Unit 6: Day 3 – Weber's Locational Theory

Journal 55:
Describe Rostow's or Wallerstein's Development Theories using a graphic organizer.

Homework:
-Map Quiz #9 – Friday – 4/21
-Unit 6 HW and Test – Thursday – 4/27

Weber's Least Cost Theory

Essential Questions:

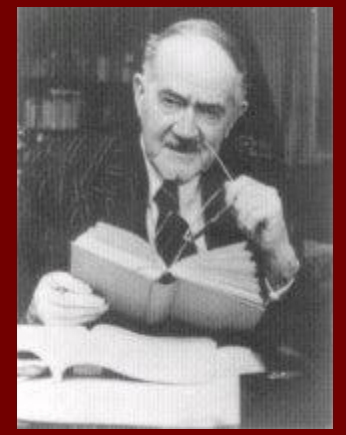
What is Weber's Least Cost Theory?

What are the assumptions of Weber's Theory?

What are the Four Factors based upon Weber's Theory?

How do weight-gaining and weight-losing scenarios compare?

Alfred Weber (1868-1958)



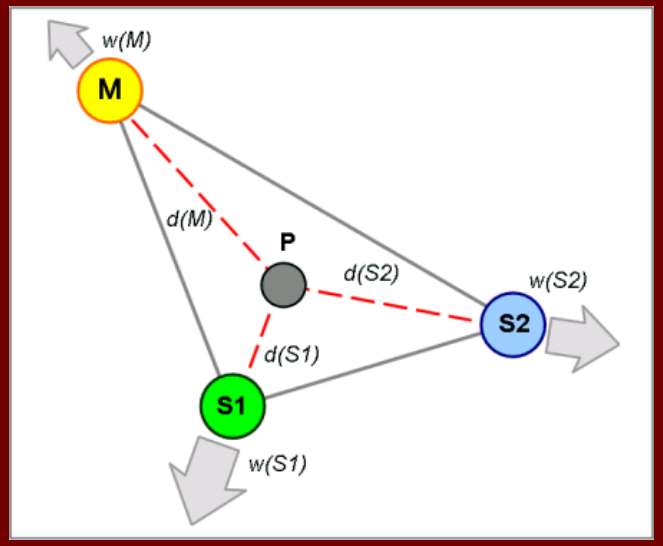
- Alfred Weber was a German sociologist and philosopher.
  - Was a part of the *Intellectual Resistance* against Nazi Germany.
- He formulated the Theory of Industrial Location (Also known as the Least-Cost Theory).
- Where will factories locate that is the lowest cost to them?
  - Like **von Thunen** (location of agricultural activities)

Least-Cost Theory

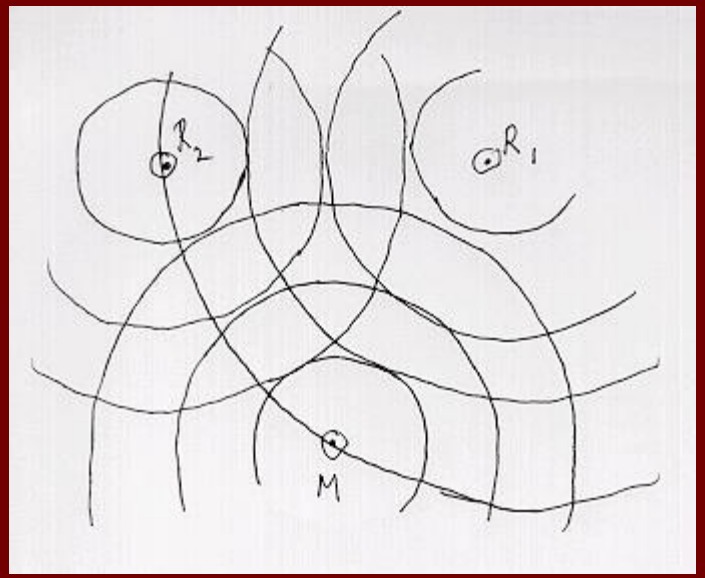
- The Least Cost theory was developed to resolve the problem of opposing locational pulls.
- Which is also used to determine whether a product is **weight-gaining** or **weight-losing**.
- Therefore, it aids in determining where a processing plant will be located to maximize profits and minimize costs.
  - The theory that an industry will be located were the transportation costs of raw materials and the final product is at the least.
  - A Decision making model of the best location of a particular industry given the material, amount shipped and transport costs.
- Determines industrial **location** of the manufacturing plant.

