CHAPTER 9

ECONOMIC GEOGRAPHY:

Manufacturing and Services

The financial district of Shanghai, China, along the Huangpu River.

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AP Learning Objectives

- Explain how the Industrial Revolution facilitated the growth and diffusion of industrialization.
- Explain the spatial patterns of industrial production and development.
- Describe social and economic measures of development.
- Explain causes and geographic consequences of recent economic changes such as the increase in international trade, deindustrialization, and growing interdependence in the world economy.
- Explain how sustainability principles relate to and impact industrialization and spatial development.

Route 837 connects the four U.S. Steel plants stretched out along the Monongahela River south of Pittsburgh. In the late 1960s, 50,000 workers labored in those mills, and Route 837 was choked with the traffic of their cars and of steel haulers' trucks. By 1979, fires were going out in the furnaces of the aging mills as steel imports from Asia and Europe flowed unchecked into domestic markets long controlled by American producers. By the mid-1980s, with employment in the steel plants of the "Mon" Valley well below 5,000, the highway was only lightly traveled, and only occasionally did anyone turn at the traffic lights into the closed and deserted mills. From Massachusetts to Wisconsin, competition with Japanese imports and the opening of new assembly plants in lower-wage countries such as Mexico led to manufacturing job losses and empty factories. Derelict factories with pollution in the soils and groundwater scared away potential investors and thus were left to rot.

At the same time, traffic was building along many highways in the northeastern part of the country. The four-lane Route 1 was clogged with traffic along the 42 kilometers (26 miles) of the "Princeton Corridor" in central New Jersey as that stretch of road in the 1980s had more office space, research laboratories, hotels, conference centers, and residential subdivisions under construction than anywhere else between Washington, D.C., and Boston. Farther south, in the Virginia and Maryland suburbs of Washington, D.C., traffic grew heavy along the Capital Beltway and Dulles Toll Road, where vast office building complexes, defense-related industries, and commercial centers were converting rural land to urban uses. And east of New York City, traffic jams were monumental around Stamford, Connecticut, in Fairfield County, as it became a leading corporate headquarters town with 150,000 daily in-commuters.

By the early 1990s, traffic in Fairfield County had thinned as corporate takeovers, leveraged buyouts, and "downsizing" reduced the number and size of companies and their need for both employees and office space. Vacancies exceeded 25 percent among the office buildings and research parks so enthusiastically built during the 1970s and 1980s, and vacant "corporate campuses" lined stretches of formerly clogged highways. But soon traffic was building elsewhere in the country as millions of Americans during the 1990s and the early 21st century gained technology-related jobs in California's "Silicon Valley," and a whole series of other emerging "high-tech" hot spots clustered around such industries as computers, lasers, software, medical devices, and biotechnology. Starting in the late 1990s and continuing unabated through this writing, the explosive growth of China's manufacturing exports led to factory closures in a wide swath of the world including textile and garment factories in the Carolinas. Starting in the mid-1990s, all sections of the United States again experienced the congested traffic and breakneck housing and commercial development that economic prosperity induces, only once more to endure job losses, office vacancies, economic reversals, and altered traffic flows following the 2007 housing market and financial industry crisis.

These contrasting and fluctuating patterns of traffic flow symbolize the ever-changing structure of the North American economy. The smokestack industries of the 19th and early 20th centuries have declined, replaced by research park industries, shopping centers, and office building complexes that in their turn experience cyclical prosperity and adversity. The continent's economic landscape and employment structure are continually changing (**Figure 9.1**). And North America is not alone. Change is the ever-present condition of contemporary economies, whether of the already industrialized, advanced countries or of those newly developing in an integrated world marketplace. Resources are exploited and exhausted, markets grow and decline, and patterns of economic advantage, of labor skills, and of industrial investment and productive capacity undergo alteration as countries and regions differentially develop, prosper, or experience reversals and decline. Such changes have a profound impact on the spatial structure and processes of economic activity.

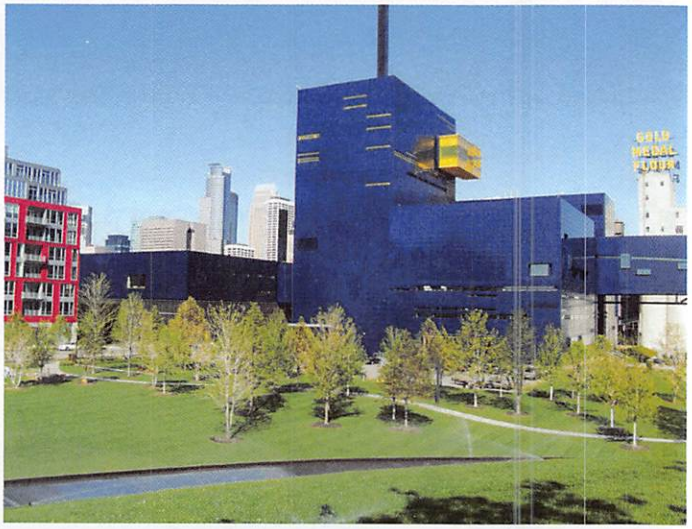

Figure 9.1 The economic changes on Minneapolis's riverfront typify the changes occurring in many postindustrial economies. Minneapolis's riverfront was once lined with flour mills and sawmills taking advantage of waterpower from the only waterfalls on the Mississippi River. Now, former manufacturing buildings have been converted to service-sector offices and expensive residences. The large blue structure is the Guthrie Theater, which completes the transformation of a heavy industrial landscape into a service sector landscape of entertainment and consumption.

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9.1 Components of the Space Economy

All human activity creates observable spatial patterns. In the economic sphere, we recognize regions of industrial concentration, areas of employment and functional specialization, and specific factory sites, store locations, and tourist destinations. As geographers, we seek to understand and explain the underlying logic behind those spatial patterns of economic activity.

Primary industries are tied to the location of **natural resources**. Location is therefore predetermined by the distribution of minerals, fuels, forests, fisheries, or natural conditions suitable for agriculture and herding. The secondary, tertiary, and quaternary stages of economic activity, however, are increasingly divorced from the conditions of the physical environment. Processing,

distribution, communication, and management work can be located in response to cultural and economic considerations rather than physical influences. They are movable, rather than spatially fixed activities. Locational decisions and economic patterns differ with the type of economic activity in question. Secondary industries involved in material processing and goods production have different spatial constraints than the retailing activities, tourist attractions, research parks, or office complexes of the service sector. Global competition and new distance-shrinking technologies regularly upset established economic patterns, creating new centers of activity and a new international division of the world's work.

