

Where Do Cities Develop? How
Many Cities?

Profit Maximizing Firm

- Market oriented firm
- For each location, chooses cost minimizing combination of K & L to produce Q
- Calculates profit in each location for life of facility
- Choose location that

Factors Affecting Location Choice of Businesses

- Transportation Costs
 - Transfer oriented firm
 - Resource oriented firm
 - Market oriented firm
- Production Costs
 - Energy, labor, local public goods, taxes
 - Localization and Urbanization economies
- Inertia

Transfer Oriented Firm

- Model
 - Single output
 - Single transferable input
 - Fixed factor proportion
 - Fixed prices
- Production Costs are equal across locations
- Firm chooses location to minimize transportation costs:
 $w_i t_i x + w_0 t_0 (x_m - x)]Q$ where w_i is the weight of the input, t_i is the transport rate for input, x is distance from input source, x_m is location of market, w_0 is the weight of the output, t_0 is the transport rate for output.

Findings

- In single output/single input model, firm will tend to locate at one of the endpoints. This tendency is reinforced if there are terminal costs of line haul economies.
- In single input/output model, if monetary weight of input exceeds monetary weight of output, firm will locate at the source of input (resource oriented firm).
- In single input/output model, if monetary weight of output exceeds monetary weight of input, firm will locate at the market (market oriented firm).
- With multiple markets and ubiquitous inputs, firm locates at median location.

Principle of Median Location

- Single product but dispersed consumers
- Consumers uniformly distributed along line
- Ubiquitous inputs
- Cost of delivery included in price of product
- Choose location that minimizes delivery costs - midpoint
- More generally, median location is where $1/2$ sales on one side and $1/2$ on other

Production Costs

- Local input costs
- Labor costs
- Taxes, regulations and public services
- Localization and urbanization economies
- Government Incentives --tax abatement; industrial bonds; loan guarantees; site development

Market Structure and Location Decisions

- Monopoly, median location principle, market area
- Monopolistic competition
 - Trade-Off between production costs and travel costs because of economies of scale in production
 - Also, firm's location decision affected by presence of rival firms. Textbook doesn't discuss this.

Algebraic Model of Market Area

- Number of CD's purchased each month per person = d
- Population density - e
- Land area of region - A
- Output of typical store - q
- Per capita demand is independent of price
- $Q = d * e * A$ (Total demand in region)
- $N = Q / q$ (Total number of stores)
- $M = A / N$ (Market Area of store)

$$M = \frac{q}{d \times e}$$

Determinants of Market Area

- **Demand Density** -- A larger density implies a smaller market area. Demand density is a product of per capita demand and population density. Income also affects demand density.
- **Economies of Scale** -- With fixed demand, significant economies of scale imply a larger market area. When law of demand holds, this tendency is offset by increase in demand density.
- **Transportation Costs** - With fixed demand, a decrease in transportation costs tends to increase market area. When law of demand holds, this tendency is offset by increase in demand density.

Simple Central Place Model

- Initial Uniform population density
- No shopping externalities
- Ubiquitous inputs
- Uniform demand
- Three goods. The three goods have different per capita demands and scale economies

Implications of Central Place Theory

- Hierarchical system of cities
- Differences in scale economies give rise to diversity in the size of cities
- Regions will have a small number of large cities and a larger number of smaller cities
- Consumers travel to bigger cities to shop; not vice versa.

Changes in Assumptions

- No disruption of urban hierarchy
 - Scale economies
 - Shopping externalities: may reduce number of cities
 - Variation in demand
- Possible disruption of urban hierarchy
 - Resource oriented firms

Questions for Discussion

- What would explain the emergence of mega-cities (a single large city , no smaller cities)?
- How would central place theory explain the emergence of edge cities (growth in number and size of small cities surrounding a large city)?