Least-Cost Theory

- Weber devised a technique involving **isotim** and **isodopanes.**
- This helps to identify the points of **least cost**.
- The **isotim** lines connect the points of equal transport cost.
- Where R or S stand for **Raw Materials**
- M stands for **Market**

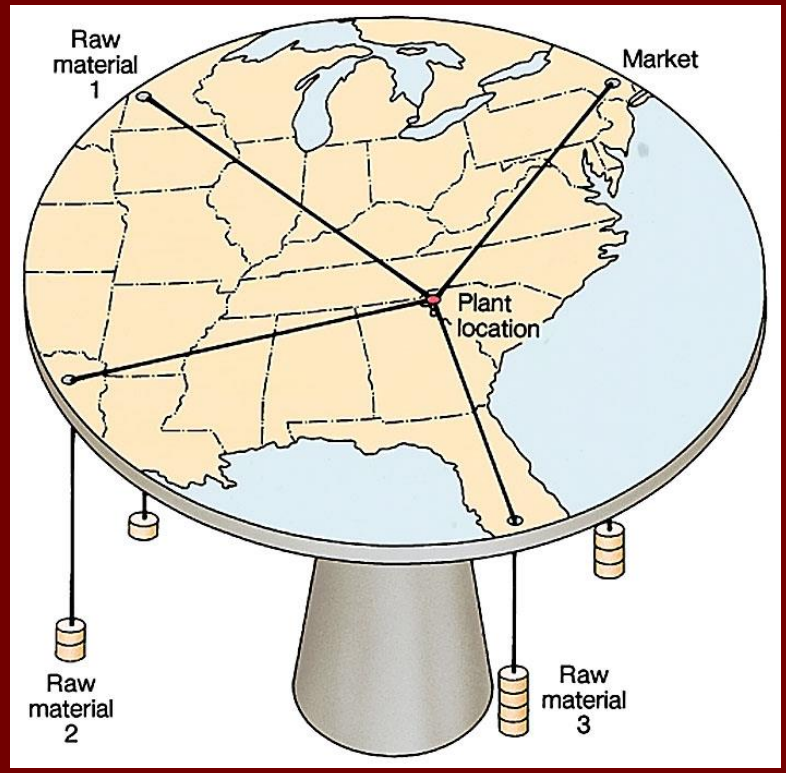


http://people.hofstra.edu/geotrans/eng/ch7en/conc7en/weberlocationtriangle.html



Least-Cost Theory

- Least-Cost location is also based on Alfred Weber's 5 formal assumptions.
- These are <u>not</u> the case for all situations.
- Site chosen must consider the following:
  1. Moving raw materials to factory
  2. Moving finish products to the market
  3. Creates a balancing act of the best location possible.



Assumptions of Weber's Model

- Uniform/Isotropic Plain: Operates in one country with an uniform plane and equal transportation paths.
  - topography
  - climate
  - Technology
  - economic system
- One finished product is considered at a time.
- The product is shipped to a single market location.
- Transportation cost may vary as they are a function of the weight of the items shipped and the distance they are shipped.
  - *Example*: Heavy and Far (cost lots of moolah!)

Assumptions… continued

- Labor has a **fixed** cost…
  - Labor not mobile.
  - It's available in unlimited quantities.
  - There is labor at any production site selected.
- The product has equal desire in the plane and equal opportunity to purchase the product.
- The raw materials are:
  - At a **fixed** location
  - Which is known
- Market location where **consumption** occurs…
  - At a **fixed** location
  - Which is also known

Factors

With these assumptions, the location is driven by four factors to determine **spatially variable costs**.

