

Alfred Weber – German – during 1940's -Least-Cost Theory – Assumption that owner of plant would try to minimize 3 categories of variable costs:

1) Transportation – most important.

2) Labor, 3) Agglomeration – phenomenon of spatial clustering or concentration of firms in a relative small area. These share cost of locating there. Thus, costs may go down. Deglomeration occurs when companies and services leave because of the diseconomies of industries' excessive concentration.

Weber concluded – two types of manufacturing industries = 1) Material –oriented, 2) Market-oriented.

Material-oriented – Raw materials really heavy or bulky or perishable – so locate industry near source of raw material.

Market-oriented – Processing increases perishability – like bakeries – processing may add bulk or weight – auto industry – weight-gain – so located near market.

Material Index = The point of optimal transportation based on costs of distance to the “material index” – the ratio of weight to intermediate products (raw materials) to finished product. Other things to take into account = Cost of land, availability of land, Assume – land may not be available – transportation factor – access to labor market – political border may exist between locations – tariffs, local taxes or government regulation. Absence or presence of environmental constraints may affect this.

Linkages between firms may localize manufacturing in areas of industrial agglomeration where common resources – such as skilled labor – or multiple suppliers of product inputs – such as auto component manufacturers are found.

These principles are generalized statements about locational tendencies of industries. Their relative weight varies among industries and firms.

Significance varies depending on extent to which economic considerations opposed to political or environmental constraints – dictate locational decisions.

Raw materials:

Only a few industries at early stages of production cycle use raw materials directly from farms or mines. Most manufacturing plants based on further processing and shaping of materials already treated by earlier stage of manufacturing located elsewhere.

The more advanced the industrial economy of nation – the smaller is the role played by truly raw materials in its economic structure. For industries where unprocessed commodities are primary input-source and characteristics of raw materials upon which they're based – important.

Quality, amount, or ease of mining or gathering of resource may be locational determinant if cost of raw material is major variable and multiple sources of primary material are available.

Raw materials may attract industries that process them when they're bulky, undergo great weight loss in processing or highly perishable.

Copper smelting and iron ore beneficiation – examples of weight (impurity) reducing industries localized by their ore supplies. Pulp, paper, and sawmills found in areas within or accessible to timber. Fruit and vegetable canning, etc... are different but comparable - examples of raw material orientation.

Reason – It's cheaper and easier to transport to market a refined or stabilizing product than one filled with waste material or subject to spoilage and loss. Multiple raw materials might dictate intermediate plant location.

Least Cost may be determined by the spatially differing costs of accumulating several inputs.

Ex. – Steel mills at Gary, Indiana or Cleveland – weren't based on local raw material sources – but on minimization of total cost of collecting at a point the needed ore, coking coal, fluxing material inputs for production process. Steel mills – East coast – were localized where important ores were unloaded from ocean carriers, avoiding expensive trans-shipment costs.

Great Lakes, and coastal locations similar in this way.

Power Supply: For some industries, power supplies that are immobile or low transferability may attract activities dependent upon them. Like early Industrial Revolution – when water power sites localized textile mills and fuel (first charcoal then coking coal) drew iron and steel industry.

Metallurgical industries became concentrated in coal-rich regions – like Midlands of England, Ruhr district of Germany.

Massive charges of electricity are required to extract aluminum from its processed raw material alumina (aluminum oxide).

Electrical power accounts for 30 – 40% cost producing aluminum and is major variable cost influencing plant location in the industry. Industries may be located far from raw material sources – but close to cheap power – ex – hydroelectricity.

Labor: Labor is spatial variable affecting location decisions and industrial development. Traditionally – 3 different considerations – price, skill, amount – of labor were considered to be determinant singly or in combination.

Now – increasingly important consideration – is Labor Flexibility – implying more highly educated workers able to apply themselves to wide variety of tasks and functions.

For some activities – cheap labor supply is necessity. For others – labor skills may constitute the locational attraction and regional advantage. In increasingly high-tech world – skilled labor even at high costs – are more in demand than uneducated work force.

In some world areas – labor of any skill level may be poorly distributed to satisfy the developmental objectives of government planners or private entrepreneurs. Ex. Siberia.

Market: Goods are produced to supply market demand. Size, nature, and distribution of markets may be as important in industrial location decisions as are raw materials, energy, labor, and other inputs.

Market pull is at root an expression of the cost of commodity movement. When transportation charges for sending finished goods to market are a relatively high proportion of total value of the good (or can be reduced by proximity to market ) - then the attraction of location near to consumers is obvious and market orientation results.

The consumer may be either another firm or general public. When a factory is but one stage in larger manufacturing process – firms making wheels, tires, etc... in assembly of auto – location near next stage of production is obvious advantage. Advantage is increased if that final stage of production is also near ultimate consumer market. People are ultimate consumers.

Large urban concentrations represent markets and major cities have always attracted producers of goods consumed by city dwellers. Urbanites as market – almost same as urbanites as labor force. Many manufactured activities are drawn to major metropolitan centers.

Certain producers are inseparable from immediate markets they serve, and so widely distributed that they're known as ubiquitous industries. Ex. Newspaper publishers, bakeries, dairies all produce highly perishable commodity for immediate consumption.

Transportation: So much the unifying thread of all references to factors of industrial location – that it's difficult to isolate the separate role. Some earlier observations about manufacturing plant orientation can be reinstated in purely transportation cost terms. Ex. – Coper smelting or iron ore beneficiation – examples of raw material orientation – may be seen as industries engaged in Weight Reduction – designed to minimize transportation costs by removal of waste material prior to shipment.

