K. The Distribution and Interaction of Cities

Understanding Urban Hierarchy

Industrialization transformed urban spaces from selfsufficient cities into an interlinked network of interdependent cities. Like the human body, each part serves a unique purpose. The parts are interlinked through muscles and nerves, allowing it to function together as a larger organism. So too with cities, being joined together as parts of a unified whole.

Each city serves a unique function, or series of functions, and are joined together through networks. The transportation network allows the flow, or movement, of physical objects between cities: people, food, goods, vehicles, etc. Improved space-time compression allows for the increase of the quantity and speed of the flow of goods to their intended destinations. Transportation allows corn from Minnesota to be fed to cows on feedlots in Nebraska, whose beef is then shipped in a refrigerated container to a port in California, and on to a restaurant in Shanghai. Metals and chemicals mined and refined from five continents, shipped tens of thousands of miles, through dozens of supply chains, can be assembled in Beijing



into a laptop sold at a mall in Toronto, Canada. Transportation allows a boy from Oklahoma to become educated in the REAL Midwest and eventually teach and write in a tobacco-field-turned-suburb of Raleigh, NC. Communication networks allow for the flow of ideas between people and places. Radio waves send images from a remote village in Alaska to a satellite orbiting the earth to a doctor in India for examination. A series of letters and numbers move from a computer in New York, through a series of interlinked computers, to an office in London - investing millions of dollars of American wealth into a European company.

Like the body, not all cities have equal value or influence in their region or around the world. The brain plays a critical role impacting the whole body while the appendix has outlived its immediate usefulness, but can still kill the body if something goes wrong. So too, amongst urban centers there is a hierarchy of importance and impact: the higher the rank or position within the hierarchy, the more globally impactful the city and the more economic, social, and political functions it serves. Inversely, the lower a city's rank within the hierarchy, the less important and influential the urban space will be on a global scale. For example: what happens in NYC, Tokyo, Shanghai, Lagos, London, and Brasilia has immediate impact around the world. What happens in Eddyville, Missouri probably won't.

These urban spaces which comprise the regional and global networks follow the principles of the *gravity model*. Urban spaces with the largest populations and strongest connections to transportation/communication infrastructure have the greatest influence on the global system. With massive size and strong development, these urban spaces are

capable of serving multiple functions in the system and attract large quantities of goods, people, and ideas. This allows large, advanced urban spaces to support large quantities of important services, like political headquarters or economic stock exchanges.

Urban hierarchies can be analyzed on two scales: Regional and Global. *Regional scale* examines the urban hierarchy within a state, examining which urban spaces holds the highest rank in the hierarchy. The higher the rank, the greater the importance and influence. *Global scale* examines the role of urban spaces around the world, ranking their importance and sphere of influence amongst every other country.



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Rank Size Rule Example:				
1. Largest City	1,000,000	D (1/1)		
2. 2 nd largest City	500,000	(1/2)		
3. 3 rd Largest City	333,333	(1/3)		
4. 4 th Largest City	250,000	(1/4)		
5. 5 th Largest City	200,000	(1/5)		

Rank-Size Rule and Primate Cities Within a State

Within a state, urban centers are unevenly distributed in their locations and clusterings, as well as unevenly populated. A state's distribution of population tends to follow one of two paths: *Rank-Size Rule or Primate City Law*:

Rank-Size Rule. The Rank-Size Rule predicts the size of the population based upon its rank (1st, 2nd, 3rd.... 10th...



12th...) in the society. The city with the largest population is ranked #1. The city with the next largest population is ranked #2. The city with the next largest population is ranked #3... and so on. *The formula for determining the population is 1/N*. The 1 is the population of the largest city. The N is the rank you want to figure out.

Let's pretend there are 10 urban centers in a State. The largest city has 1 million people. What would the second largest city be? Following the 1/N model: 1 = 1 million, N = the rank, which is 2nd. The result of 1,000,000 / 2 = 500,000. What about the 3rd largest city? Following the 1/N model: 1 = 1 million, N = 3rd. 1,000,000 / 3 = 333,333. What about the 10th largest city? 1,000,000 / 10 = 100,000.

