



UNIWERSYTET WARSZAWSKI
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International Economic Geography – Location theory III

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Agglomeration economies

Marshall's three reasons why agglomeration economies are achieved:

1. Information spillovers.
2. Local non-traded inputs.
3. Local skilled-labor pool.

Advantages and disadvantages of agglomeration economies?

Disadvantages produce dispersion!

Different agglomeration forces

Three types of agglomeration:

1. Internal returns to scale: firm-specific.
2. Economies of localization: industry-specific.
3. Economies of urbanization: city-specific.

When 2 becomes 1, or 1 becomes 2? *Changes in the boundary of the firm.*

- Example: General Motors in Detroit.
- Fragmentation of a big firm.



Dispersion

- Do all activities agglomerate?
- If not, how do we decide
 - ✓ How many centers?
 - ✓ What functions in each center?
 - ✓ How far apart?
- The disadvantages of the Agglomeration
(The Benefits of Maximizing Separation)
 - ✓ More Competition
 - ✓ Market share is reduced in agglomeration
 - ✓ Congestion, pollution and crime in cities
 - ✓ Reduced degree of spatial monopoly power



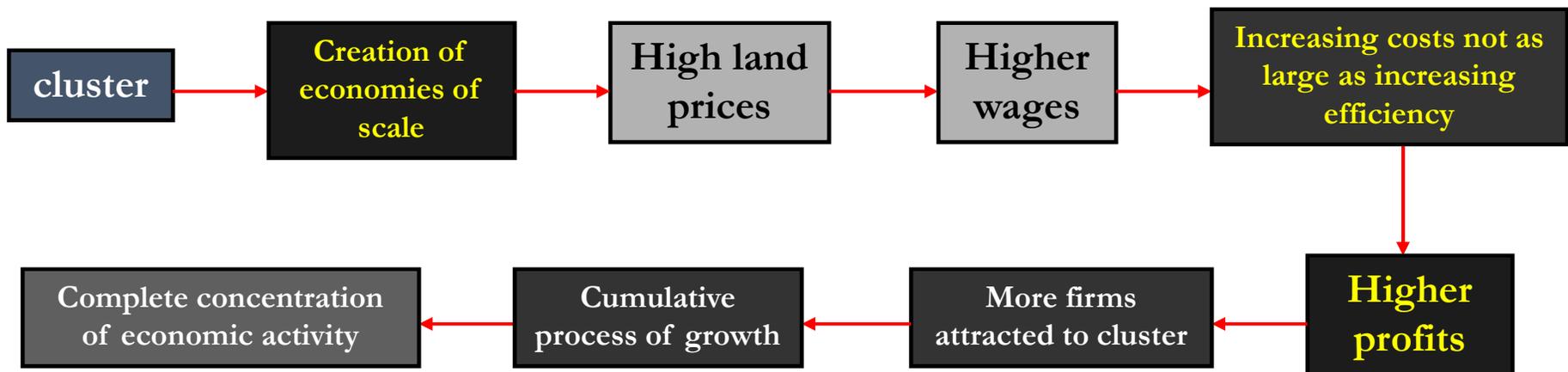
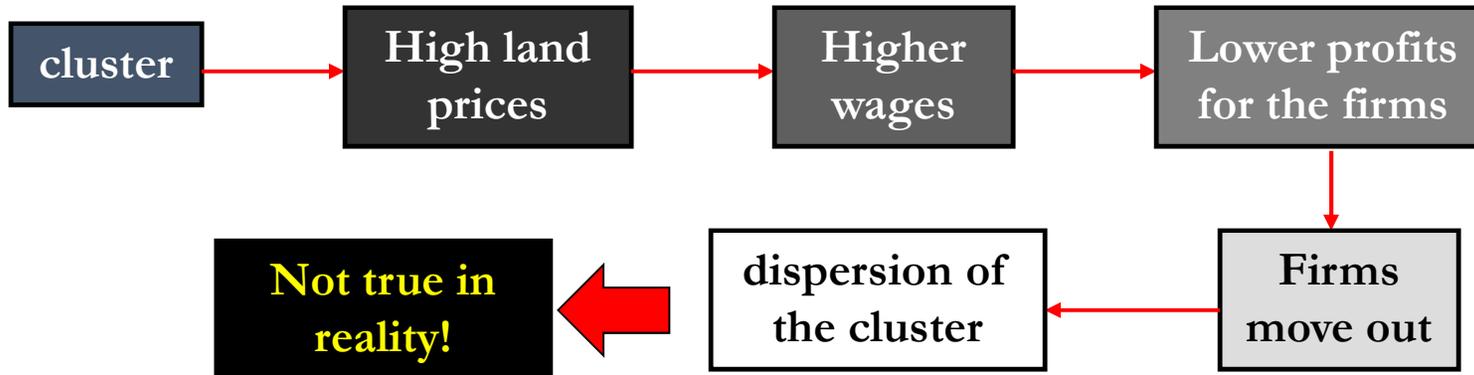
Industrial clustering vs. Industrial dispersion

When do we observe clustering and when dispersion?

- Clustering with homogenous product and non-price competition (e.g., shopping centres).
- Dispersion with similar products but difficult non-price competition (e.g., gas stations).
- Welfare comparisons between industrial clustering and dispersion.



Clustering - pull and push factors



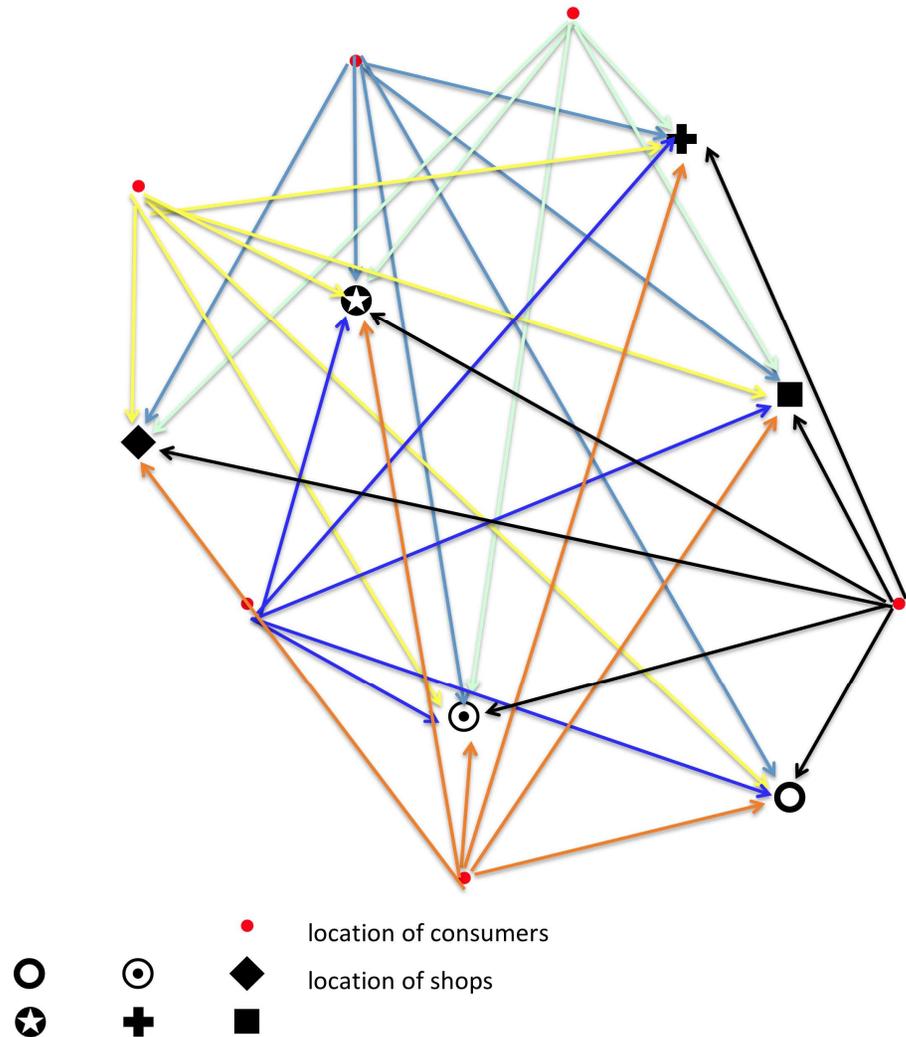


Urbanization

- Urbanization exploits the advantages of agglomeration/clustering
- Enhances specialization
 - ✓ of labor
 - ✓ of cities
- Very dependent on efficient movement over space – key role of transportation costs