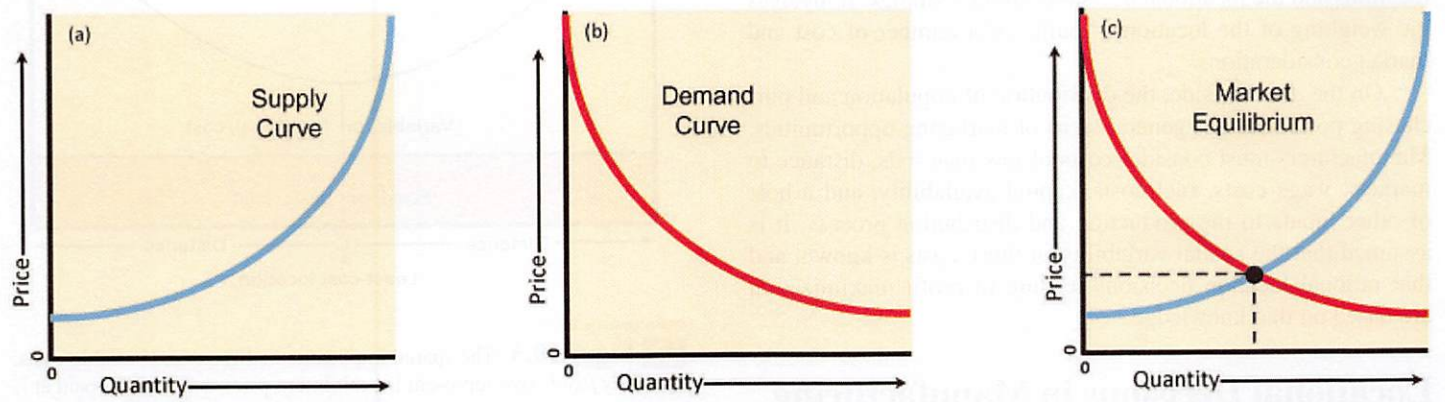
Basic Economic Concepts

Principles of human spatial behavior apply to economic behavior as well. We already explored some of those principles in Chapter 3. We noted, for example, that the intensity of spatial interaction decreases with increasing separation of places—distance decay. We observed the importance of **complementarity** and transferability in the assessment of resource value and trade potential. Johann Heinrich von Thünen's model of agricultural land use, you will recall, was rooted in the relationship between transportation costs and land values. Conventional economic thinking is based on a set of simplifying assumptions about the motivations guiding human economic behavior. Economists assume, for example, that people are *economically rational;* that is, given all of the information relevant to a particular economic decision, they make locational, production, or purchasing decisions in light of their perception of what is most cost-effective and advantageous. From the standpoint of producers or sellers of goods or services, it is assumed each is intent on *maximizing profit* (from the standpoint of consumers, it is assumed each is intent on *maximizing value*). To reach that objective, each may consider a host of production and marketing costs and political, competitive, and other limiting factors—and, perhaps, respond to individual behavioral quirks—but the ultimate goal of profit-seeking remains clear. Finally, most economists assume that in commercial economies the best measure of the efficiency of economic decisions is afforded by the *market mechanism.*

At root, that market control mechanism is measured by *price*—the price of land (rent), of labor (wages), of a college course (tuition), or of goods at the store. In turn, price is seen as a function of *supply* and *demand.* In large, complex economies where there are many producers, sellers, and buyers, and many alternative products competing in the marketplace, price is the neutral measure of comparative value and profitability. If demand for a good or service exceeds its available supply, scarcity will drive up the price that it can command in the marketplace. That increased price will enhance the profitability of the sale, which will encourage existing producers to increase output or induce new producers or sellers to enter the market (**Figure 9.2a**). That is, *the higher the price of a commodity, the more of it will be offered in the market.* Of course, this does not imply that more expensive commodities will be offered in greater quantities than less expensive commodities, only that more of a given commodity will be offered if more can be charged for it.

When the price is very high, however, relatively few people are inclined to buy. To dispose of their increased output, old and new producers of the commodity are forced to reduce prices to enlarge the market by making the commodity affordable to a larger number of potential customers. That is, *at lower prices, more of a commodity will be purchased* (**Figure 9.2b**). If the price falls too low, production or sale becomes unprofitable and inefficient suppliers are forced out of business, reducing supply. **Market equilibrium** is marked by the price at which supply equals demand, satisfying the needs of consumers and the profit motivation of suppliers (**Figure 9.2c**).

These basic economic models and assumptions treat supply, demand, and price as if all production, buying, and selling occurred at a single point. But as geographers, we know that human activities have specific locational settings and that neither people, nor resources, nor opportunities are uniformly distributed over the Earth. We appreciate that the place or places of production may differ from the locations of demand. We understand



AP Figure 9.2 The regulating mechanism of the market may be visualized graphically: supply, demand, and market equilibrium. (*a*) The *supply curve* tells us that as the price of a commodity increases, more of it will be made available for sale. Countering any tendency for prices to rise to infinity is the market reality that the higher the price, the smaller the demand, as potential customers find other purchases or products more cost-effective. (*b*) The *demand curve* shows how the market will expand as prices are lowered and commodities are made more affordable and attractive to more customers. (*c*) *Market equilibrium* is marked by the point of intersection of the supply and demand curves and determines the price of commodities, the total demand, and the quantity bought and sold.

that there are spatial relations and interactions based on supply, demand, and equilibrium price. We realize there is a geography of *supply,* a geography of *demand,* and a geography of *cost.*

Other economic geographers question the economist's assumptions of economic rationality. They point to a wide range of human motivations and behaviors that aren't the result of purely rational economic calculations—some examples might include impulsiveness; envy; altruism; attachments to people, places, and things; nostalgia for the past; optimism for the future; or a willingness to settle for less than the optimum result. Despite being an oversimplification, the assumption of economic rationality is important to economic thinking. Fortunately, the assumption of economic rationality is most applicable to the decisions made by companies, the focus of this chapter.

9.2 Secondary Activities: Manufacturing

Secondary activities involve transforming raw materials into usable products, from pouring iron and steel to stamping out plastic toys, assembling computer components, or sewing jeans. In every case, the common characteristics are the application of power and specialized labor to the production of finished products in factory settings: in short, industrialization.

Unlike the gathering or extraction of primary commodities, manufacturing involves assembling and processing multiple inputs and distributing the output to markets in diverse locations. It therefore presents the question of where the processing should take place. If we assume free markets, rational producers, and informed consumers, then the decision where to locate a manufacturing facility should be based on costs and opportunities that vary from place to place. In the case of primary industries—those tied to the environment—possible locations are fixed by the locations of natural resources. The decision is only whether or not to exploit known resources. In the instance of secondary-quaternary economic activity, however, there are many possible locations and the locational decision is more complex. It involves the weighing of the locational "pulls" of a number of cost and market considerations.

On the *demand* side, the distribution of population and purchasing power defines general areas of marketing opportunities. Manufacturers must consider costs of raw materials, distance to markets, wage costs, fuel costs, capital availability, and a host of other inputs to the production and distribution process. It is assumed that the spatial variability of those costs is known, and that rational location decisions leading to profit maximization are based on that knowledge.

Locational Decisions in Manufacturing

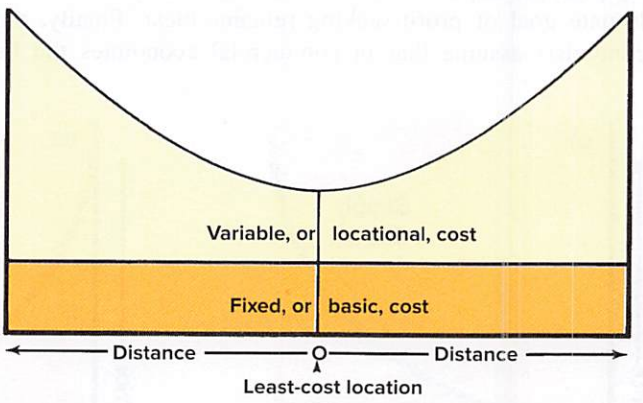
Locational decisions for manufacturing may require multiple spatial scales of analysis. The first scale is international. The second scale is regional and examines the attractiveness of different sections of a country. Later decision stages become more focused, localized, and specific to an individual enterprise. They involve assessment of the special production and marketing requirements of particular industries and the degree to which those requirements can or will be met at different subregional scales—at the state (in the United States), community, and individual site levels. That is, we can ask at one level why the northeastern United States–southeastern Canada exerted an earlier pull on industry in general and, at other decision stages, why specific sites along the Monongahela Valley to the south of Pittsburgh in Pennsylvania were chosen by the U.S. Steel Corporation for its mills.