Some market orientation is opposite nature – reflecting weight-gaining production – ex. = soft drink bottles. All transportation costs reduced if only the concentrate is shipped to local bottlers who add water available everywhere and distribute to local dealers.

Frequency of this practice suggests the inclusion of soft drink bottlers among ubiquitous industries. Industrial Revolution seen as initially and simultaneously a transportation revolution as successive improvements in technology of movement of peoples and commodities enlarged effective areas of spatial interaction and made integrated economic development and areal specialization possible.

All advanced economies are well served by diversity of transportation media – without them – all that is possible is local subsistence activity. All major industrial agglomerations are simultaneously important nodes of different transportation media, each with own characteristics and limitations.

Water transportation is cheapest means of long-distance freight movement. Little motive power is required, right of way costs are low or absent, and operating costs per unit of freight are low when high-capacity vessels are used.,

Inland waterway improvement and canal construction marked first phase of Industrial Revolution in Europe and was first phase of modern transportation in U.S. Because ton-mile costs of water movement remain so relatively low, river ports and seaports have locational attractiveness for industry unmatched by alternative centers not served by water carriers.

Though disadvantages of water carriage of freight are serious, where water routes are in place, they're vital elements in regional industrial economies.

Railroads efficiently move large volumes of freight over long distances at low fuel and labor costs. They're inflexible in route, slow to respond to changing industrial location patterns, expensive to construct and maintain. Require high volumes of traffic to be cost-effective. When traffic declines below minimum revenue levels – rail service may be uneconomic and lines abandoned – response of U.S. lines railroads that abandoned over 125,000 miles line from 1930 – 2000.

High volume, high speed motor trucks operating on modern roadway and expressway systems have altered competitive picture to favor highways in many intercity movements now.

Road systems have flexibility of service and are more quickly responsive than railroads to new traffic demands and changing origin and destination points.

Intervening opportunities are more easily created and regional integration more cheaply obtained by highway than rail or water systems.

Disadvantages of highway transportation include high maintenance costs of vehicles (and roads) and low efficiency in the long-distance, high-volume movement of bulky commodities.

Increasingly greater transportation costs efficiencies are achieved by combining short-haul motor carriage with longer haul rail or ship movement of same freight containers. Hauling truck trailer on railroad flatcar (“piggy-backing”) or on ship deck serves to minimize total freight rates and transportation times by utilizing most efficient carrier at different trip stages to move goods kept within a prepacked container.

Pipelines provide efficient, speedy, dependable transportation suited to movement of variety of liquids and gases.

They serve to localize along the routes the industries, particularly fertilizer and petrochemical plants than use the transported commodity as raw material.

Air transport – has little locational significance for most industries despite its growing importance in long-distance passenger and high-value package freight movement. It contributes to range of transportation alternatives available to large population centers in industrially advanced nations and may increase the attractiveness of airport sites for high-tech and other industries shipping or receiving high value, low bulk commodities.

Air transport may serve as only effective connection with larger national economy in the development of outposts of mining and manufacturing – Ex. – Arctic regions or interior Siberia. Not effective competitor in usual patterns of freight flow.

Transportation and Location:

Variable transportation costs represent the application of differing freight rates = charges made for loading, transporting, and unloading of goods. Freight rates – discriminate between commodities on the basis of their assumed ability to bear transport costs in relation to their value.

Manufactured goods have higher value, greater fragility that require more special handling, and can bear higher freight charges than can unprocessed, bulk commodities. The higher transport costs for finished goods are seen as major reason for increasing market orientation of industry in advanced economies with high-value manufacturing.

In addition, each shipment of whatever – must bear a share of fixed costs of the company's investment in land, plant, and equipment, and the assigned terminal line-haul costs of the shipment.

Terminal costs = charges associated with loading, packing, and unloading of shipment +paperwork and shipping documents. Line-Haul or Over the Road costs vary with individual shipments and are expenses involved in actual movement of commodities once they have been loaded. Allocated to each shipment according to equipment used and distance traveled. Total transport costs represent a combination of all charges and are curvilinear rather than linear functions of distance.

Carrier costs have tendency to decline as length of haul increases because scale economies in long haul movement permit the averaging of total costs over a greater number of miles. The result is the tapering principle. Actual rates charged move in stepwise increments to match general pattern and level of company costs.

Consequence of these costs to every shipment is that factory locations intermediate between sources of materials and final markets are less attractive than location at either end of single long haul. That is, two short hauls cost more than a single continuous haul over the same distance.

Two exceptions to this locational generalization =

1) Break of Bulk points = sites where goods have to be transferred or transshipped from one carrier to another – at ports for example. When such transfer occurs, an additional fixed or terminal cost is levied against the shipment, maybe significantly increasing total transport costs (piggyback transfers reduce, but don't eliminate those handling charges). Tendency for manufacturing to concentrate at such points to avoid additional charges.

In-Transit Privilege may be granted to manufacturer as traffic-generating inducement by transport agency through quotation of single rate from material source to market for a movement that may be interrupted for processing or manufacturing en route. Such special rate obviously removes the cost disadvantage of two short hauls and – by equalizing shipping costs between locations – tends to reduce the otherwise dominant attractions of either market or market locations.

Foot-Loose Industries – can locate anywhere – Light weight, high value, easy to move – Examples = computer chips, diamonds.

Locate wherever find skill and labor force needed – to maximize advantage.

Today – industrial location – global decision-making process – Can apply Weber to whole world.