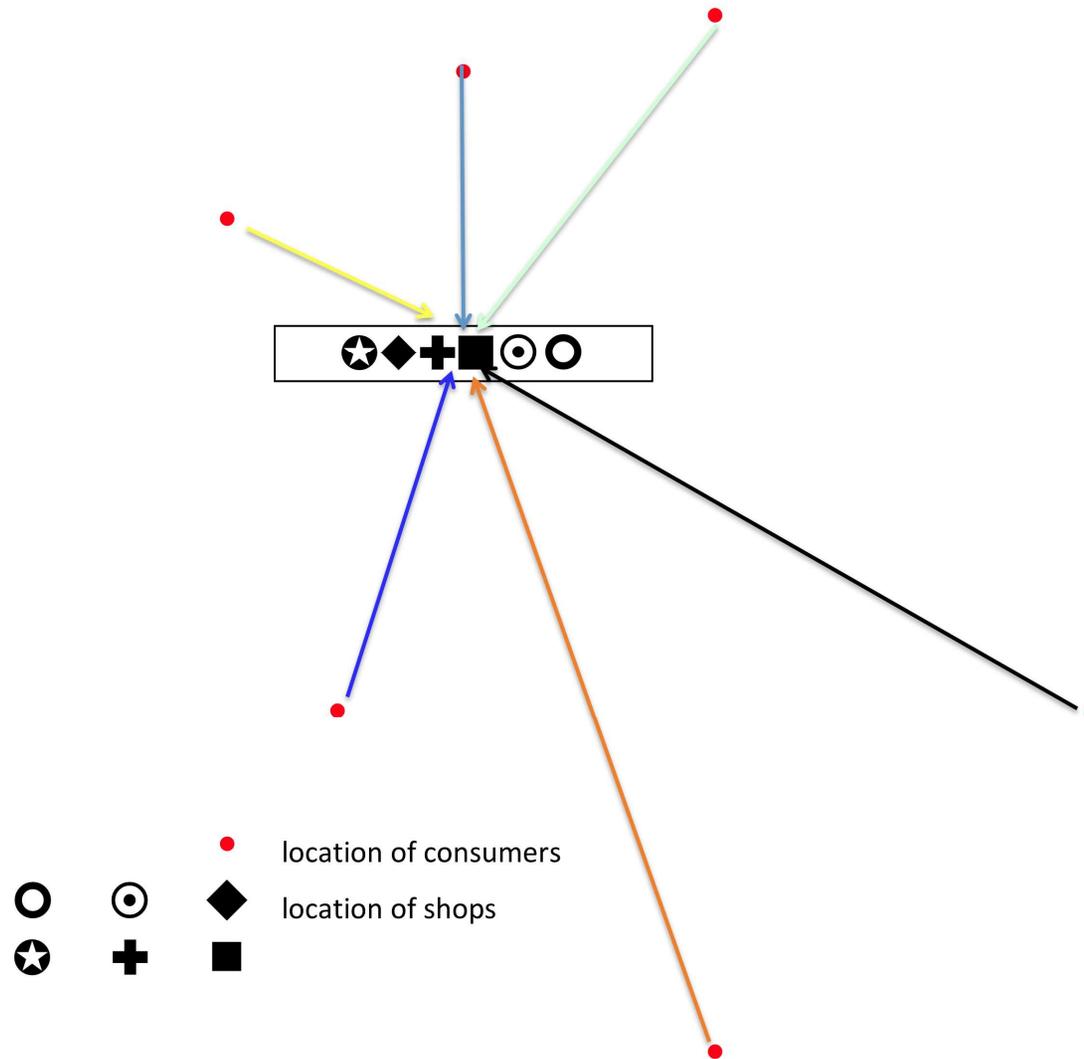


No agglomeration: each consumer must travel to different locations to purchase goods/services





With agglomeration: each consumer can travel to just one location to purchase goods/services





Central Place Theory

- Original ideas can be traced to Walter Christaller and August Lösch
- Interested in exploring the regularity of urban places in the landscape but noticed that
 - ✓ Places were of different sizes
 - ✓ Larger places were more distantly located from each other than smaller places
- Focus on the role of consumers



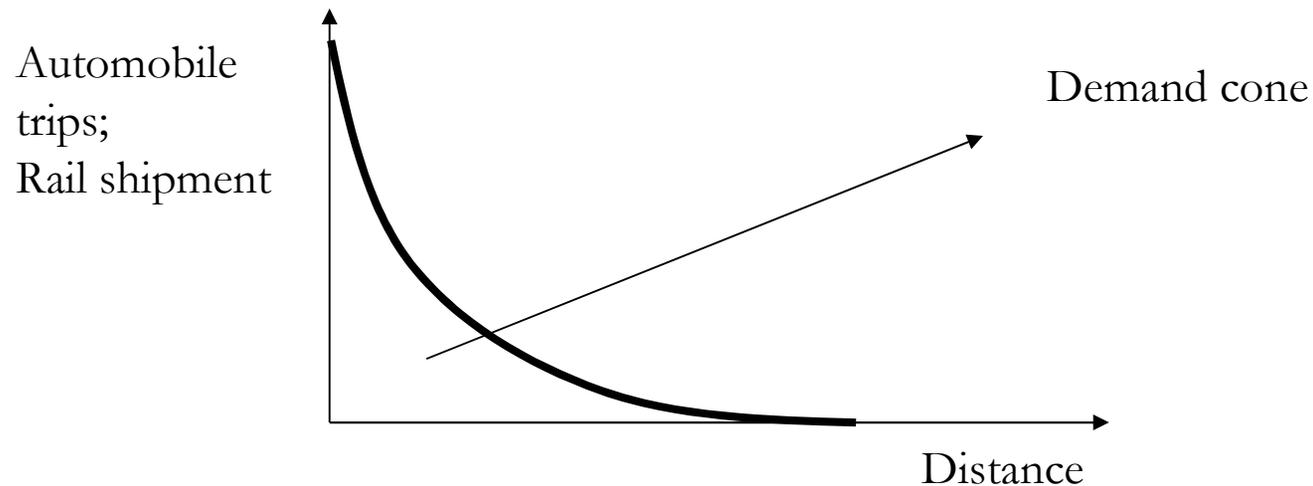
Basic principles

- All consumers need to access all goods and services
- Quantity purchased involves trade-off between
 - ✓ Price of good
 - ✓ Transportation cost involved in getting to the store
- Producers need to consider optimal size and pricing of goods
- Hence, beginnings of a general equilibrium problem, linking spatial supply and spatial demand
- Regions are homogenous in sense of the consumers' preferences, production possibilities, population density, transport surface etc.
- Also, each region is separated from others, so no interregional trade



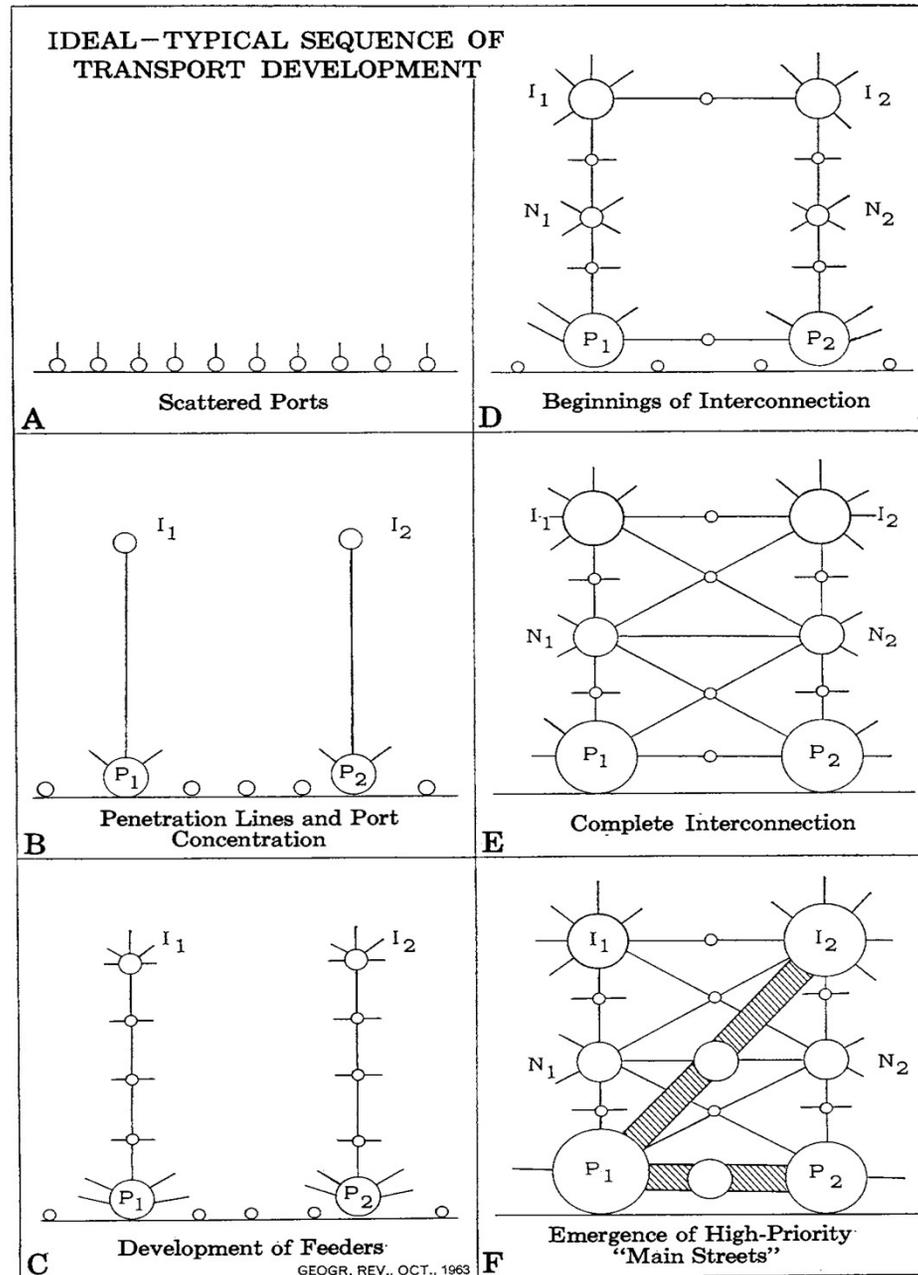
The Role of Transportation Costs

- Transport networks are constructed to facilitate *spatial interaction*, the movement of goods, people, and information.
- **Distance decay**: the reduction in the trade flow between places with increasing distance between them.