The Rank Size Rule is a relative model, that is not perfect but gives a general idea of the size of cities in developed states. For example: In the USA, NYC has 8.6 million people. The second largest city is Los Angeles with 4 million. The third largest is Chicago with 2.67 million. The 6th largest is Philadelphia, with 1.57 million. While not a perfect mathematical equation, the Rank-Size Model puts urban geographers in range.



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The presence of a primate city has a series of positive effects on a society:

- <u>Business & FDI</u>. The presence of a large market of people provides a strong pull factor for other businesses and FDI move into the city. As businesses move into the primate city, it attracts more businesses and complimentary services who wish to take advantage of the large markets and the benefits of agglomeration.
- <u>*Global Market*</u>. The combination of businesses and a large market population makes the primate city a powerful partner in global trade. No matter what state the city is in, the city will be able to compete with other large urban centers around the world for other business opportunities.
- <u>*High Order Services.*</u> The prosperity created within the large population due to the growth, agglomeration, and multiplication of business results in a large tax base for the government. With the large tax base and a high population density, the primate city is able to provide a large quantity of quality services such as infrastructure, transportation, sports & entertainment, communication, k-12 education, universities, banks, and cutting edge healthcare and medical research.

The creation of a primate city also creates a series of negative consequences for the rest of the state:

• <u>Uneven Wealth & Development</u>. Because businesses and governments focus first upon profitability, the presence of a primate city creates extreme levels of uneven development within a state or region. The primate city has more wealthy and middle class residents, who have higher incomes than the other countrymen. A disproportionate amount of money is invested into the transportation systems and development of resources surrounding the primate city. The economic and political power of the primate city makes it difficult for other urban areas to receive funding and be targeted for infrastructure development projects like transportation, especially in a state with an already weak economy. The primate city provides the strongest return on investment.



- <u>Brain Drain</u>. These opportunities will attract the best and brightest in the state and broader region to the primate city, causing a brain drain in the remaining urban centers. This improves the primate city's ability to prosper while seriously hindering the economic and political opportunities of the smaller cities.
- <u>Political Imbalance</u>. Politically, the extreme differences in population cause an imbalance in power. In a democracy, the residents of a primate city provide the largest block of voters and politicians to the congress/ parliament. In cases where the primate city is home to over 50% of the state's population, the primate city would dictate all government policy. The politicians would only know of life in the primate city, being relatively unaware of the needs and struggles of the other regions.
- <u>Centrifugal Forces.</u> The uneven development and the imbalances in the distribution of power and opportunity can serve as centrifugal forces, leading to division or rebellion. The primate city feels they can survive on their own in the global economy and becomes tired of other cities riding their coattails. The other cities resent the power and influence the primate city has developed and may grow bitter and resentful.
- <u>Squatter Settlements</u>. As the gravity model states, the larger the population and economic pull of a region, the greater the number of people who will want to interact with and relocate to the region. The disproportionate opportunities cause massive migration of the economically desperate to the region, potentially beyond what the city is capable of handling. This causes an explosion of squatter settlements or slums. The residents cannot afford to participate in the formal economy or pay rent but still need a place to sleep and something to eat.
- <u>Natural Disaster Vulnerability</u>. Large, dense, and highly impoverished populations become extremely vulnerable to natural disasters. If a hurricane or tsunami strikes a primate city, a disproportionate percentage of the population, businesses, and services are effected. Without a second major urban center, it can be difficult to rally the resources needed for disaster relief; crippling the state's largest population and the overall economy.

APPLICATION #1

Before moving on in the reading, complete the following activity: How long (in minutes) would you be willing to travel to purchase the following and why?