Transportation, Labor, Agglomeration, Deglomeration

Transportation

- The location of the industry will be located in an area where it ensures the cost will be lowest for:
  - *Moving raw materials to the processing location*
  - *Moving finished products to the market*
- Costs of transportation are affected by **distance** the product is shipped and the **weight** of the **product** when being shipped.
- There are also cases where a company has more than 1 mode of transportation.
- This is known as **break-in-bulk** locations.
  - *Example*: San Francisco, California
  - Methods of Transport: Ports, Rail, Air, Highway

Labor

- Considered the most expensive factor for LCT.
- The profits of a company are reduced as the cost of labor increases, and vice versa.
- In some cases an industry may perform better farther away from the market and raw materials, due to the availability of cheap labor.
- Higher labor costs reduce profits, can affect location of industry, regardless of raw material and market locations.
  - Example: Outsourcing textiles overseas

Labor

- Employers look for:
  - Low Wages
  - Little unionization
  - Young employees (Few healthcare costs)
  - Female employees (Thought to be less demanding and more expendable)
- If an industry moves to a place to access lower labor costs, even though transportation costs increase is called the **substitution principle.**

Agglomeration

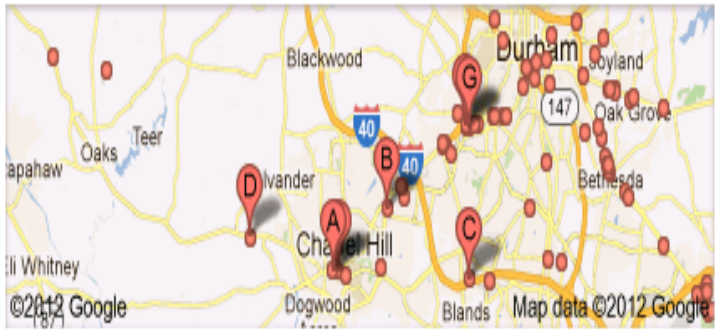
- **Agglomeration**: the concentration of businesses in one particular area.

- It occurs when there is a demand for services that the population needs (school, hospitals, grocery stores).
- They provide assistance to each other through shared talents, and services. Typically results in lower prices!
- When a large number of companies cluster in the same area and can assist each other through shared talents, services and/or facilities.
  - *Example*: Research Triangle Park
  - *Example*: Michigan Auto Industry and PA steel industry

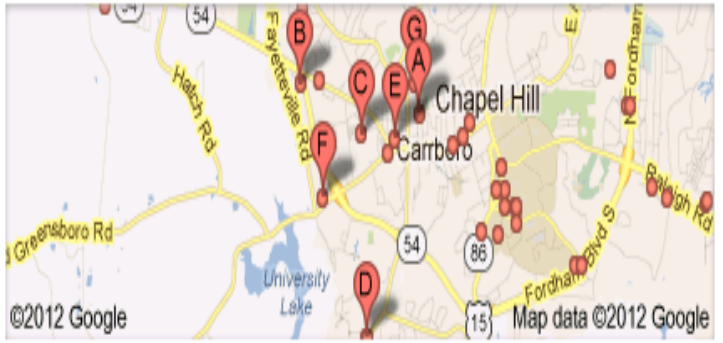
Deglomeration

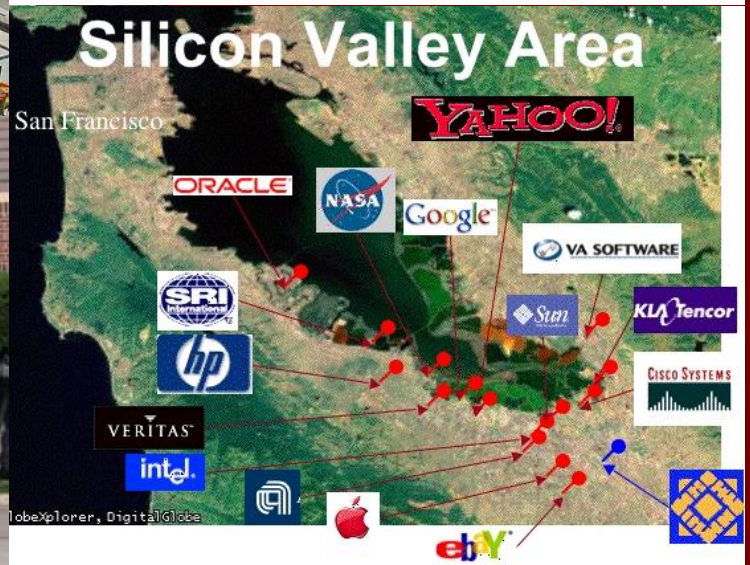
- When an agglomerated region becomes too clustered or too crowded from **cumulative causation** (think positive feedback loop), then there are negative effects.
  - Pollution, Traffic, Lack of Resources or Labor
- Industries choose to move away from each other called deglomeration.
  - Essentially it is the "unclumping" of factories due to the negative effects and higher costs of industrial overcrowding.
- Markets can also become oversaturated with a particular industry forcing businesses to relocate or shut down.