Theoretical solution

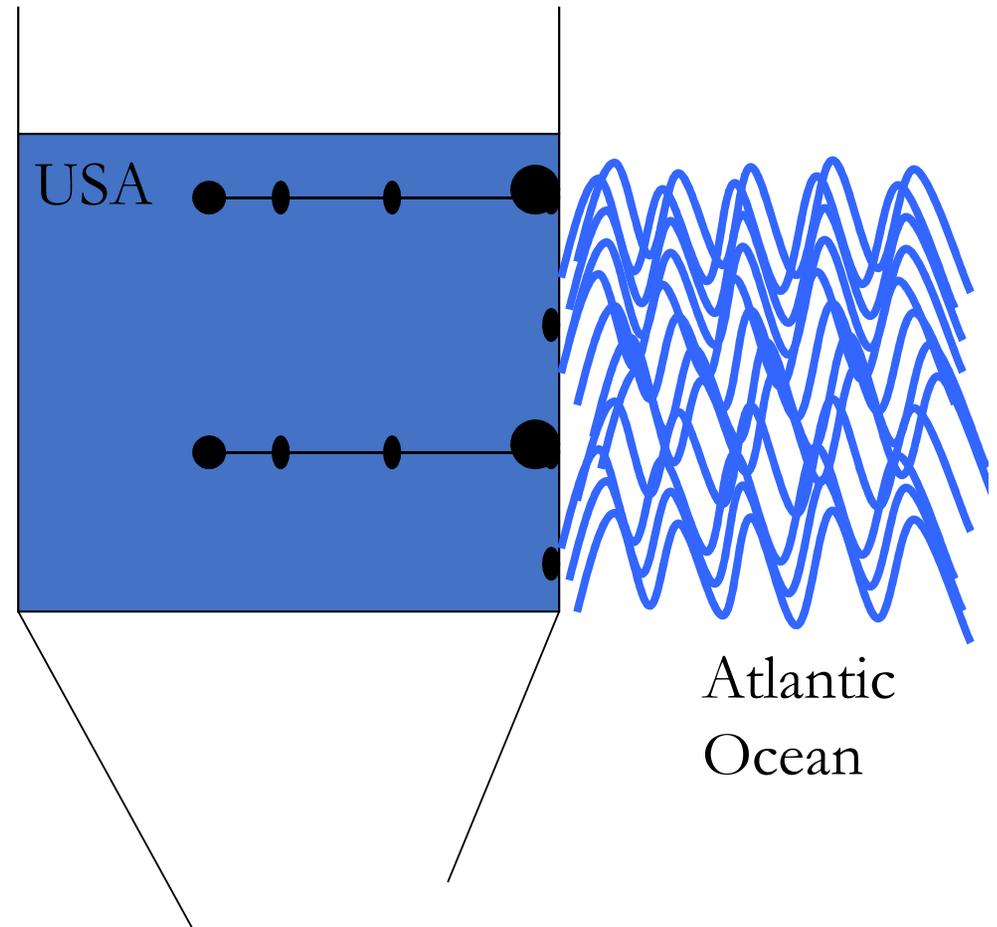




US experience

Colonization stages

- 1) Early colonial conquest creates a system of settlements and berthing points along the seacoast.
- 2) Construction of penetration routes that link the best-located ports to the inland mining, agricultural and population centers.
- 3) Export-based development stimulates growth in the interior: the growth of the feeder routes and links from the inland centers.

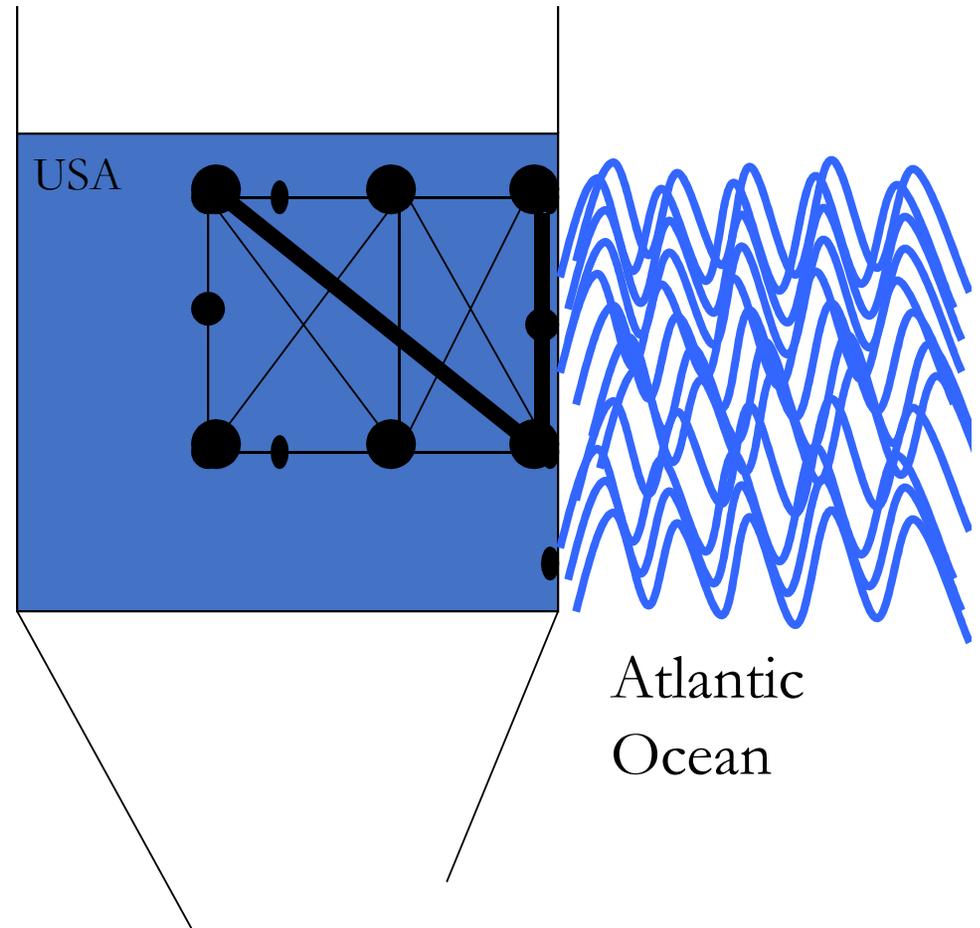




US experience (2)

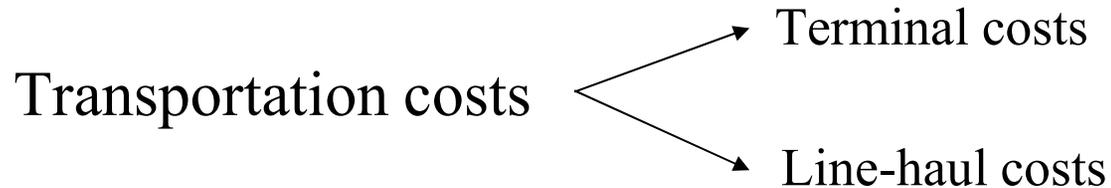
Colonization stages

- 4) Beginnings of interconnection
- 5) Transport network interconnects all the major centers.
- 6) Development of high-priority linkages reinforces the advantages of urban centers that have come to dominate the economy.





Transportation and Communications



Terminal costs: must be paid regardless of the distance involved.
(loading, unloading, and line maintenance).

Line-haul costs: are strictly a function of distance.
(fuel costs).

Terminal costs: fixed in the short run but altered by technological changes (reductions in handling costs in ports more than offset the cost of building specialized handling facilities).



Competitive differences in transport media account for variations in terminal and line-haul costs.

Trucks:

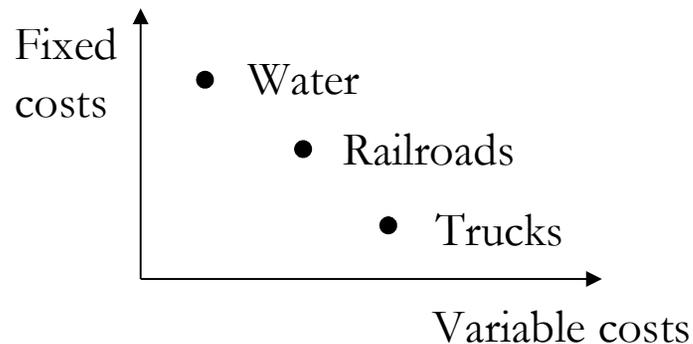
Low terminal costs (no highway maintenance, can load and unload anywhere);
High line-haul costs (low efficiency in moving freight).

Water:

The highest terminal costs;
The lowest line-haul costs.

Railroads

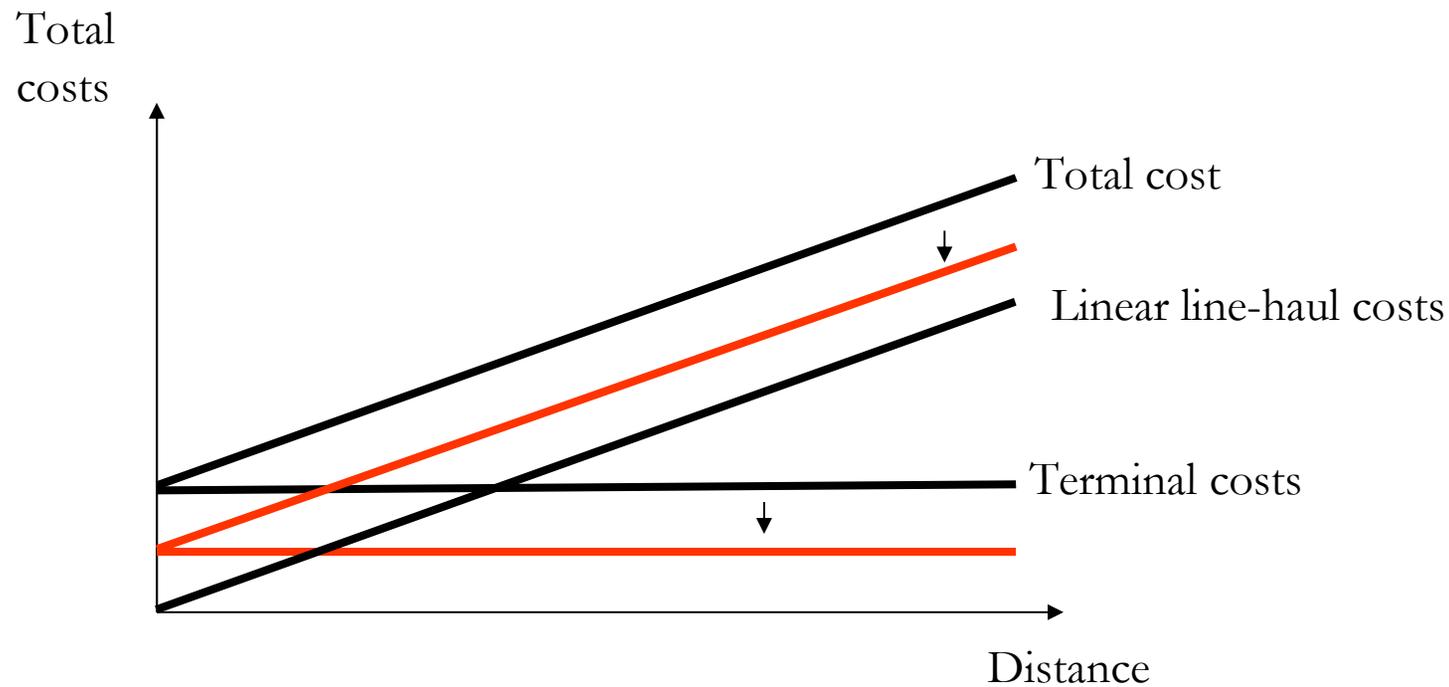
Terminal costs: higher than trucks and lower than water carries;
Line-haul costs: lower than trucks and higher than water carries.