For a great many searches, two or several alternate locations would be equally satisfactory. In very practical terms, locational decisions at the state, community, and site levels may ultimately be based on the value of incentives offered by rival areas and agencies competing to lure the new or relocated manufacturing plant (see the feature "Contests and Bribery,"). In both practice and theory, locational factors are complex, interrelated, change over time in their relative significance, and differ between industries and regions. But all of them are tied to *principles of location* that are assumed to operate under all economic systems.

Principles of Location

The principles of industrial location are simply stated. Certain input costs of manufacturing are **spatially fixed costs;** that is, they are relatively unaffected no matter where the industry is located within a regional or national setting. Wage rates set by national or areawide labor contracts are an example. Fixed costs do not give any location an advantage over others. Other input costs of manufacturing are **spatially variable costs;** that is, they show significant differences from place to place (**Figure 9.3**). These will influence locational choices.

The ultimate aim of the economic activity is *profit maximization.* In an economic environment of full and perfect competition, the profit objective is most likely to be achieved if the manufacturing



AP Figure 9.3 The spatial implications of fixed and variable costs. *Spatially fixed* costs represent the minimum price that must be paid at any location for the necessary inputs of production of a given item. Here, for simplicity, a single raw material is assumed and priced at its cheapest source. *Spatially variable (locational)* costs are the additional costs incurred at alternate locations in overcoming distance, attracting labor, purchasing the plant site, and so forth. In the example, only the transportation cost of the single material away from its cheapest (source) location is diagrammed to determine *O,* the optimal or least-cost location.

enterprise is situated at the *least total cost* location. Under conditions of imperfect competition, considerations of sales and market may be more important than production costs in fixing "best" locations. As we see later in this chapter, the location of markets becomes the predominant factor in locating tertiary services such as retail.

Spatially fixed costs are not of major importance in determining optimum, or least-cost, locations. Rather, the locational determinant is apt to be the variable cost that is an important component of total costs and shows the greatest spatial variation.

Transportation charges—the costs of bringing together the inputs and distributing products—are highly variable costs. As such, they may become the locational determinant, imparting an unmistakable *orientation*—a term describing locational tendencies—to the plant siting decision.

Individual establishments rarely stand alone; they are part of integrated manufacturing sequences and environments, in which *interdependence* increases as the complexity of industrial processes increases. Spatial interdependence may be a decisive locational determinant for some industries. *Linkages* among firms may localize manufacturing in areas of industrial clusters (agglomerations) where common resources—such as skilled labor—or multiple suppliers of product inputs—such as automobile component manufacturers—are found.

These principles are generalized statements about the locational tendencies of industries. Their relative weight, of course, varies among industries and firms. Their significance also varies depending on the extent to which purely economic considerations—as opposed, say, to political or environmental constraints—dictate locational decisions.

Raw Materials

All manufactured goods have their origins in the processing of raw materials, but only a few industries at the early stages of the production cycle use raw materials directly from farms or mines. Most manufacturing is based on the further processing and shaping of materials already processed by an earlier stage of manufacturing. In general, the more advanced the industrial economy of a nation, the smaller the role played by truly *raw* materials in its economic structure.

For those industries in which unprocessed commodities are a primary input, however, the source and characteristics of those raw materials is important. The quality, amount, or ease of mining or gathering of a resource may be a locational determinant if cost of raw material is the major variable cost and multiple sources of the primary material are available. Raw materials may attract the industries that process them when they are bulky, undergo great weight loss in the processing, or are highly perishable. Copper smelting and iron ore beneficiation are examples of weight- (impurity-) reducing industries that almost always are located next to ore supplies. Pulp, paper, and sawmills, which reduce bulky logs into neat, stackable outputs, are found in timber harvesting areas. Fruit and vegetable canning in California, meat packing in Iowa, and Florida orange juice concentration and freezing are comparable examples of raw **material orientation.** The reason is simple: It is cheaper and easier to transport a refined or stabilized product than one that is filled with waste material or subject to spoilage and loss.

Multiple raw materials might dictate an intermediate plant location. Least cost may be determined not by a single raw material input, but by the spatially variable costs of several inputs. Steel mills at Gary, Indiana, or Cleveland, Ohio, for example, were not based on local raw material sources but on minimizing the total cost of assembling the necessary iron ore from northern Minnesota, coking coal from Appalachia, and fluxing material inputs (**Figure 9.4**). Steel mills along the U.S. East Coast—at Sparrows Point, Maryland, or the Fairless Works near Philadelphia, for example—were located where imported ores were unloaded from ocean carriers, avoiding expensive transshipment costs. In this respect, both the Great Lakes and the coastal locations are similar.

Power Supply

For some industries, power supplies with low transferability may serve to attract energy-intensive activities. Such was the case early in the **Industrial Revolution**, when water power sites

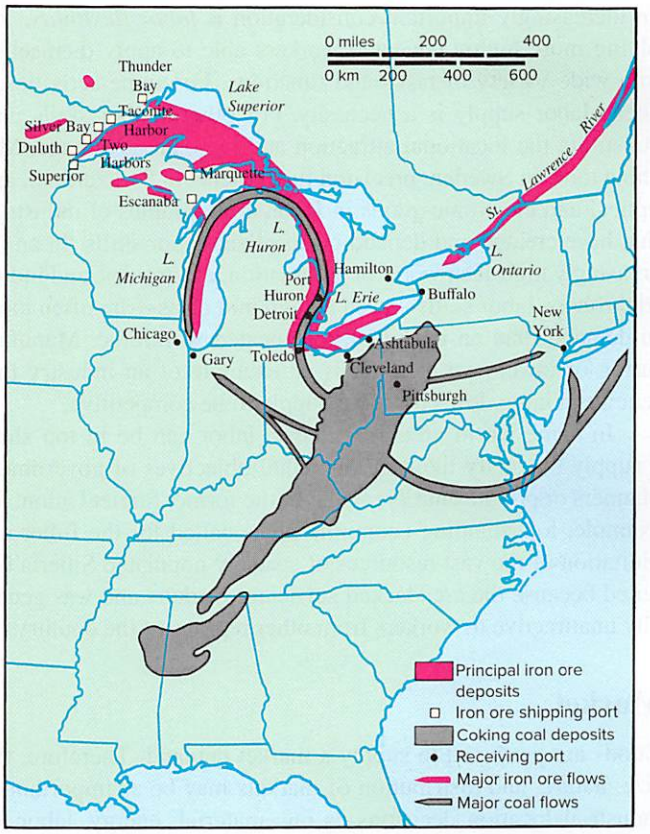


Figure 9.4 Material flows in the steel industry. When an industrial process requires the combination of several heavy or bulky ingredients, an intermediate point of assembly of materials is often a least-cost location. In the early 20th century, the iron and steel industry of the eastern United States showed this kind of localization—not at the source of any single input but where coking coal, iron ore, and limestone could be brought together at the lowest price. In fact, the city of Gary, Indiana, at the southern tip of Lake Michigan, was founded by the U.S. Steel Corporation in the early 1900s for the sole purpose of making steel at the lowest-cost location.

attracted textile mills and fuel (initially charcoal, later coking coal) drew the iron and steel industry. Metallurgical industries became concentrated in such coal-rich regions as the Midlands of England, the Ruhr district of Germany, and the Donets Basin of Ukraine.