Map for **car dealerships**



Map for **medical centers**





Weight-Gaining and Weight-Losing

- Weight-Gaining
  - The finished product(s) weight is **more** than the raw materials
  - Cost for shipping the finished product are greater than that of the raw materials.
  - Industry location would be the closest to the market!
  - Industry is said to have a **market orientation**.

- Weight-Losing (Also known as bulk-reducing)
  - The finished product(s) weight is **less** than the raw materials
  - Therefore, it cost more to ship the raw materials than to ship the finished product.
  - Industry location would be the closest to the source of raw materials!
  - Industry is said to have a **material orientation.**

Weight-Losing

Scenario

Location 1

FIGURE 1

- In this situation the processing location is between the source and market.
- This however is not the best place to locate the plant because of the fact that the product is weight-losing.
- Therefore, it cost the company a great amount of money to ship the raw materials to the plant and more then half of that to ship the finished product to market.

Location 2

FIGURE 2

- In this situation the processing location has been moved closer to the source.
- This caused the cost of shipping the final product to be reduced, greatly.
- However, the cost of shipping the raw materials to the plant is still not the least it could be.

Location 3

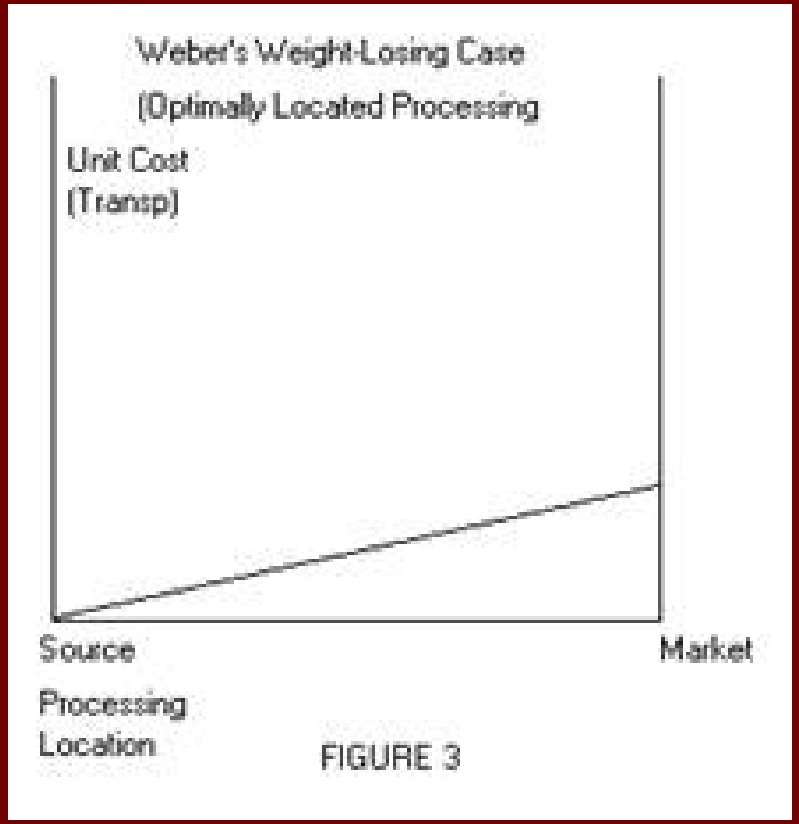
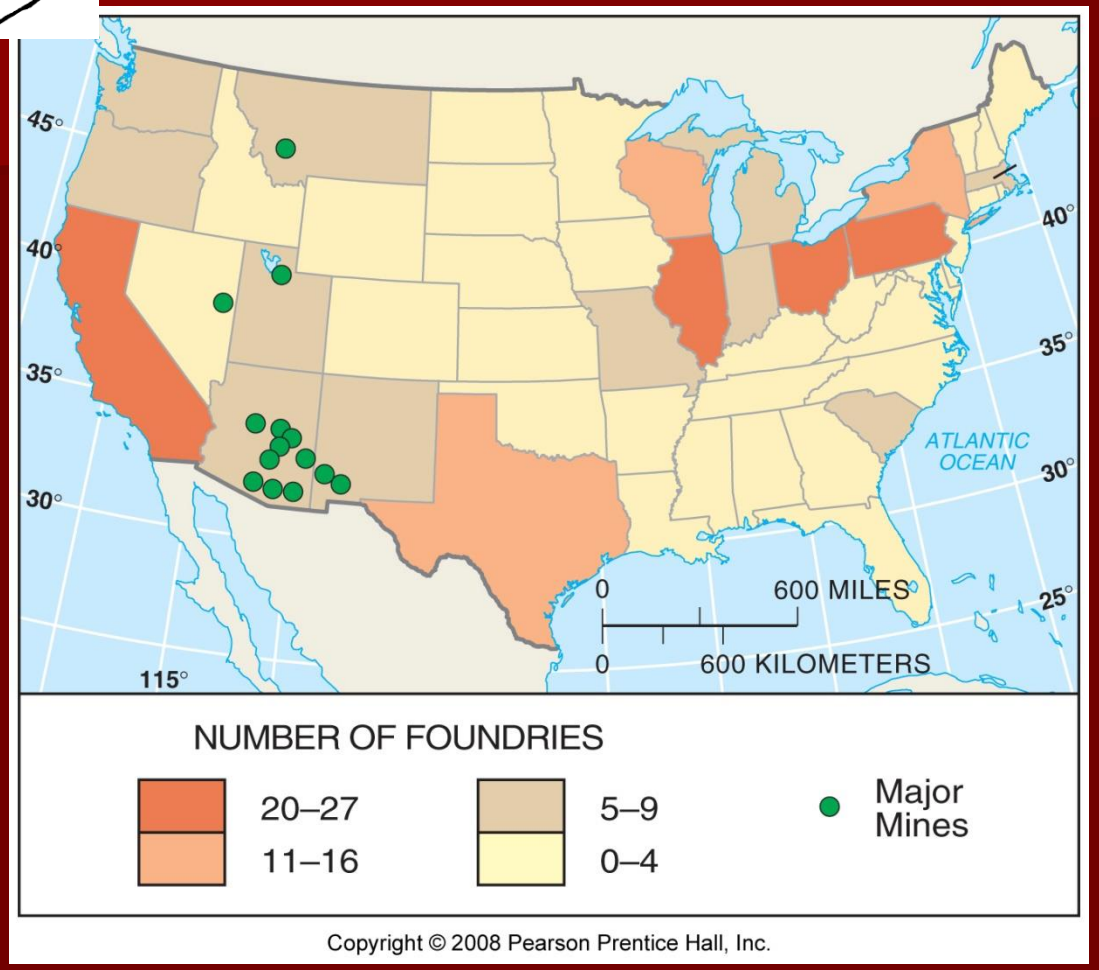


FIGURE 3

- In this situation the processing location is located at the source of the raw materials.
- And the cost of shipping has again been reduced from the previous situation.
- Therefore, the best location for the plant would be at the source of the raw materials.

Example: Copper Industry in North America



The Lavender Pit Copper Mine in Bisbee, Arizona operated between 1951 and 1974.

Fig. 11-8: Copper mining, concentration, smelting, and refining are examples of bulk-reducing industries. Many are located near the copper mines in Arizona.

Weight- Gaining

Scenario

Location 1

- In this situation the plant is located between the source and the market.
- Therefore, the cost of shipping the raw materials is much cheaper than that of the finished product.
- And this is because the product is weight-gaining.