What about air?



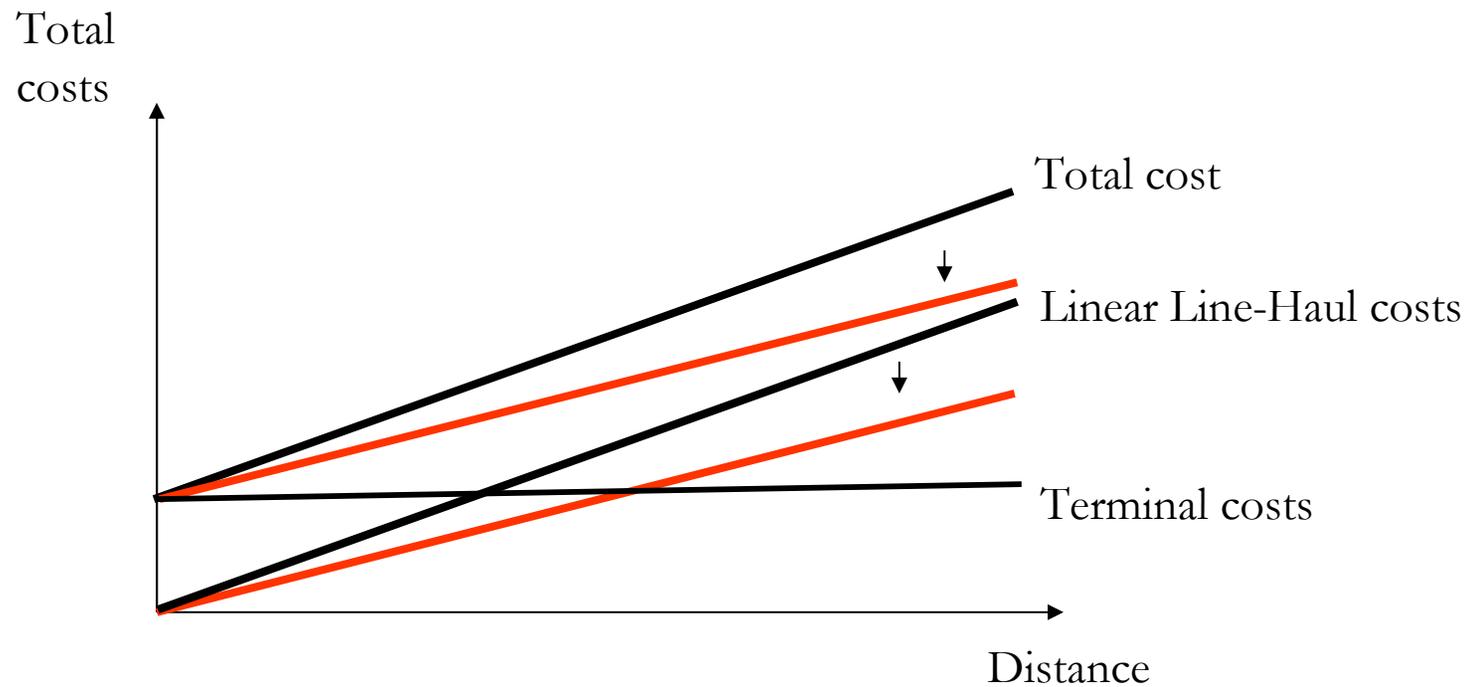
Transportation costs - terminals



Technological improvements lead to lower terminal costs



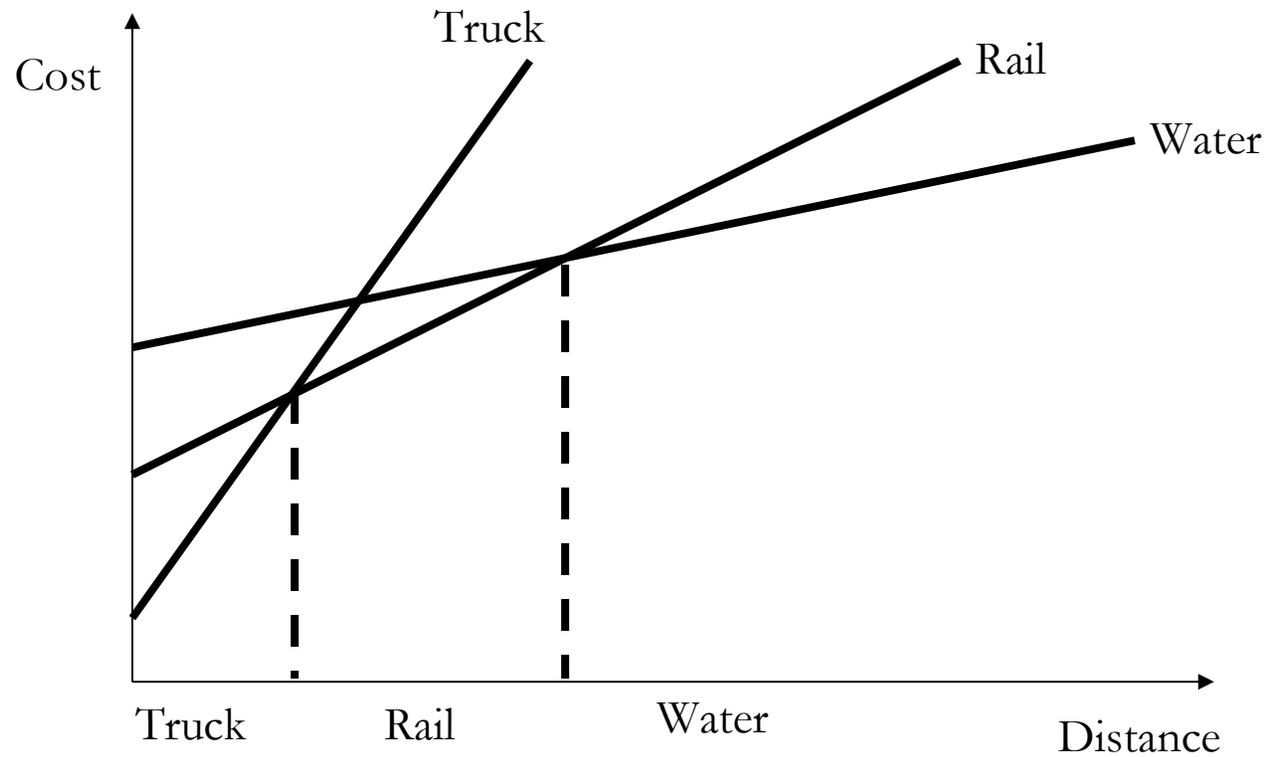
Transportation costs – line haul



Investment in transportation: lower line-haul costs



Transportation costs – different modes



What about air?



Fragmentation of production processes

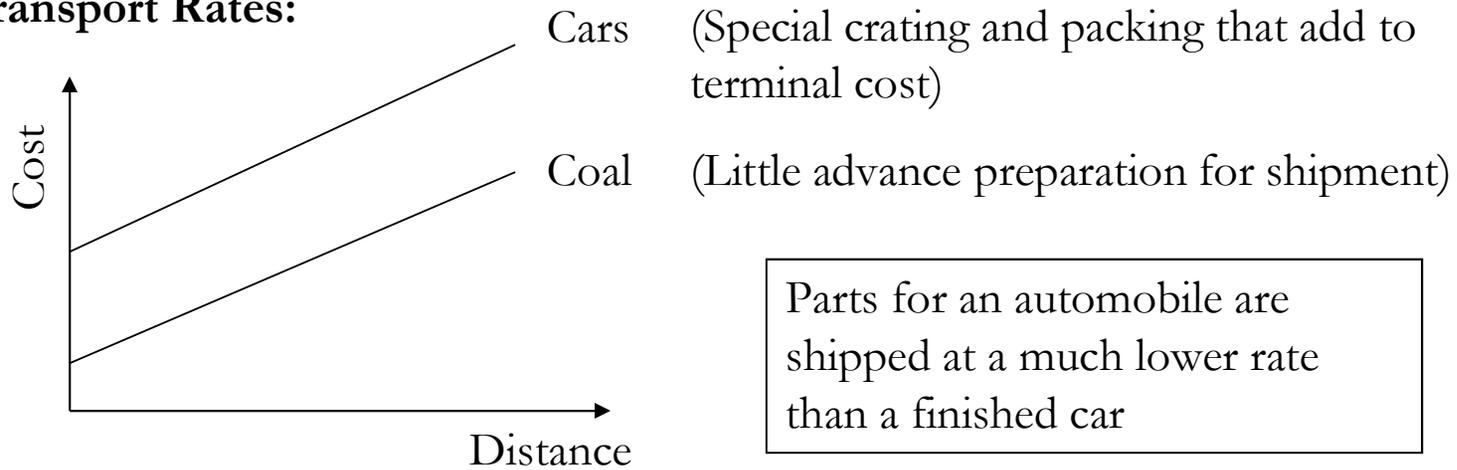
Jones (2000):

“Recent decades have witnessed more than just an increase in the volume of trade relative to incomes, since there has also been an increase in the fraction of such trade that takes the form of *intermediate goods*, raw material, capital goods, or middle products. Furthermore, production processes that have traditionally been vertically connected, so that all activity takes place in one location, are now frequently broken up or *fragmented* so that regions that are especially well suited to the production of parts of the process can now be utilized in producing these fragments.”