Massive amounts of electricity are required to extract aluminum from its processed raw material, *alumina* (aluminum oxide). Electrical power accounts for between 30 percent and 40 percent of the cost of producing aluminum and is the major variable cost influencing plant location. The Kitimat plant on the northwest coast of Canada and the Bratsk plant near Lake Baikal in eastern Siberia are examples of industry placed far from raw material sources or market but close to vast supplies of cheap power—in these instances, hydroelectricity.

Labor

Labor costs are highly variable across space, increasingly affecting location decisions and industrial development. Traditionally, three different considerations—price, skill, and amount—of labor were considered important. For many manufacturers today, an increasingly important consideration is *labor flexibility,* implying more highly educated workers able to apply themselves to a wide variety of tasks and functions. For some activities, a cheap labor supply is a necessity. For others, labor skills may constitute the locational attraction and regional advantage. Machine tools in Sweden, precision instruments in Switzerland, and optical and electronic goods in Japan are examples of industries that have created and depend on localized labor skills. In an increasingly high-tech world of automation, electronics, and industrial robots, labor skills—even at high unit costs—are often more in demand than an unskilled, uneducated workforce. Manufacturing of lower-cost clothing is an example of an industry that requires a large, low-cost labor supply to be competitive.

In some world areas, of course, labor can be in too short a supply to satisfy the developmental objectives of government planners or private entrepreneurs. In the former Soviet Union, for example, longstanding economic plans called for the fuller exploitation of the vast resources of sparsely populated Siberia but failed because the area lacked sufficient workers and was generally unattractive to workers from other regions of the country.

Market

Goods are produced to supply a market demand. Therefore, the size, nature, and distribution of markets may be as important in industrial location decisions as raw material, energy, labor, or other inputs. When the transportation charges for sending finished goods to market are a relatively high proportion of the total value of the good, then the attraction of location near to the consumer is obvious and **market orientation** results.

The consumer may be another firm or the general public. When a factory is but one stage in a larger manufacturing process—firms making wheels, tires, windshields, bumpers, and the like in the assembly of automobiles, for example—location near the next stage of production is an obvious advantage. This advantage is increased if that final stage of production is also near the ultimate consumer market. Thus, automobile part plants have been scattered throughout the North American realm in response to the existence of large regional markets and the cost of distribution of the finished automobile. This market orientation is further reflected by the location in North America of auto manufacturing or assembly plants of Asian and European motor vehicle companies, although both foreign and domestic firms again appear to be reconcentrating the industry in the southeastern part of the United States.

People themselves, of course, are the ultimate consumers. Large urban concentrations represent markets, and major cities have always attracted producers of goods consumed by city dwellers. Admittedly, it is impossible to distinguish clearly between cities as markets and cities as labor force. In either case, many manufacturing activities are drawn to major population centers. For example, California, the most populous state in the United States, is also the leader in the manufacture of mattresses and soft drinks, products that gain significant bulk during manufacture. Certain producers are, in fact, inseparable from the immediate markets that they serve and are so widely distributed that they are known as **ubiquitous industries.** Newspaper publishing, bakeries, and dairies, all of which produce a highly perishable commodity designed for immediate consumption, are examples.

Transportation Modes

Transportation is such an essential factor of industrial location that it is difficult to isolate its separate role. Earlier observations about manufacturing plant orientations can be restated in purely transportation cost terms. For example, copper smelting or iron ore beneficiation—already described as examples of raw material orientation—may also be seen as industries engaged in *weight reduction* designed to minimize transportation costs. Some market orientation is of the opposite nature, reflecting *weight-gaining* production. Soft drink bottlers, for example, add large amounts of water to small amounts of concentrated syrup to produce a bulky product of relatively low value. All transport costs are reduced if only the concentrate is shipped to local bottlers, who add the water that is available everywhere and distribute only to local dealers. The frequency of this practice suggests the inclusion of soft drink bottlers among the ubiquitous industries.

The location of industry is inseparably tied to transportation systems. The Industrial Revolution involved a transportation revolution as successive improvements in the technology of movement of peoples and commodities enlarged the effective areas of spatial interaction and made integrated economic development and areal specialization possible. All advanced economies are well served by a diversity of transport modes (see Figure 8.4); without them, all that is possible is local subsistence activity. All major industrial agglomerations are important nodes for different transportation modes, each with its own characteristic advantages and limitations.

Water transportation is the cheapest means of long-distance freight movement (**Figure 9.5**). Inland waterway improvement and canal construction marked the first phase of the Industrial

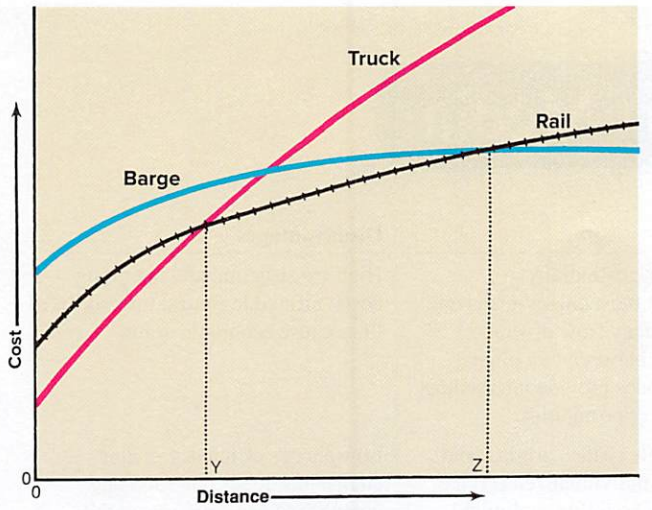


Figure 9.5 Different transport modes have cost advantages over differing distances. Generally, trucks are most efficient and least expensive over short hauls of up to about 500 kilometers (about 300 miles), railroads have the cost advantage for intermediate hauls of 500 to 3,200 kilometers (about 300 to 2,000 miles), and water (ship or barge) movement over longer distances (and, often, over shorter distances where speed of delivery of nonperishable commodities is not a consideration). Railroad and water shipments require much less energy and generate fewer greenhouse gas emissions per unit weight of freight hauled.

Revolution in Europe and was the first stage of modern transport development in the United States. Even today, river ports and seaports have locational attractiveness for industry unmatched by alternative centers not served by water carriers. Where water routes are in place, as in northwestern Europe or the Great Lakes–Mississippi systems of the United States, they are vital elements in regional industrial economies.

Railroads efficiently move large volumes of freight over long distances at low fuel and labor costs. They are, however, inflexible in route, slow to respond to changing industrial locational patterns, and expensive to construct and maintain. When traffic declines below minimum revenue levels, rail service becomes uneconomic and the lines are abandoned—a response of American railroads, which abandoned more than 125,000 miles of line between 1915 and 2005.

Trucks operating on modern roads and expressways have altered the competitive picture to favor highways over railways for many intercity movements. Road systems provide great flexibility of service and are more quickly responsive than railroads or waterways to new traffic demands and changing origin and destination points. Intervening opportunities are more easily created and regional integration more cheaply achieved by highway than by railroad (or waterway systems).