- Gas
- Diamond Ring
- Stock Market Portfolio

- Box of Cereal
- Soap- Dress/Tux for Prom
- Fancy Car
- Dark Roast Coffee
- Honeymoon
- University Degree
- Apple Laptop
- Your Favorite Book

Christaller's Central Place Theory Within a State

In the 1920s, urbanization was exploding throughout Europe and the USA. While theorists developed models around urban land use and form, questions arose around the distribution of cities and services: why are urban spaces located where they are located? Why do some areas have shopping malls and every restaurant imaginable, while another area barely has a functional gas station? In 1930, William Christaller (German) developed the *Central Place Theory* to provide an understanding of the spatial distribution of urban spaces and services across a state.

Basics Principles. Understanding the Central Place Theory begins with the hierarchy of cities. All urban spaces do not carry the same weight of importance, nor appear in the same frequency. Smaller urban spaces, like hamlets and villages, occur in a higher volume and higher frequency and appear closer together. Medium sized urban spaces, like towns, appear less frequently and are farther apart. The largest urban spaces appear least frequently and are the furthest apart. Thus, within the average state there are thousands of hamlets located very close together, hundreds of towns comparatively further apart, a dozen cities, and maybe 1-2 conurbanations/megacities the farthest apart.

Similarly with urban spaces, not all services carry the same weight of importance or demand. The importance, or order, of a good or service is dependent upon its *threshold and range*: how many customers are needed to keep the service in business and how far are they willing to travel? For low order goods, like gasoline and food, people are only willing to travel a 5-15 minutes to acquire. For medium level goods like retail stores, movie theaters, fancy restaurants, or tax services, people would be willing to travel 20-40 minutes to acquire. For the highest order goods, like sports arenas, major theaters, business legal services, and stock exchanges, people would be willing to travel for many hours, if not days, to participate in the needed activity.

Merging the two concepts together, the size of the urban center determines the level of services that will be available there. For schools, villages would have a church run preschool or family-owned day care and a K-12 all-in-one building. A town might have a separate building for the elementary, middle, and high schools. A city has its own network of schools, possessing a plethora of each level dispersed throughout the city. Metropolitan areas have an even deeper network with over 150 public schools separated into independent districts, plus a university (or two or three).

Applied to retail shopping: a hamlet would have one all-in-one gas station that sells snacks. The village would also have a grocery store and a social space with 1-2 fast food restaurants or hometown diners. The town adds strip malls with some box store retail selling clothing and housing items, doctors offices, a pharmacy, and multiple social spaces like coffee shops and a movie theater. The city and metropolitan areas have high density shopping malls, Apple stores, Ikea, fashion boutiques, fine dining, live theater, and professional sports arena(s).

Central Place Theory Assumptions:

- 1. The land is flat and featureless.
- 2. People are economically rational and will make the choice that will maximize their profits (both customers and retailers).
- 3. All people have similar purchasing power.
- 4. At the beginning before cities developed, the population was evenly distributed across the land.





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access to services, more people would want to live in the central place to have better access or better jobs.(#economicOpportunities) Since people have low and medium level, needs this concept is

reapplied at the next level of the urban hierarchy as well. For every collection of seven hamlets, a village will develop in a CENTRAL PLACE with a main street containing one grocery store, two fast food restaurants, and a small post office. For every 7 villages, a town will form in the most central place. In the town will be grocery stores, big box retail like Walmart, a pharmacy, family doctor, movie theater, mechanic, small library, etc. Because of the economic opportunities and improved access to services, more people would come to live in the villages and towns, increasing their populations.

Scaling out another level, residence have mid-high range services that they need and would be willing to travel even farther to acquire. For every seven towns, a city will develop in the most central place. In the city are the higher range services like multiple schools, malls with larger retail chains, a larger library, university, hospital, tax services, lawyers, banking, entertainment, sports teams a reasonable size CBD with office space, etc. Because of the economic opportunities and improved access to services, more people would come to live in the city, increasing their populations.

Hamlet to Town

Why Hexagons?

Christaller promoted the idea of using a hexagon. Like a honeycomb of a bee, the hexagons fit perfectly together without overlap, showing the ideal market area, that is the threshold and range, of the businesses and the populations they are seeking to serve. He tried circles, but when circles are close together it either left a gap or the circles overlapped.