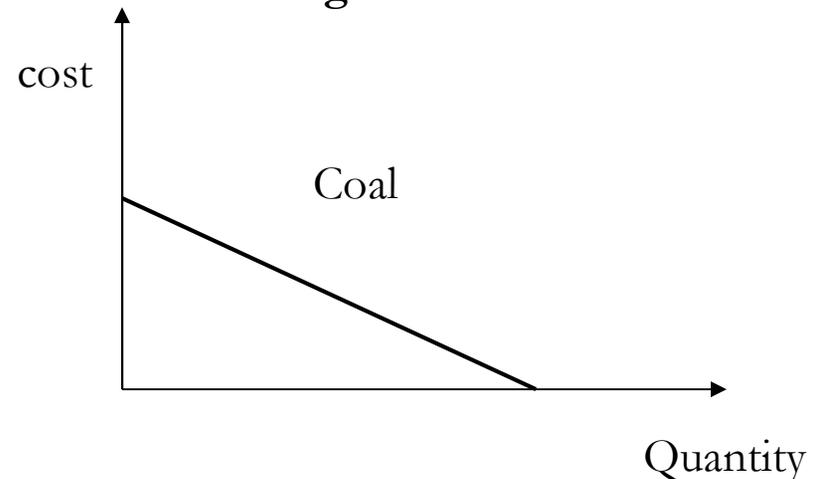
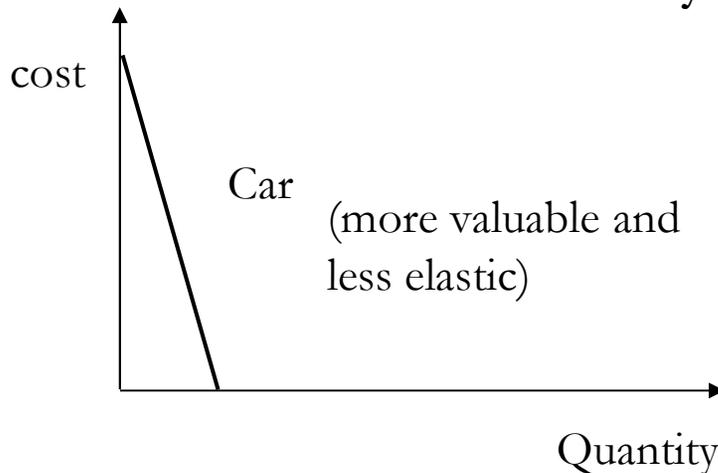


Transportation and Communications

Transport Rates:



Different elasticity of demand for different goods:





Central Place Theory again

- Central place theory portrays cities as market-oriented retail and service centers, ignoring the dynamics of production.
- Static model that does not incorporate changes over time.
- Dynamic version of the model developed by Isard.
- Definitions:

Market areas: area served by a central place (city).

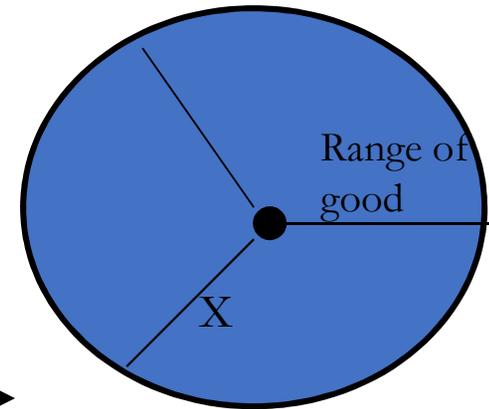
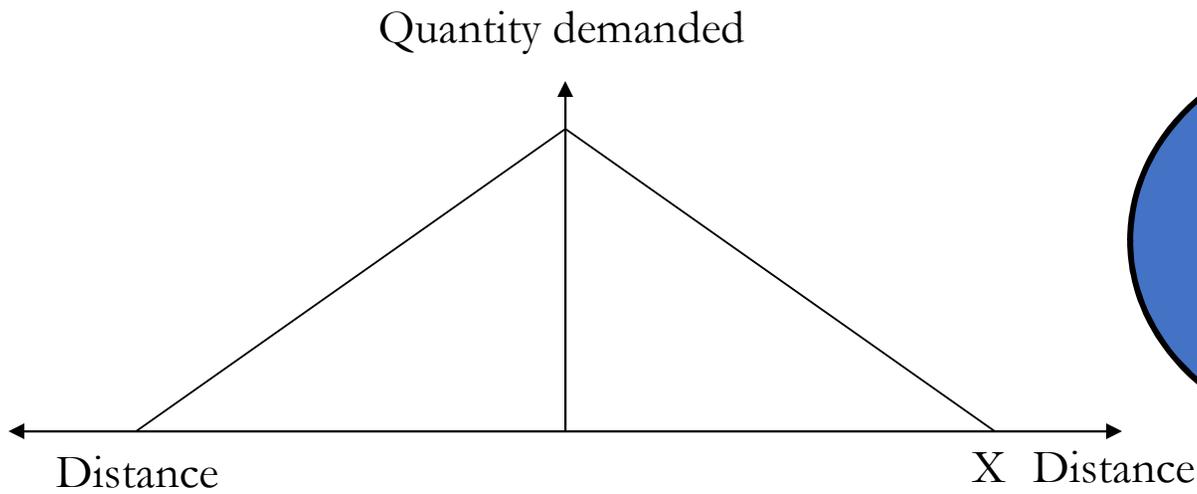
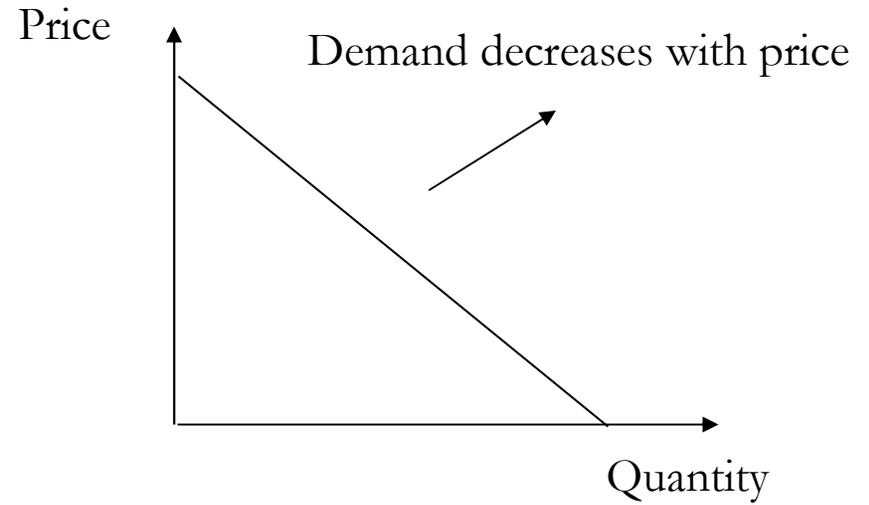
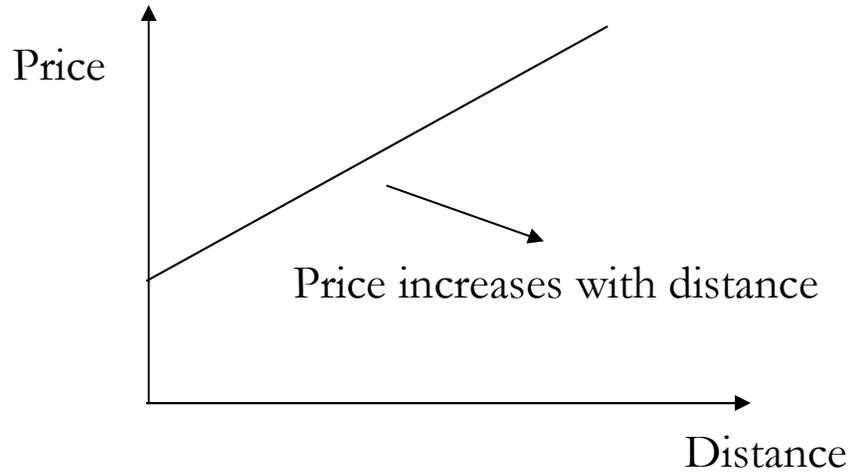
Threshold of a good: the minimum level of effective demand that will allow a firm to stay in business.

Range of a good: maximum distance that people are willing to travel to obtain the good at a given market price.

Low-order goods: products with low threshold.



Spatial Demand



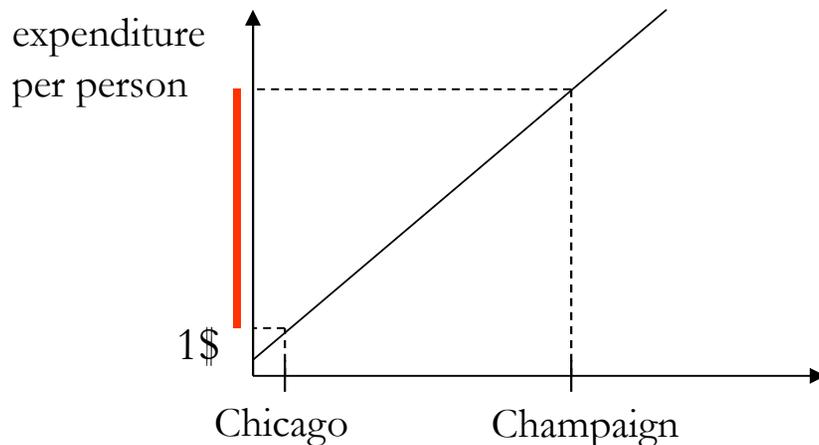


Spatial Demand

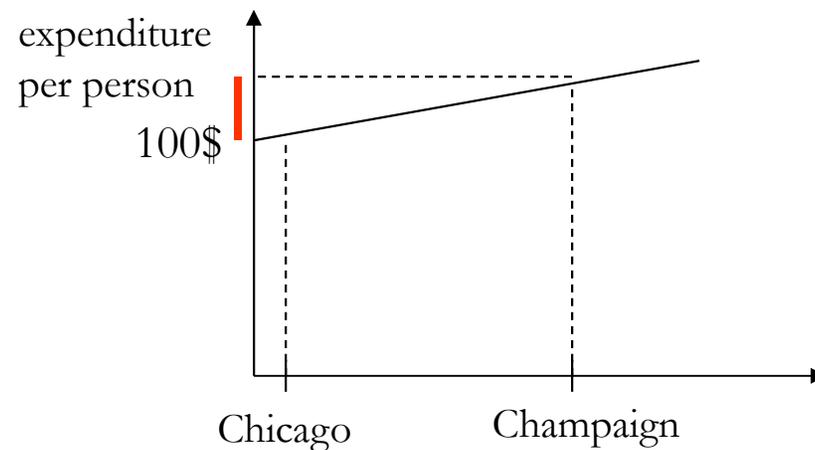
Goods that are costly and purchased infrequently have higher thresholds.