Major cost and time savings are achieved by the use of freight containers that can link trucking, railroads, and oceangoing vessels. Such *multimodal freight* movements seek the advantages of the most efficient carrier for each stage of the journey from cargo origin point to final destination through the use of internationally standardized shipping containers, which are tracked by computer. The containers with undisturbed content may be transferred to ships for international ocean carriage, to railroads for long-haul land movement, and to truck trailers for shorter-haul distances and pickup and delivery. Their use is increasingly common on long "trailer-on-flat-car" trains and in the growing volume of international ocean trade (**Figure 9.6**).

Pipelines provide fast, efficient, and dependable transportation for a variety of liquids and gases. Pipeline corridors are laid out to serve the industries that use the transported commodity—particularly fertilizer plants, oil refineries, and petrochemical plants—which in turn encourages new plants using those commodities to choose nearby locations.

Air transport is vital for the movement of skilled workers, consultants, and decision makers and increases the attractiveness of airport sites for high-tech and other industries shipping or receiving high-value, low-bulk commodities. It is not, however, an effective competitor for most freight flow (see the feature "A Comparison of Transport Media").

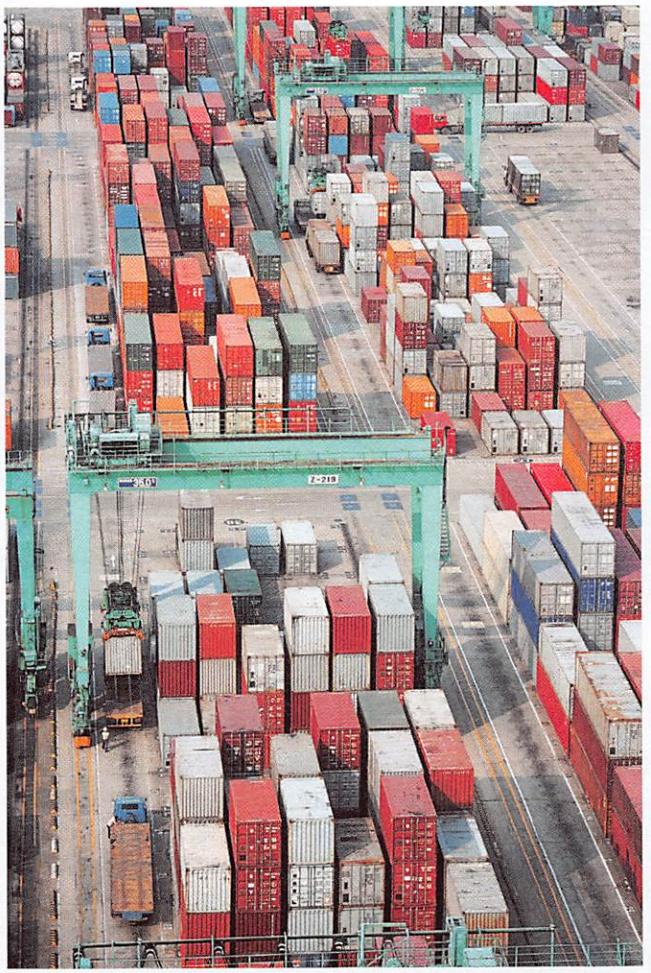


Figure 9.6 Cargo containers in docks in Shanghai, China. Standardized cargo containers have revolutionized shipping, sharply reducing shipping times and making possible the increased economic interdependence in the world economy. In 2010, China exported $1.6 trillion worth of goods, with the largest categories being electrical machinery and equipment, power generation equipment, and clothing.

A Comparison of Transport Media

Mode	Uses	Advantages	Disadvantages
Railroad	Intercity medium- to long-haul bulk Fast, reliable service on separate and general cargo transport.	Rights-of-way; essentially nonpolluting; most energy-efficient; adapted to steady flow of single commodities between two points; routes and nodes provide intervening development opportunities.	High construction and operating costs; inflexible routes; underutilized lines cause economic drain.
Highway trucking	Local and intercity movement of general cargo and merchandise; pickup and delivery services; feeder to other carriers.	Highly flexible routes, origins, and destinations; individualized service; maximum accessibility; unlimited intervening opportunity; high speed and low terminal costs.	Low energy efficiency; major contributor to air pollution and greenhouse gas emissions; adds congestion to public roads; high maintenance costs; inefficient for large-volume freight.
Inland waterway	Low-speed haulage of bulk, nonperishable commodities.	High energy efficiency; low per mile costs; large cargo capacity.	High terminal costs; low route flexibility; not suited for short hauling; possible delays from ice or low water levels.
Pipelines	Continuous flows of liquids, gases, or suspended solids where volumes are high and continuity is required.	Fast, efficient, dependable; low per mile costs over long distances; maximum safety.	Highly inflexible in route and cargo type; high development cost.
Airways	Medium- and long-haul of high-value, low-bulk cargo where delivery speed is important.	High speed and efficiency; adapted to goods that are perishable, packaged, of a size and quantity unsuited to other modes; high route flexibility; access to areas otherwise inaccessible.	Very expensive; high greenhouse gas emissions; high mileage costs; inconvenient terminal locations; no intervening opportunities between airports.
Intermodal containerization	Employs standardized closed containers to move a shipment by any combination of water, rail, and truck without unpacking between origin and final destination.	Speed and efficiency of transit and lower shipping costs when multiple carriers are needed; reduced labor charges and theft losses.	Requires special terminals and handling machinery to load, off-load, and transfer containers.

Transportation and Location

Figure 9.7 shows the general pattern of industrial orientation based on transportation costs. Those costs are more than a simple function of the distance that goods are carried. Rather, they represent the application of differing **freight rates,** charges made for loading, transporting, and unloading of goods. In general, manufactured goods have higher value and greater fragility, require more special handling, and can bear higher freight charges than unprocessed bulk commodities. The higher transport cost for finished goods is one reason for locating high-value manufacturing near the market for the finished products.

Freight rates are composed of **terminal costs,** the charges for paperwork, loading, packing, and unloading of a shipment; and **line-haul** or *over-the-road costs,* the expenses for the actual movement of commodities once they have been loaded. Total transport costs represent the sum of all pertinent charges and are curvilinear rather than linear functions of distance. That is, carrier costs tend to decline as the length of haul increases because scale economies for long-haul movement permit the averaging of total costs over a greater distance. The result is the **tapering principle** diagrammed in **Figure 9.8**.

One consequence of the necessary assignment of fixed and terminal costs to *every* shipment regardless of distance moved is that factory locations intermediate between sources of materials and final markets are less attractive than locations at either end of a single long haul. That is, two short hauls cost more than a single continuous haul over the same distance (**Figure 9.9**).