FIGURE 4

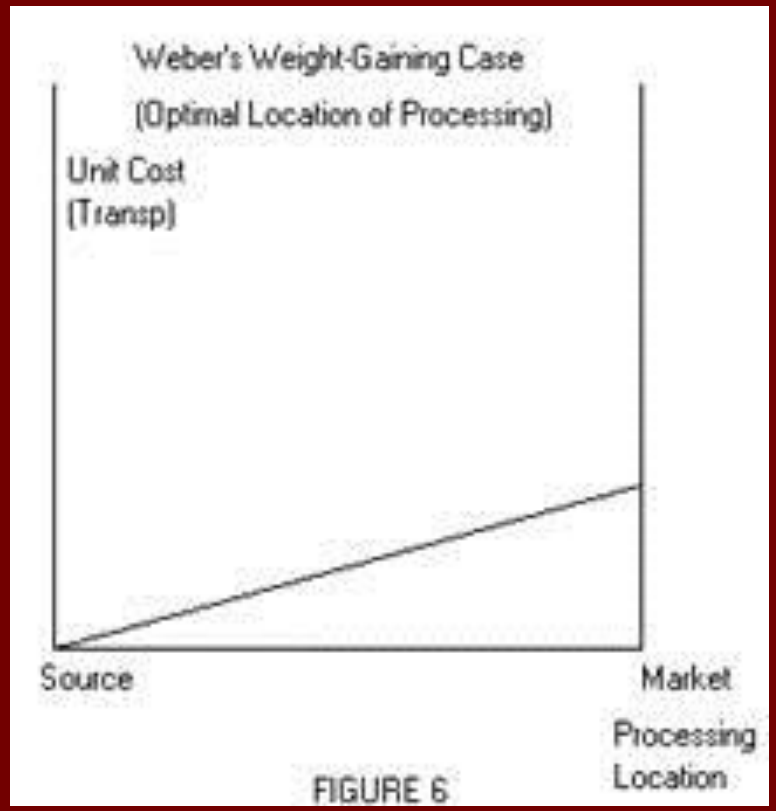
Location 2

- In this situation the processing plant has been moved closer to the market.
- As a result, the cost of the finished product has reduced and the cost for shipping the raw material is at a gradual rate.
- Though this location has reduced the overall cost of transportation, cost are not at the least.

FIGURE 5

Location 3

- In this situation the processing plant is located at the market.
- This causes the cost of shipping to increase at a gradual rate and therefore the cost of shipping is at the least.
- Therefore, this is the best location for the plant is at the market.



Example: Location of Beer Breweries

Fig. 11-11: Beer brewing is a bulk-gaining industry that needs to be located near consumers. Breweries of the two largest brewers are located near major population centers.

How to Use Weber's Theory

- Calculate Transport Costs or Finished Product/Mile
  - For 1 mile for R1 (6*5) = 30
  - For 2 miles for R1 30 x 2 = 60
- Transport Costs
  - 11 to M: 4 movements or miles = 280
- Complete Cost:
  - Site 1: 30 +175+ 280 = 485

Let's calculate LCT using these rules. Write this in your "Notes" Section!

Material Quantities and Transport Rates

Location	Symbol	Amount Shipped	Transport Rate
Raw Material #1	R1	6 tons	$5/ton-mile
Raw Material #2	R2	7 tons	$5/ton-mile
Market	M	10 tons	$7/ton-mile