Threshold of a good: milk and opera

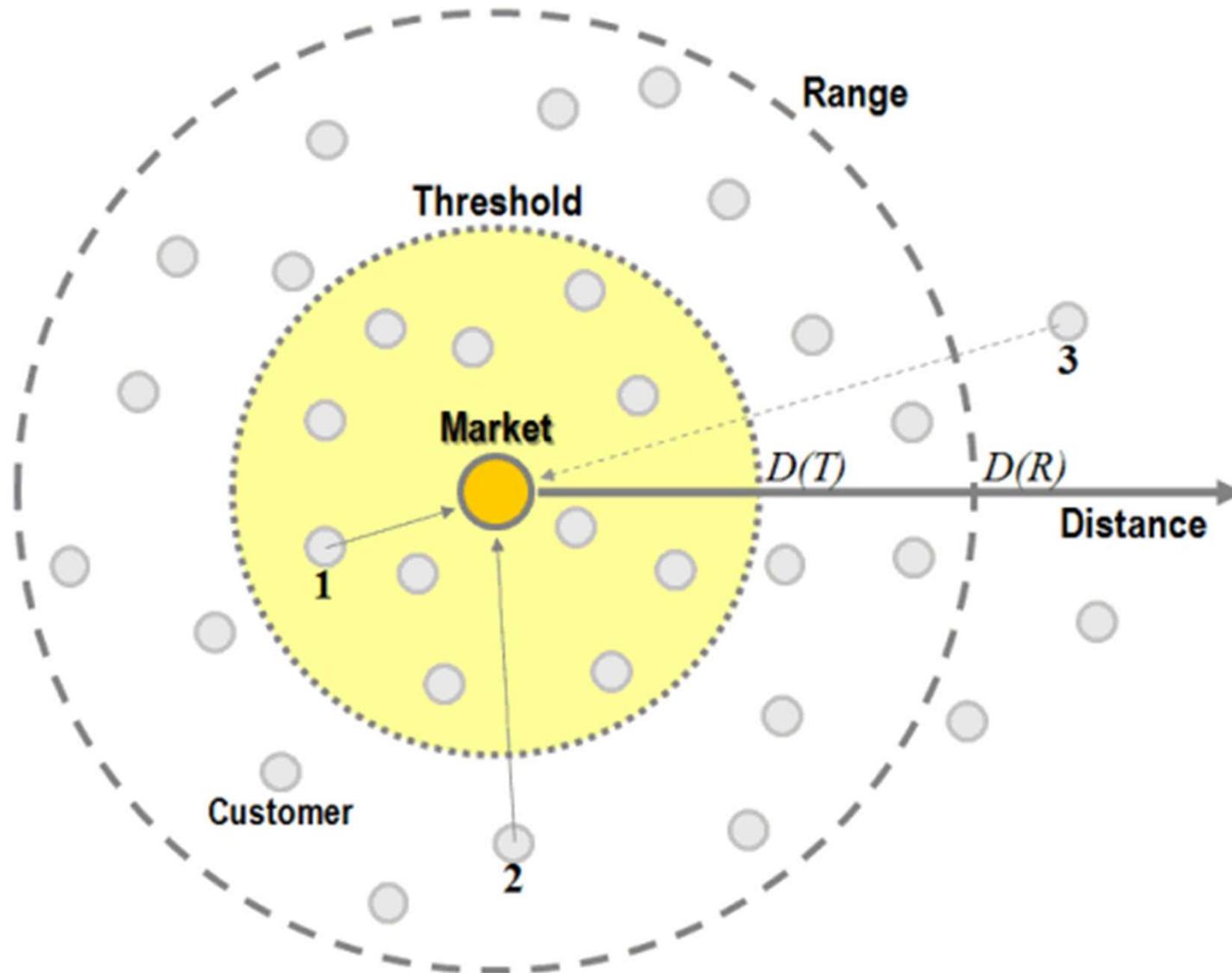
Milk



Opera



The difference in expenditure (cost) per person increases with distance. So it is small for opera but huge for milk (produced in Chicago and sold in Champaign).





Threshold of a good: milk and opera

Supply side

Existence of *indivisibilities* in the provision of certain goods or facilities.
We can neither construct 1/3 of a theater in a small village nor buy only 2 minutes of opera.

Duranton and Puga (2003)

“To justify the existence of cities, perhaps the simplest argument is to invoke the existence of indivisibilities in the provision of certain goods or facilities. Consider a simple example: an ice hockey rink. This is an expensive facility with substantial fixed cost (...)

While having a community of 1,000 people share a rink is feasible, building a rink for each of those people at $1/1,000^{\text{th}}$ of the usual scale is not”.



The Spatial Impossibility Theorem

- The Spatial Impossibility Theorem states that an economy with a finite number of locations and a finite number of consumers and firms, in which space is homogenous and transport is costly, no competitive equilibrium exists in which actual transport takes place.
- This is intuitively easy to understand as in such an economy transport cost can always be avoided because production and consumption can take place at an arbitrarily small level, without additional costs (backyard capitalism).
- In such a hypothetical world of perfect divisibility, it would be impossible to explain why clustering or agglomeration of activities occurs (as we observe in reality).



The Spatial Impossibility Theorem (2)

- Only if there are indivisibilities, or extra costs involved if production is split, the location of economic activities becomes important (Starrett, 1978): “...as long as there are some indivisibilities in the system (so that individual operations must take up space) then a sufficiently complicated set of interrelated activities will generate transport costs.”
- This principle is known as Starrett’s *Spatial Impossibility Theorem*, by Fujita and Thisse (2002).
- Koopmans (1957) already pointed out that we can only begin to understand the importance of location or geography for economics if we recognize the fact that economic activities are not infinitely divisible. He commented: "Without recognizing indivisibilities - in human person, in residences, plants, equipment, and in transportation - ... location patterns, down to those of the smallest village, cannot be understood.”

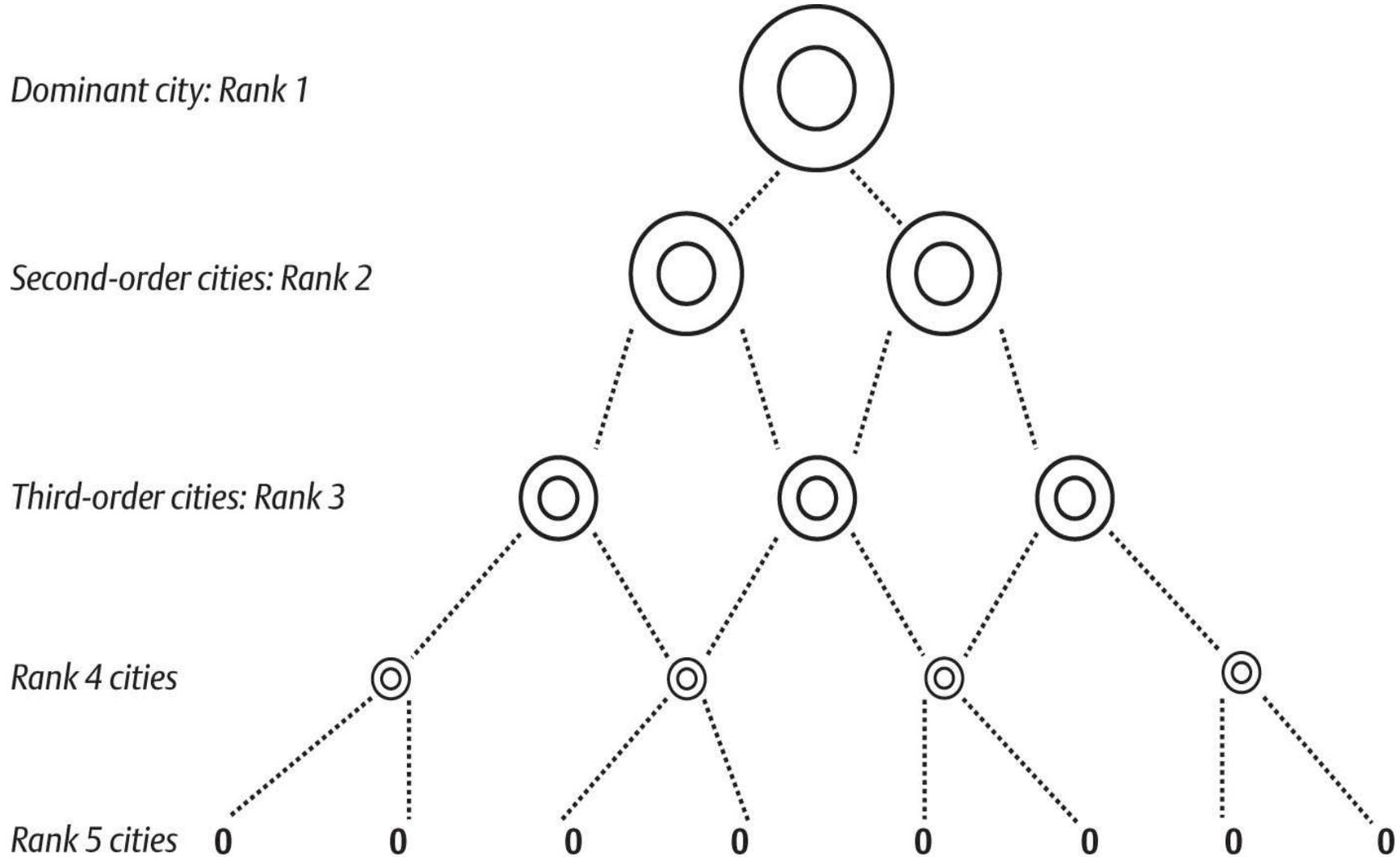


From the Demand Side: Hierarchy of Central Places

1 = high order	Metro	City	Town	Village	Example
1	X				Opera house
2	X	X			Museum
3	X	X	X		Bank
4	X	X	X	X	Gas station