Two exceptions to this locational generalization are of practical interest. **Break-of-bulk points** are sites where goods have to be transferred or transshipped from one carrier to another—at ports, for example, where barge or ocean vessel must be unloaded and cargo reloaded to railcar or truck, or between railroad and truck line. When such transfer occurs, an additional fixed

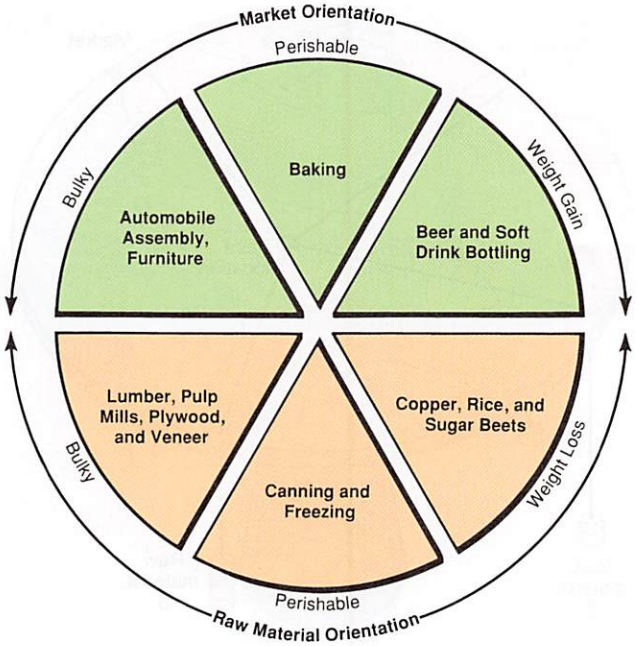


Figure 9.7 Spatial orientation tendencies. *Raw material orientation* occurs when there are few alternative material sources, when the material is perishable, or when—in its natural state—it contains a large proportion of impurities or nonmarketable components. *Market orientation* represents the least-cost solution when manufacturing uses commonly available materials that add weight to the finished product, when the manufacturing process produces a commodity bulkier or more expensive to ship than its separate components, or when the perishable nature of the product demands processing close to the market.

Source: Adapted from Interpreting the City: An Urban Geography, *Truman A. Hartshorn. 1980 John Wiley & Sons, Inc.*

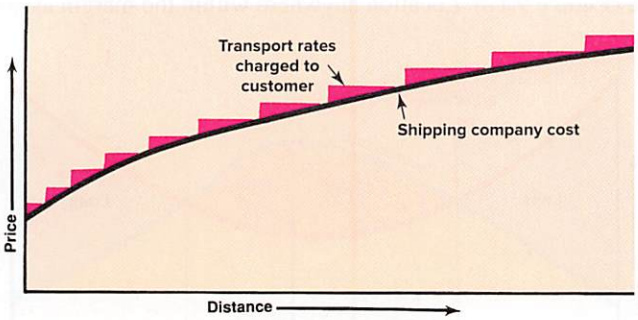
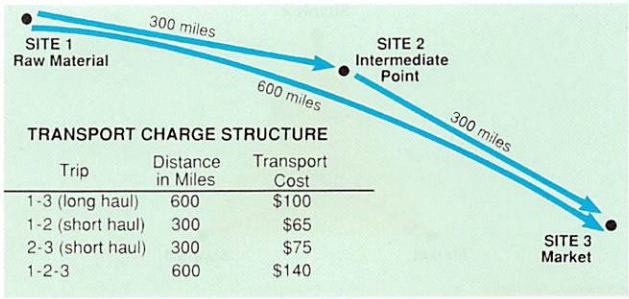


Figure 9.8 The tapering principle. The actual costs of transport, including terminal charges and line costs, increase at a decreasing rate as fixed costs are spread over longer hauls. The "tapering" of total cost for the shipping company varies among modes because their mixes of fixed and variable costs are different, as Figure 9.5 diagrams. Note that the actual transport rates charged to customers move in stepwise increments within certain distance ranges.

or terminal cost is levied against the shipment, perhaps significantly increasing its total transport costs (use of cargo containers reduces, but does not eliminate, those handling charges). There is a tendency for manufacturing to concentrate at such points to avoid the additional charges. Many of the world's important industrial cities developed at break-of-bulk locations.



TRANSPORT CHARGE STRUCTURE

Trip	Distance in Miles	Transport Cost
1-3 (long haul)	600	$100
1-2 (short haul)	300	$65
2-3 (short haul)	300	$75
1-2-3	600	$140

Figure 9.9 The short-haul penalty. Plant locations intermediate between material and market are generally avoided because of the realities of transportation pricing shown here. Two short hauls cost more than a single long haul simply because two sets of fixed costs must be assigned to the interrupted movement.

Industrial Location Theory

In practice, industrial locational decisions are based not on a single factor, but on the interplay of a number of considerations. Implicit in our review has been the understanding that each type or branch of industry has its own specific set of significant plant siting conditions. Classic industrial location theory was developed in the early 1900s, when the world economy was dominated by railroads, based on heavy industry and goals of national industrial self-sufficiency. Obviously, much has changed in a globalized economy shaped by institutions such as the World Trade Organization (WTO), transnational corporations, environmental protection agencies, and the like. Nevertheless, classic location theory concepts and their spatial implications remain relevant in understanding past and present-day industrial locational decisions.

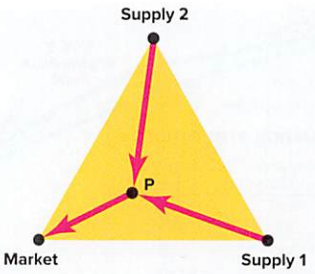
Least-Cost Theory

The classical model of industrial location theory, the **least-cost theory,** is based on the work of Alfred Weber (1868–1958) and sometimes called **Weberian analysis.** It explains the optimum location of a manufacturing establishment based on minimizing three basic expenses: transport costs, labor costs, and agglomeration costs. **Agglomeration** refers to the clustering of productive activities and people for mutual advantage. Such clustering can produce "agglomeration economies" through shared facilities and services. Diseconomies such as higher rents or wage levels resulting from competition for these resources also may occur.

Weber concluded that transport costs are the major consideration determining location. That is, the optimum location will be found where the costs of transporting raw materials to the factory and finished goods to the market are at their lowest. He noted, however, if variations in labor or agglomeration costs are sufficiently great, a location determined solely on the basis of transportation costs may not in fact be the optimum one.

Weber made five simplifying assumptions:

1. An area is completely uniform physically, politically, culturally, and technologically. This is known as the **uniform,** or **isotropic, plain** assumption.
2. Manufacturing involves a single product to be shipped to a single market in a known location.



AP Figure 9.10 Weber's locational triangle. With one market for the finished product and two raw material sources, the optimum production point, *P*, lies within the triangle. The heavy arrows represent the weight or "pull" of the raw materials and the finished product. When the weight of the finished product exceeds that of the raw materials, the optimum location is pulled closer to the market. If the raw materials are heavier, the optimum location is closer to the raw material supply locations.

3. Inputs involve raw materials from more than one known source location.
4. Labor is infinitely available but immobile.
5. Transportation routes are not fixed but connect origin and destination by the shortest path; and transport costs directly reflect the weight of items shipped and the distance moved.

Given these assumptions, Weber derived the least transport cost location by means of the *locational triangle* (**Figure 9.10**). It diagrams the cost consequences of fixed locations of materials and market and movement of raw material supplies and finished goods. Except in the unlikely scenario that the weight of each raw material input and the finished product were all equal, the least transport cost location will be an intermediate point somewhere within the locational triangle. Its exact position will depend on distances, the respective weights of the raw material inputs, and the final weight of the finished product. Each input and the finished product exerts a pull proportional to its weight. Material orientation (that is, when the least cost location is close to raw material supplies) reflects a sizable weight loss during the production process. Market orientation (that is, when the least-cost location is near the market) indicates weight gain during the production process. The optimum placement of *P* can be found by mathematical or geographic information system (GIS) methods, but the easiest to visualize is by way of a mechanical model of weights and strings (**Figure 9.11**).