At the top of the hierarchy is a *megacity* or conurbation (collection of cities merged together). This is home to the highest order of services. For every seven cities, the most central city becomes a mega city/conurbation, fulfilling every order of good or service. This is the location of the larger political services, major law firms, universities, the most sophisticated retailing, bulk gain manufacturing, and research hospitals with the highest level of intensive care facilities. Because of the economic opportunities and improved access to services, more people would come to live in the megacity/conurbation, further increasing their populations.

Urban spaces are similar to building a tower with blocks: the quantity at the base determines the quality at the top. There must be a certain number of small hamlets before a town can form. There must be a certain number of towns before a city will form. There must be so many cities before a metropolitan area will form. In the urban space shown in the diagram, at right, there are: 84 hamlet/villages, 24 towns, 6 cities, 1 megacity/regional city.



APPLICATION #2

Compare Minot, North Dakota to the Central Place model above. How does the region display the core ideas of Central Place Theory? In what ways is it different?



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Critiques of Central Place Theory

Models are used to explain an ideal situation and to understand the drivers or processes in a pure setting. They cannot, and will not, explain all the variables within normal reality. With that being stated, there are general criticisms, critiques, and considerations to remember when utilizing the Central Place Theory:

- **Impact of Topography**. Unlike in the model, the real world is not flat and does not have equal access to arable soil, sun, and resources in all places. Certain landscapes are unlivable, like a desert or a mountainous region. Major waterways physically alter the urban landscape while encouraging business activity due to the accessibility of trade routes.
- Impact of Transportation. The shape and distance between locations is altered by transportation networks. Consumer decisions are most strongly influenced by the time it takes to accomplish a task. Areas of urban settlement with better transportation access can be located further away from other similar areas with no change in time invested into an activity. The type of transportation available also has an impact. Train based societies tend towards a spoke-and-hub or star shaped model because of the straight-line nature of train tracks. The more people dependent on trains to travel between urban centers, the greater the society is shaped by the train's transportation corridor. Highway based societies have a more decentralized urban distribution. The ability to put roads and developments anywhere topography allows for creates urban spaces and roads with a more scattered distribution. Automobiles allow humans to easily make multiple stops on a shopping trip to multiple stores in multiple urban centers, causing a distortion in the Central Place model.
- **Impact of Space-Time Compression**. The ability to move over greater distance in shorter time has a drastic impact upon the shape and distribution of urban spaces. As stated above, people only wish to invest a certain amount of time into a particular order of activity. The faster the person can move (or be moved), the further away services can be located from each other. If people wish to invest 20 minutes going to a strip mall, the type of transportation has a significant impact upon how far that service can be located from the residential housing:
 - 20 minutes of Walking = 1-2 miles travelled 20 minutes of Biking = 3-5 miles travelled 20 minutes of Car Travel = 10-20 miles travelled 20 minutes of Bullet Train = 50-70 miles travelled 20 minutes of Airplane Travel = 180-200 miles travelled

Looking at the map of major urban settlements in the USA, the distribution was strongly impacted by available transportation. In accordance with *Borchert's Epochs*, the Northeast urban centers were founded in the 1600-1700s upon walking and animal transportation, thus causing them to be physically closer together and clustered. West of the Appalachian Mountains, train travel rose to prominence. This caused urban areas to be located significantly further apart.



APPLICATION #3

Compare the cities of the New England east coast, with the cities of the Mid-West & West coast. How are the spatial distributions different? Where does the idea/concept of "Central Place" most visible?

