET US SUM UP

The topic of urban economy is vast. Nevertheless most of the concepts deals with why cities are formed and how they are arranged in spaced. While the concept of agglomeration and rank size rule explains the reasons for city growth and distribution, bid rent curve and rent gradient appreciates the fact that land being fixed is valuation and is under tremendous competition. Economics and technological innovations can to a large extent explain the nature of population distribution in space, but real world scenarios are much more complex and needs careful considerations.

10.8 KEY WORDS

Economic resources: Resources which have economic value like land, labour, capital, etc.

Urban Agglomeration: An urban area characterised by high population density and infrastructure.

Economies of Scale: Advantages which occur when companies incur profits.

10.9 REFERENCES OR SUGGESTED FURTHER READINGS

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10.10 ANSWERS TO CHECK YOUR PROGRESS

Answers to check your Progress 1

Your answer should include the following points :

- 1) Adam Smith, basic and non-basic industry, employment
- 2) Primate city, economies and diseconomies of agglomeration, population distribution

Answers to check your Progress 2

Your answer should include the following points :

- 1) Rent, land use, transport, technology
- 2) Congestion, pollution, employment, agglomeration, economic output



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