Modifications to Least-Cost Theory

For many theorists, the assumptions and simplicities of least-cost theory are unrealistically restrictive. They agree that the correct location of a production facility is where the net profit is greatest. However, they propose employing a **substitution principle** that recognizes that in many industrial processes it is possible to replace a declining amount of one input (e.g., labor) with an increase in another (e.g., capital for automated equipment) or to increase transportation costs while simultaneously reducing land rent. With substitution, a number of different points may be appropriate manufacturing locations. Further, they suggest, a

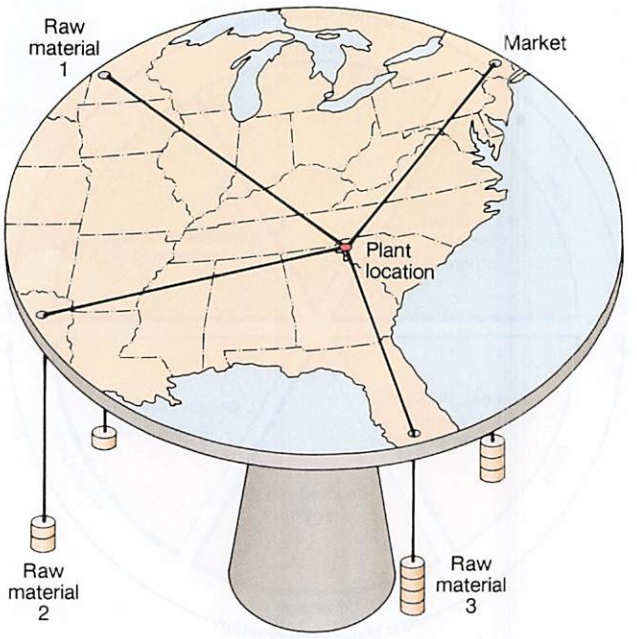


Figure 9.11 Plane table solution to a plant location problem. This mechanical model, suggested by Alfred Weber, uses weights to demonstrate the least transport cost point where there are several sources of raw materials. When a weight is allowed to represent the "pull" of raw material and market locations, an equilibrium point is found on the plane table. That point is the location at which all forces balance one another and represents the least-cost plant location.

whole series of points may exist where total revenue of an enterprise just equals its total cost of producing a given output. These points, connected, mark the **spatial margin of profitability** and define the larger area within which profitable operation is possible (**Figure 9.12**). Location anywhere within the margin assures

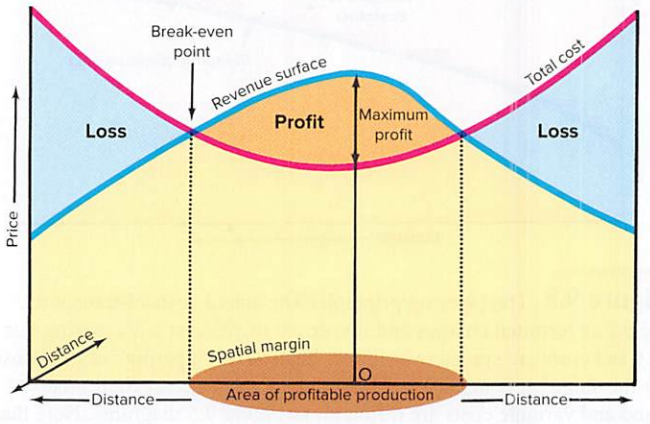


Figure 9.12 The spatial margin of profitability. In the diagram, *O* is the single optimal profit-maximizing location, but locations anywhere within the brown-shaded area (defined by the intersection of the total cost and total revenue surfaces) will be profitable. Some industries will have wide margins; others will be more spatially constricted. Skilled entrepreneurs may be able to expand the margins farther than less able industrialists. Importantly, a *satisficing* location may be selected by reasonable estimate, even in the absence of the perfect information required for an *optimal* decision.

AP Geography and Citizenship

Contests and Bribery

In 1985, it cost Kentucky more than $140 million in incentives—some $47,000 a job—to induce Toyota to locate an automobile assembly plant in Georgetown, Kentucky. That was cheap. In 1993, Alabama spent $169,000 per job to lure Mercedes-Benz to that state; Mississippi agreed to $400 million in spending and tax rebates to Nissan in 2001; and in 2002, Georgia gave DaimlerChrysler $320 million in incentives in successful competition with South Carolina to secure the company's proposed new factory. Earlier, Kentucky bid $350,000 per job in tax credits to bring a Canadian steel mill there.

The spirited bidding for jobs is not confined to manufacturing. A University of Minnesota economist calculates that his state will have spent $500,000 for each of the 1,500 or more permanent jobs created by Northwest Airlines at two new maintenance facilities. Illinois gave $240 million in incentives ($44,000 per job) to keep 5,400 Sears, Roebuck employees within the state, and New York City awarded $184 million to the New York Mercantile Exchange and more than $30 million each to financial firms Morgan Stanley and Kidder, Peabody to induce them to stay in the city. For some, the bidding between states and locales to attract new employers and employment gets too fierce. Kentucky withdrew from competition for a United Airlines maintenance facility, letting Indianapolis have it when Indiana's offered package exceeded $450 million. By 2004, following a slowdown in air travel, United walked away from a fully completed operational facility, leaving the city and state with $320 million of bonded debt and a complex of empty hangars and office buildings.

Inducements to lure companies are not just in cash and loans—though both figure in some offers. For manufacturers, incentives may include workforce training, property tax abatement, subsidized or free land and buildings, and below-market financing of bonds. Similar offers are regularly made by states, counties, and cities to wholesalers, retailers, and major office worker– and other service activity–oriented employers. The total annual loss of city and state tax revenue through abatements, subsidies, grants, and the like to benefit retained or attracted firms has been estimated at $30 billion to $40 billion. The objective, of course, is not just to secure the new jobs represented by the attracted firm, but to benefit from the general economic stimulus and employment growth that those jobs—and their companies—generate. Auto parts manufacturers are presumably attracted to new assembly plant locations; cities grow and service industries of all kinds—doctors, department stores, restaurants, food stores, and so on—prosper from the investments made to attract new employment.

Not everyone is convinced that those investments are wise. A majority of Minnesotans opposed the generous loans made by the state to keep Northwest Airlines headquarters and maintenance facilities in the state. The naysayers may have had a point: Before the loans were repaid, Northwest Airlines merged with Delta Airlines and moved their headquarters to Atlanta. In the late 1980s, the governor of Indiana, a candidate for Kentucky's governorship, and the mayor of Flat Rock, Michigan, were all defeated by challengers who charged that too much had been spent in luring the Suburu-Isuzu, Toyota, and Mazda plants, respectively. Established businesses resent what often seems neglect of their interests in favor of spending their tax money on favors to newcomers. The Council for Urban Economic Development has studied the issue and actively lobbies against incentives, and many academic observers note that industrial incentives are a zero-sum game: Unless the attracted newcomer is a foreign firm, whatever one state achieves in attracting an expanding U.S. company comes at the expense of another state.

Some doubt that inducements matter much, anyway. Although, sensibly, companies seeking new locations will shop around and solicit the lowest-cost, best deal possible, their site choices are apt to be determined by more realistic business considerations: access to labor, suppliers, and markets; transportation and utility costs; weather; the nature of the workforce; and overall costs of living. Only when two or more similarly attractive locations have essentially equal cost structures might such special inducements as tax reductions or abatements be determinants in a locational decision.