Spatial and Hierarchical Organization

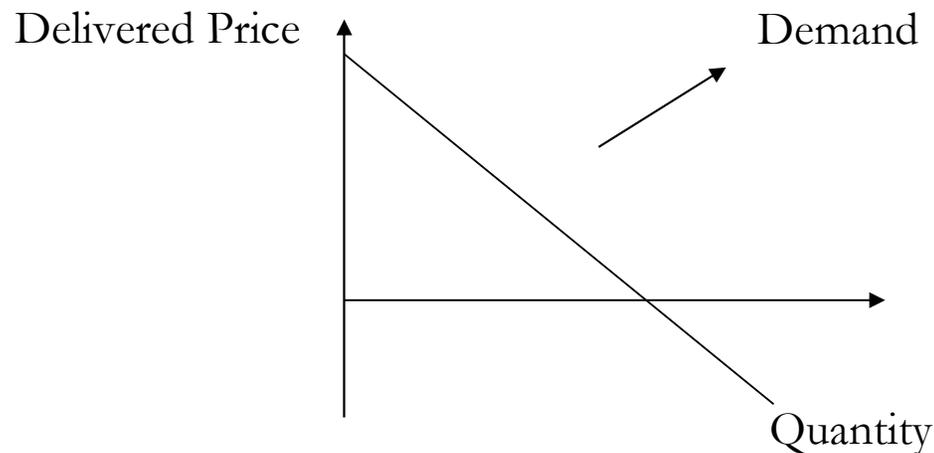


Source: McCann (2013)



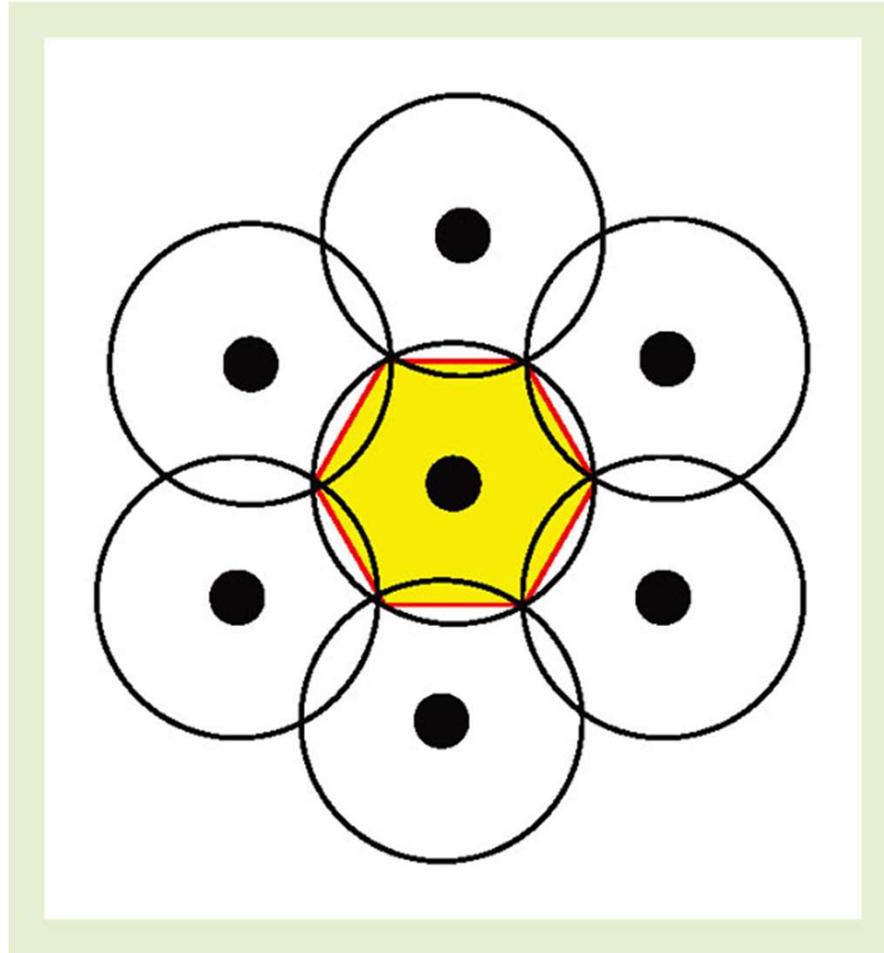
Spatial Organization

- If we assume that all consumers are to be served, circular market areas will leave spaces. Why? Because consumers are only willing to spend a fixed amount on any good/service
- At some point (range of a good) demand will be zero because consumer budget is exhausted





Hexagons



Circular market squeezed into hexagons – now no unserved areas

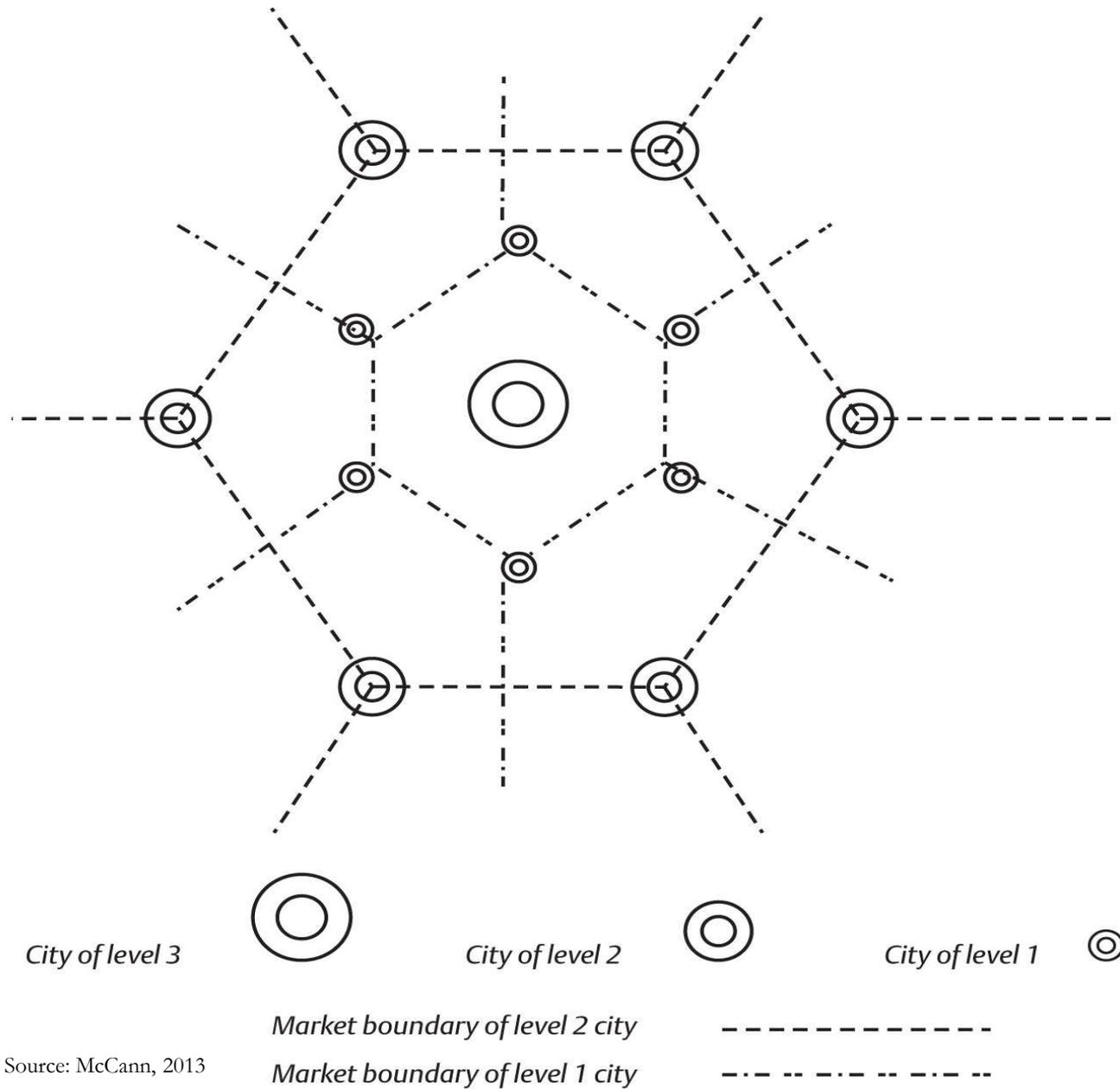


Spatial Hierarchy: Multiple Goods

- Each good will have its own threshold, range
- Assignment to different sizes of communities
- Endogenous growth process – communities grow because they offer greater range of goods and services
- End up with an hierarchy of urban areas