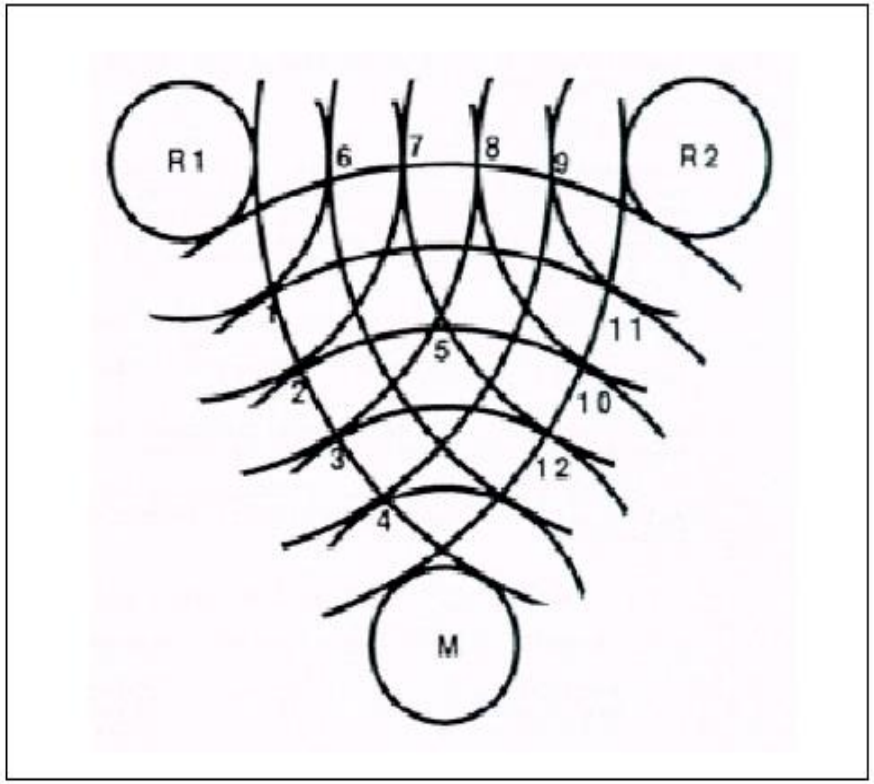


Chart 1. Transport Costs for Raw Materials or Finished Product/Mile

	Mile 1	Mile 2	Mile 3	Mile 4	Mile 5
R1					
R2					
M					

Chart 2. Total Transport Cost for Each Proposed Plant Site

Site	R1	R2	M	Total Cost
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Other considerations and limitations for Weber's Theory

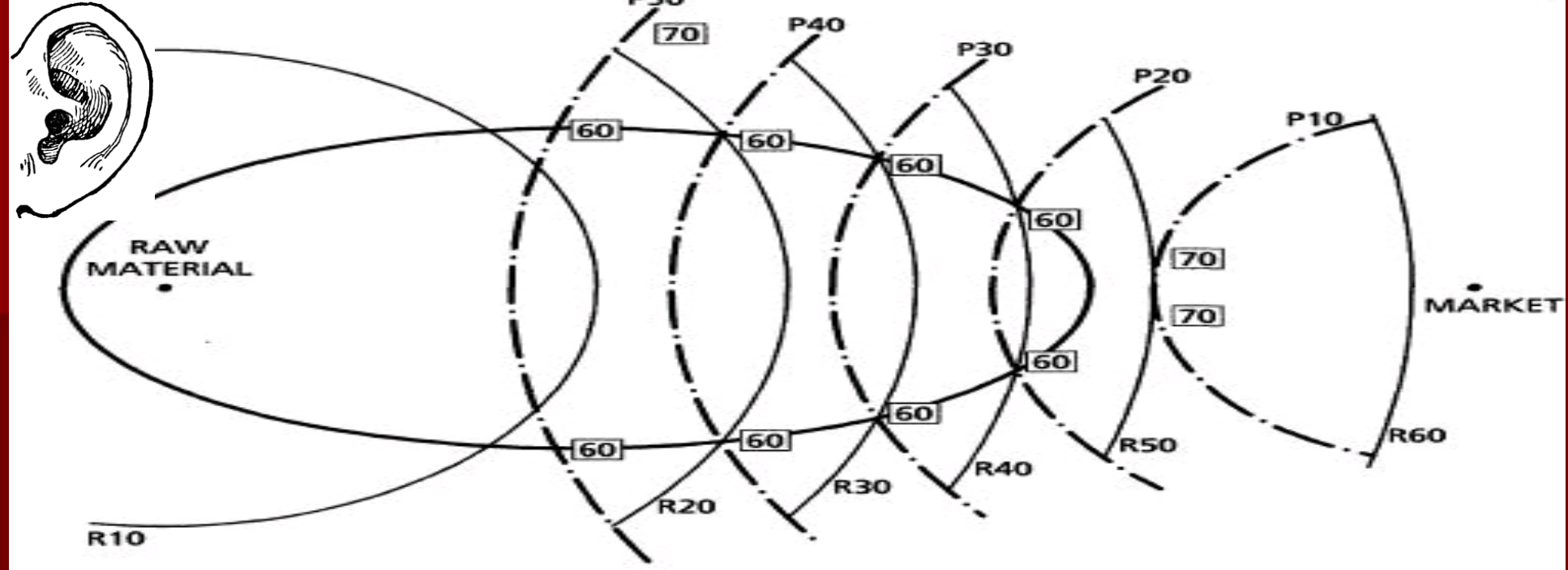
- Labor costs (labor unions)
- Labor diversity (age, sex, education, gender, etc)
- Labor movement (indeed labor does move and change from place to place)
- Reality of Transportation Costs
- Land Rent (real estate)
- Tax subsidy
- Pollution (NIMBY factor)
- Long-term Availability of Resources
- Perishability considerations (spoilage)
- Fragility
- Hazardous materials
- Zoning (residential versus industrial)
- NAFTA and other special trade agreements
- Globalization and Deindustrialization