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- **Wealth Disparity** The financial success of a region changes the quantity and spacing of urban centers. Areas that are highly profitable with workers making high incomes do not need a large market area to achieve their market threshold. This allows more urban spaces to be located closer together. Similarly, in impoverished areas, it takes more people to meet the threshold because each individual has less money to spend. As a result, less market areas are established, and they struggle to meet their threshold.
- **Economic Decline**. When there is a depression or deindustrialization, the number of urban centers decreases and become spaced further apart because a decline in profits causes a decline in the number of services struggling to meet thresholds when customers did not have expendable income. It also increases the range of market area a service needs in order to achieve its threshold. During the Great Depression (1929) and Great Recession (2008), the overall number and size of urban centers declined.
- Humans are not Economically Rational. Humans are predictably irrational. Humans make choices based on qualities such as beauty and self worth, not just on maximizing profitability. For example, more people would rather be a great architect making \$60,000 a year instead of being a trash collector making \$200,000 a year. A shopper will drive past 3 retail complexes to go to the one that has their favorite brands. Humans will buy a more expensive product because of how it makes them feel, even if it costs them more or if they have to travel farther away. Their choices do not follow economic market principles and further distort the shape and distribution.
- Socialism. Christaller's German cultural heritage was steeped in capitalism and his model is based on the competition between businesses as the primary force shaping urban settlements and the availability of services. In a socialist or communist society however, the distribution of urban areas is specifically planned by the government to achieve a certain result for the residents and larger society. More attention is paid to the quality of life of the people living in a city and the spatial distribution of services. This leads to choices that improve lifestyles but may not be logical economically.

Distribution & Urban Hierarchy

Expanding Central Place Theory to a global scale of analysis, there is a hierarchy of importance internationally. Since the growth of globalization in the 1950s, a new class of city has developed: **The World City**. A world city is dominant on the global stage in every capacity. Economically, world cities are home to the headquarters of multinational organizations and corporations, financial institutions, insurance agencies, and stock markets. They have massive populations, giving the cities incredible purchasing power and influence in the global market. Their transportation hubs move large quantities of the world's population around the globe. Politically, world cities are active on the political stage, having great influence on national and international policies. World Cities shape popular culture around the globe. Their buildings are iconic; where even a silhouette is instantly recognizable. They produce artists, musicians, athletes, and actors who shape the desires, mindsets, opinions and actions of people on a global scale. These cities are known on a first name basis in almost every culture: New York, Paris, London, Tokyo, Moscow, Los Angeles, Singapore, Shanghai, and Chicago.



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APPLICATION #4

Using the map on the previous page and the table below, compare Ranked World Cities. What is the relationship with Wallerstein? How many are in the USA?

First Rank	Second Rank	Third Rank		
London New York Tokyo Paris Chicago Frankfurt, Ger Hong Kong Los Angeles Milan, Italy Singapore	San Fransisco Sydney Toronto Zurich (Sw) Brussels Madrid Mexico City Sao Paulo Moscow Seoul (S. Korea)	Amsterdam Boston Caracas (Ven) Dallas Geneva (Sw) Houston Jakarta (Indo) Johannesburg (S. Af) Melbourne (Australia) Atlanta Barcelona Hamburg (Ger)	Berlin (Ger) Buenos Aires (Arg) Budapest (Hung) Copenhagen (Den) Hamburg (Germ) Istanbul (Turkey) Kuala Lumpur (Malaysia) Manila (Philipines) Beijing Bangkok (Thailand)	Osaka (Japan) Taipei (Taiwan) Santiago (Chile) Washington DC Rome Stockholm (Swed) Warsaw (Poland) Miami Minneapolis Montreal (Canada) Munich (Ger) Shanghai

CONCLUSION

Humanity is constantly growing and changing. Every moment, hundreds of thousands of people are moving into urban settings, creating a unified human experience. Urban communities offer great hope for economic opportunities, services, innovations, and gender equality opportunities. Urban communities also put a great strain on the environment and, if not planned correctly, the economy of the region.

As the urbanization trend rapidly proceeds forward, only time will reveal whether we are truly better living together.