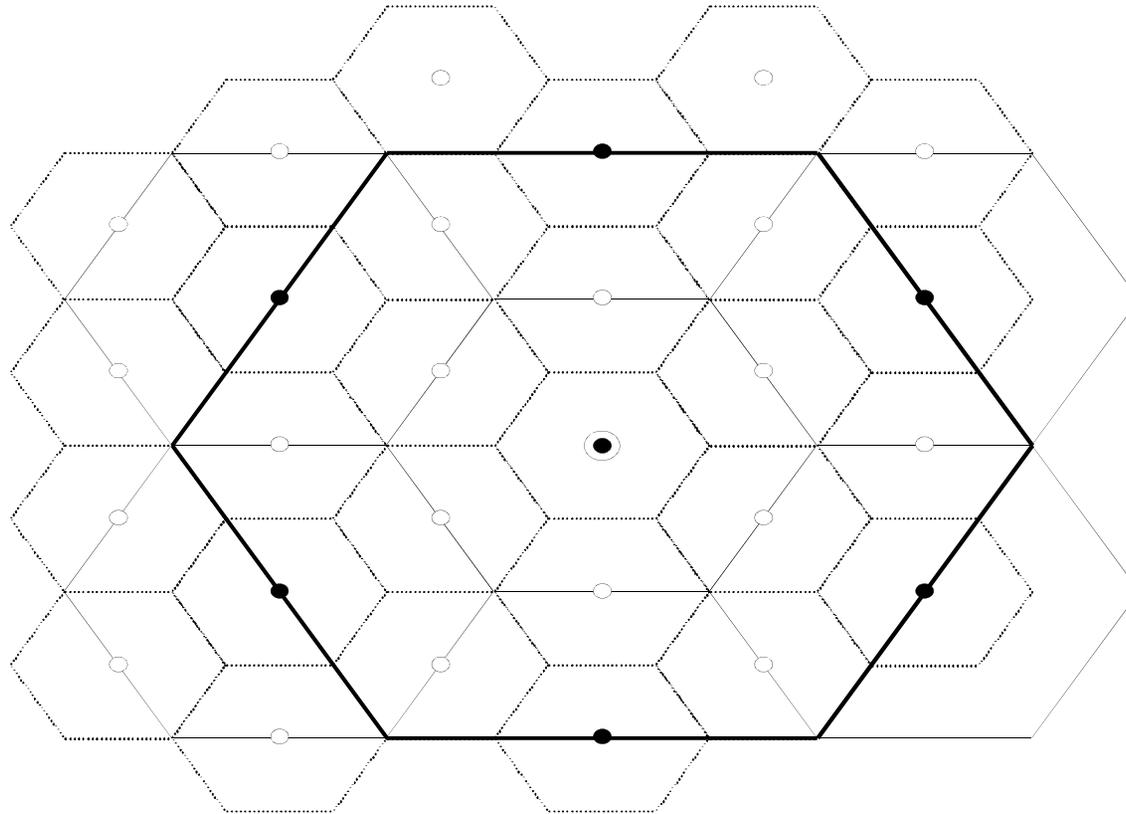
Christaller Urban Hierarchy



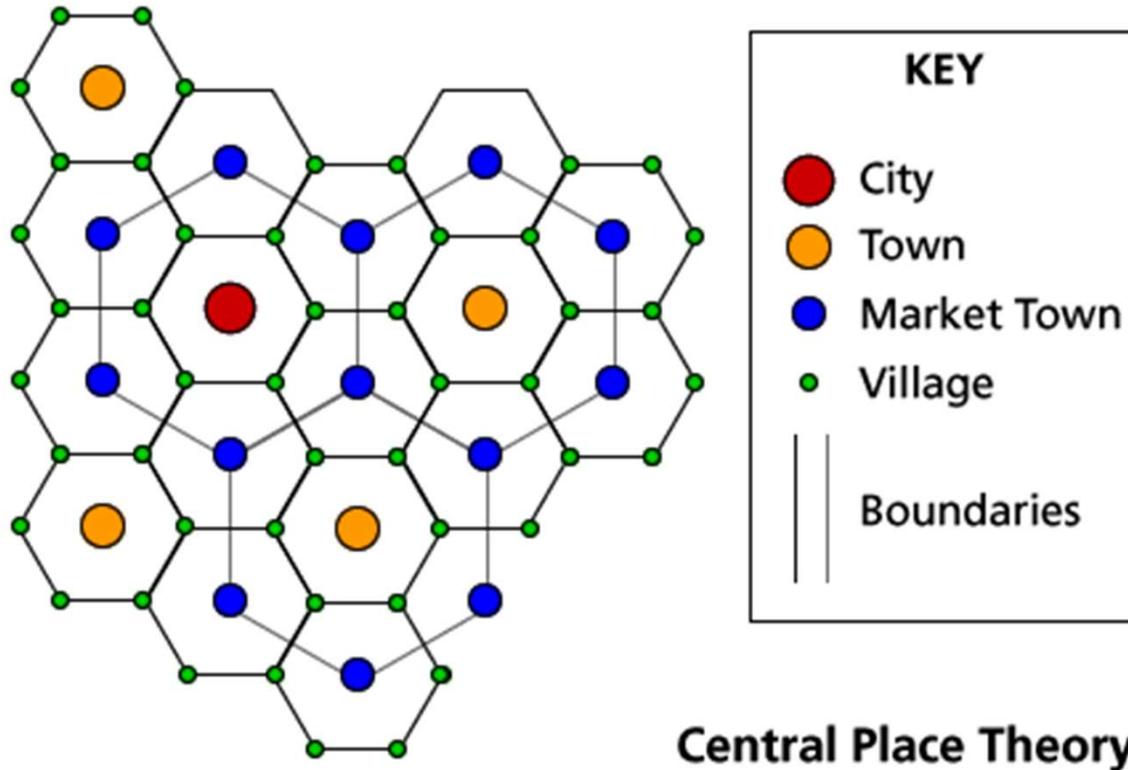
Source: McCann, 2013



Hexagon map



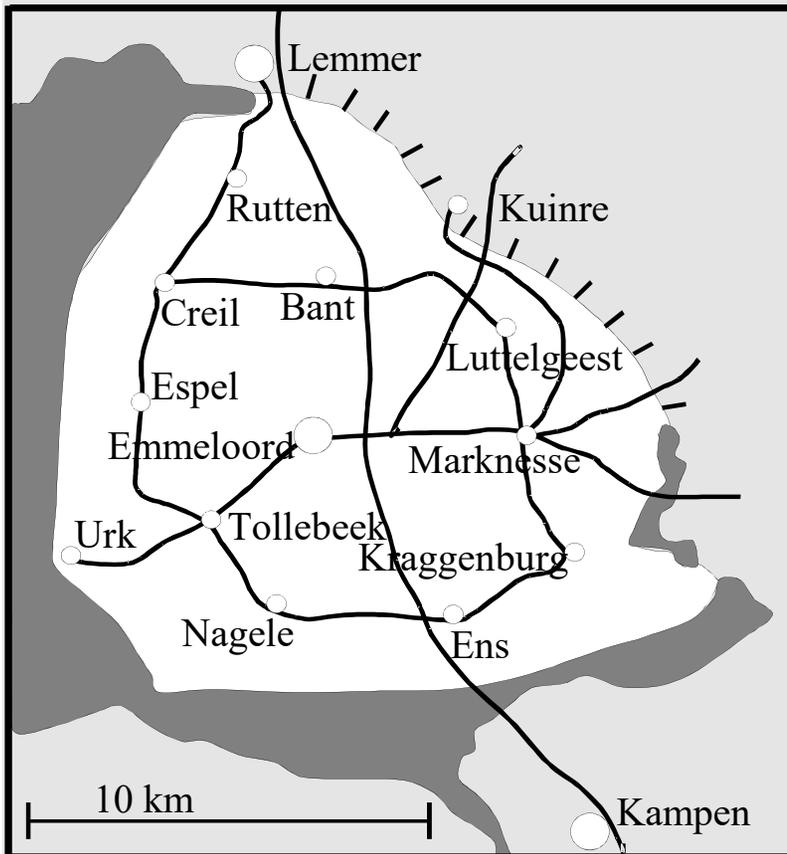
○ Village ● Small city ⊙ Large city



Low-order goods: everywhere;
High-order goods: metropolitan areas.



Central Place Theory in the Netherlands



Location	Start	Planned population	Population in 1985
Emmeloord	1946	10,000	18,976
Marknesse	1946	2,000	2,194
Ens	1948	2,000	1,618
Kraggenburg	1948	2,000	655
Luttelgeest	1950	2,000	666
Bant	1951	2,000	651
Rutten	1952	2,000	620
Creil	1953	2,000	687
Nagele	1954	2,000	1,014
Espel	1956	2,000	714
Tollebeek	1956	2,000	579



Cities and Urban Economies

Specialization: Tendency for cities and regions to specialize in the production of some outputs and not others.

Most specialized US cities in 1992
(Duranton and Puga, 2002)

1	Richmond VA, (tobacco)	64.4
2	Macon, GA (tobacco)	55.0
3	Lewiston, ME (leather)	49.6
317	Chicago, IL (metal products)	1.5

Most diversified US cities in 1992
(Duranton and Puga, 2002)

1	Cincinnati, OH	166.6
2	Oakland, CA	161.2
3	Atlanta, GA	159.4
4	Philadelphia, PA	151.4

Larger cities tend to be more diversified.
Individual city growth is related to specialization and diversity.
(Duranton and Puga, 2002)



Supply Side Considerations

Following Ottaviano and Thisse (2004):

1. The economic space is the outcome of a trade-off between various forms of increasing returns and different types of mobility costs;
2. Price competition, high transport costs and land use foster the dispersion of production and consumption (e.g., urban sprawl);
3. Firms are likely to cluster within large metropolitan areas when they sell differentiated products and transport costs are low;
4. Cities provide a wide array of final goods and specialized labor markets that make them attractive to consumer/workers; and...
5. Agglomerations are the outcome of cumulative processes involving both the supply and demand sides.



Theory of urban land market

Alonso (1960) extended the land use model by von Thünen in order to explain the allocation of economic activity around the Central Business District (CBD):

1. He makes a distinction between farmers, firms and households;
2. He shows that each of them will have different bid rent curve;
3. Different slope of bid rent curves determines the allocation of different entities around the CBD;
4. The slope may be different within particular land use groupings (e.g., households may have different curves for poor and rich).
5. The determination of densities and locations is due to competitive bidding process that takes into account the combination of land price and its location for particular land use.



Link to New Economic Geography

- Central Place theory champions notion of an hierarchy and an uneven distribution of activities over space
- However, it says little about the role of agglomeration economies or externalities (see table below)
- The New Economic Geography/Geographical Economics attempts to fill the gap

Two types of externalities:

Marshallian (MAR) externalities	Localization economics	Sector-specific spillovers
Jacobs externalities	Urbanization economics	City-specific spillovers