What if the costs are all the same?

- Some industries maintain the same cost of transportation and production regardless of where they choose to locate.
- These industries have **spatially fixed costs**.
- These are often called "Footloose Industries" because they can locate wherever they want!
- Footloose products are typically small and of very high value. Or locate for a single, specific reason (tax purposes at offshore locations.)
  - *Example*: Computer chip industries, Diamonds

Application of Hotelling's Theory

- **High-tech corridor** – agglomeration of technology and computer industry.
- A region (such as Silicon Valley) of this agglomeration is called a **technopole**.
  - Typically **ancillary activities** will be attracted to these areas to act as support businesses. (computer repair, wiring services)
- The downside of this is the brain drain of talented individuals from a particular area, called the **backwash effect**.
- Hotelling's theory of **locational interdependence** asserts that industries choose locations based upon where their competitors are located.
  - Industries do not make isolated decisions without considering where other, related industries already exist.

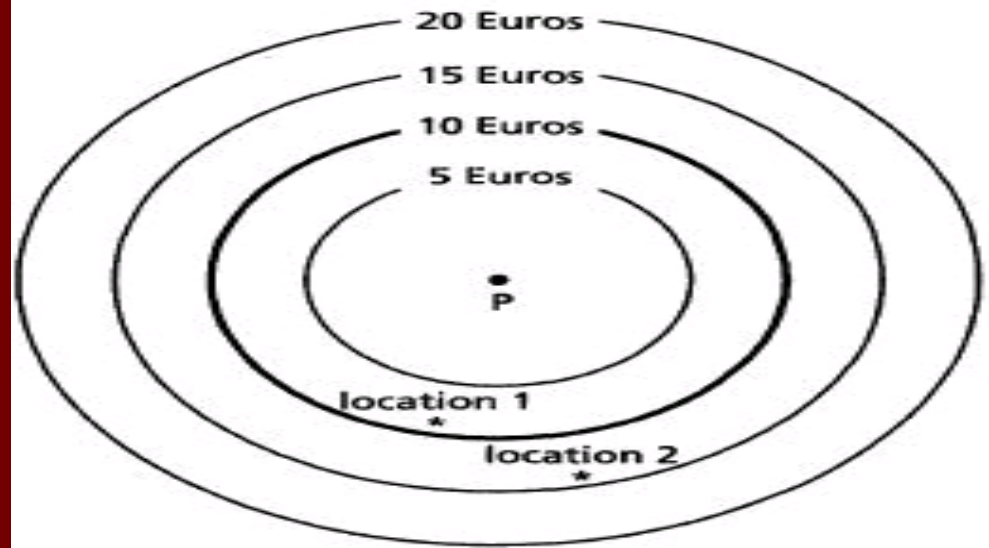


isotim for finished product

isotim for raw material

isodapane—line joining sites of equal total transport cost

60 total transport cost



P location of industry

* sites where labour is 10 Euros cheaper

isodapane (line of equal total transport cost)

critical isodapane where extra cost of transport is offset by savings on labour cost