Ch 13 Standards

	Objective	Knowledge		
	The presence and growth of cities vary across geographical locations because of physical geography and resources.			
6.1 The Origin and Influences of Urbanization Ch 13a, 13b, 13e,	Explain the processes that initiate and drive urbanization and suburbanization	Site and situation influence the origin, function, and growth of cities.		
		Changes in transportation and communication, population growth, migration, economic development, and government policies influence urbanization.		
6.2 Cities Across the World Ch 13a, 13b, 13c, 13d, 13e,	Explain the processes that initiate and drive urbanization and suburbanization.	Megacities and metacities are distinct spatial outcomes of urbanization increasingly located in countries of the periphery and semiperiphery.		
		Processes of suburbanization, sprawl, and decentralization have created new land-use forms —including edge cities, exurbs, and boomburbs —and new challenges.		
6.3 Cities and Globalization Ch 13f,	Explain how cities embody processes of globalization.	World cities function at the top of the world's urban hierarchy and drive globalization.		
		Cities are connected globally by networks and linkages and mediate global processes.		
6.4 The Size and Distribution of Cities Ch 13d, 13f,	Identify the different urban concepts such as hierarchy, interdependence, relative size, and spacing that are useful for explaining the distribution, size, and interaction of cities.	Principles that are useful for explaining the distribution and size of cities include rank-size rule, the primate city, gravity, and Christaller's central place theory.		
6.5 The Internal Structure of Cities Ch 13c, 13e,	Explain the internal structure of cities using various models and theories.	Models and theories that are useful for explaining internal structures of cities include the Burgess concentric-zone model, the Hoyt sector model, the Harris and Ullman multiple- nuclei model, the galactic city model, bid-rent theory, and urban models drawn from Latin America, Southeast Asia, and Africa.		
	The attitudes and values of a population, as well as the balance of power within that population, are reflected in the built landscape.			
6.6 Trade & the World Economy Ch 13a, 13c, 13d,	Explain how low-, medium-, and high- density housing characteristics represent different patterns of residential land use.	Residential buildings and patterns of land use reflect and shape the city's culture, technological capabilities, cycles of development, and infilling.		
6.7 Infrastructure Ch 13a, 13b,	Explain how a city's infrastructure relates to local politics, society, and the environment.	The location and quality of a city's infrastructure directly affects its spatial patterns of economic and social development.		

	Objective	Knowledge	
6.8 Urban Sustainability Ch 13d, 13e,	Identify the different urban design initiatives and practices.	Sustainable design initiatives and zoning practices include mixed land use, walkability, transportation-oriented development, and smart-growth policies, including New Urbanism, greenbelts, and slow-growth cities.	
	Explain the effects of different urban design initiatives and practices.	Praise for urban design initiatives includes the reduction of sprawl, improved walkability and transportation, improved and diverse housing options, improved livability and promotion of sustainable options. Criticisms include increased housing costs, possible de facto segregation, and the potential loss of historical or place character.	
6.9 Urban Data Ch 13b,	Explain how qualitative and quantitative data are used to show the causes and effects of geographic	Quantitative data from census and survey data provide information about changes in population composition and size in urban areas.	
	change within urban areas.	Qualitative data from field studies and narratives provide information about individual attitudes toward urban change.	
	Urban areas face unique economic, political, cultural, and environmental challeng		
6.10 Challenges of Urban Changes Ch 13d, 13e,	Explain how sustainability principles relate to and impact industrialization and spatial development.	As urban populations move within a city, economic and social challenges result, including: issues related to housing and housing discrimination such as redlining, blockbusting, and affordability; access to services; rising crime; environmental injustice; and the growth of disamenity zones or zones of abandonment.	
		Squatter settlements and conflicts over land tenure within large cities have increased	
		Responses to economic and social challenges in urban areas can include inclusionary zoning and local food movements.	
6.10 Continued		Urban renewal and gentrification have both positive and negative consequences.	
		Functional and geographic fragmentation of governments—the way government agencies and institutions are dispersed between state, county, city, and neighborhood levels—presents challenges in addressing urban issues.	
6.11 Challenges of Urban Sustainability 13a, 13d, 13e,	Describe the effectiveness of different attempts to address urban sustainability challenges.	Challenges to urban sustainability include suburban sprawl, sanitation, climate change, air and water quality, the large ecological footprint of cities, and energy use.	
		Responses to urban sustainability challenges can include regional planning efforts, remediation and redevelopment of brownfields, establishment of urban growth boundaries, and farmland protection policies.	