Thinking Geographically

1. Is it appropriate to spend public money to attract new employment to your state or community? If not, why not? If yes, what kinds of inducements and what total amount offered per job seem appropriate? Defend your opinion in a one-page position paper.
2. If you believe that "best locations" for the economy as a whole are those determined by pure location theory, what arguments would you propose to discourage locales and states from making financial offers designed to circumvent decisions clearly justified on abstract theoretical grounds? Present your arguments in an oral presentation.

some profit and tolerates both imperfect knowledge and personal (rather than purely rational economic) considerations. Such suboptimal, but still acceptable, sites are considered **satisficing locations.**

For some firms, spatial margins may be very broad because transport costs are a negligible factor in production and marketing. Such firms are said to be **footloose**—that is, neither resource- nor market-oriented. For example, both the raw materials and the finished product in the manufacture of computers are so valuable, light, and compact that transportation costs have little bearing on where production takes place.

Contemporary Industrial Location Considerations

Weber's classic industrial location theory was based on a highly simplified version of the world. Through assumptions such as the isotropic plan, it tried to explain the behavior of individual

firms seeking production sites under competitive market conditions. But such theory no longer fully explains world or regional patterns of industrial localization or specialization. Moreover, it does not account for locational behavior that is uncontrolled by objective "factors," directed by national or regional economic development planning goals, or influenced by new production technologies and corporate structures.

Political Considerations

Location theories dictate that in a pure, competitive economy, the costs of material, transportation, labor, and plant should control locational decisions. However, just as the world is not an isotropic plain, a pure market economy does not exist, even in the United States. Political factors and constraints also affect, perhaps decisively, the location decision process. Least-cost locations rely upon governments to build the highways and regulate the interstate commerce that connects the raw materials, production facilities, and markets, Land use and zoning controls, as well as environmental regulations, also influence where industries locate.

Many governments actively seek to attract industry to underdeveloped regions or encourage the full utilization of a region's resources by creating quasi-governmental corporations, building industrial parks, or investing in large development projects. In the United States, the Bureau of Reclamation, Tennessee Valley Authority, and Appalachian Regional Commission are examples of federal government organizations that promote economic development. The Bureau of Reclamation's mission is to promote the development of the western United States, and it has built many large hydroelectric dams, including the Hoover Dam and Grand Coulee Dam, to provide water and electricity for cities, industry, and agriculture. State and local governments promote economic development by offering incentives and subsidies to industries who agree to build plants in specific places. These incentives are a way for communities and regions to lure footloose industries to specific places, but they often ending up pitting communities and regions against each other to the benefit of the private company (see the feature "Contests and Bribery").

Agglomeration Economies

Geographical concentration of economic activities is the norm. We take it for granted that certain places are associated with certain products. Hollywood makes films; Silicon Valley makes computer software; Detroit makes automobiles; and Pittsburgh used to make steel. Weber's least-cost theory made provision for *agglomeration,* the spatial concentration of people and activities for mutual benefit. That is, clustering of industrial activities may produce benefits for individual firms that they could not experience in isolation. Those **agglomeration economies** are a form of **external economies;** that is, benefits that firms enjoy due to factors outside the firm. The benefits of agglomeration economies come from linkages among firms and savings from shared transport facilities, worker training programs, social services, public utilities, communication facilities, and forms of industrial **infrastructure.**

Geographic clusters are centers of innovation as knowledge and new ideas are shared among related firms. Clustering of similar firms creates pools of skilled and ordinary labor, of capital, suppliers, ancillary business services, and, of course, a built-in market of other industries and urban populations. New firms, particularly, may find significant advantages in locating near other firms engaged in the same activity because specialized workers and support services specific to that activity are already in place. Thus, for example, it is not surprising that Facebook, which started at Harvard University in Massachusetts, moved its headquarters to Silicon Valley, where it could find the skilled software professionals the young company needed. A concentration of capital, labor, management skills, customer base, and infrastructure will tend to attract still more industries to the cluster. In Weber's terms, agglomeration economies alter locational decisions that otherwise would be based solely on transportation and labor costs, and once in existence, agglomerations will tend to grow (**Figure 9.13**). Through a **multiplier effect,** each new firm added to the agglomeration will lead to the further development of infrastructure and linkages. As we shall see in Chapter 11, the "multiplier effect" also implies total (urban) population growth, and thus the expansion of the labor pool and the local market that are part of agglomeration economies.

Agglomeration—concentration or clustering—of like industries in small areas dates from the early industrial age and continues with many of the newest industries. Familiar examples include the town of Dalton, Georgia, home to all but one of the top 20 U.S. carpet makers, and Akron, Ohio, which, before 1930, held almost the entire 100 or so tire manufacturers in the country. Silicon Valley dating from the 1960s and other more recent high-tech clusters simply continue the tradition.

On the other hand, agglomeration may have disadvantages. Overconcentration can result in diseconomies of congestion, high land values, pollution, and rising labor costs. When the costs of aggregation exceed the benefits, a firm will actually profit by relocating to a more isolated position, a process called **deglomeration.** It is a process seen in the suburbanization of industry within metropolitan areas or the relocation of firms to nonmetropolitan locations.

Just-in-Time and Flexible Production

Traditional theories sought to explain location decisions for plants engaged in mass production for mass markets where transportation lines were fixed and transport costs relatively high. Both conditions began to change significantly during the late 20th century. Assembly-line work that breaks the production process into many repetitive, low-skill tasks in order to produce large quantities of identical commodities for mass markets efficiently is known as "**Fordism,**" in honor of Henry Ford's pioneering role in implementing this idea. Increasingly, Fordist production processes have been moved to low-wage countries, and in advanced economies, Fordism was replaced by post-Fordist *flexible manufacturing* processes based on smaller production runs of a greater variety of goods aimed at smaller, niche markets. Agglomeration economies are encouraged by newer manufacturing approaches practiced by both older, established

Figure 9.13 On a small scale, the planned industrial park furnishes its tenants some of the agglomeration economies offered by large urban concentrations. An industrial park provides a subdivided tract of land developed according to a comprehensive plan for the use of firms. Because the park developers, whether private companies or public agencies, supply the basic infrastructure of streets, water, sewage, power, transport facilities, and perhaps private police and fire protection, tenants are spared the additional cost of providing these services themselves. In some instances, factory buildings are available for rent, still further reducing start-up costs. Counterparts of industrial parks for manufacturers are the office parks, research parks, and science parks for "high-tech" firms and for service enterprises.

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industries and by newer, post-Fordist plants. Traditional Fordist industries required the on-site storage of large lots of materials and supplies ordered and delivered well in advance of their actual need in production. That practice permitted cost savings through infrequent ordering and reduced transportation charges and made allowances for delayed deliveries and for inspection of received goods and components. The assurance of supplies on hand for long production runs of standardized outputs was achieved at high inventory and storage costs.

Just-in-time (*JIT*) manufacturing, in contrast, seeks to reduce inventories for the production process by purchasing inputs for arrival just in time to use and producing output just in time to sell. Rather than costly accumulation and storage of supplies, JIT requires frequent ordering of small lots of goods for precisely timed arrival and immediate deployment to the factory floor. JIT manufacturing is often associated with Toyota, whose engineers developed the concept from American management consultants and watching American companies. Such *lean manufacturing* based on frequent purchasing of immediately needed goods demands rapid delivery by suppliers and encourages them to locate near the buyer. The trend toward JIT manufacturing, thus, reinforces the spatial agglomeration tendencies evident in the older industrial landscape.

JIT is one expression of a transition from mass-production Fordism to *flexible production systems.* That flexibility is designed to allow producers to shift quickly and easily between different levels of output and, importantly, to move from one factory process or product to another as market demand dictates. Flexibility of that type is made possible by new technologies of easily reprogrammed computerized machine tools and by computer- aided design and computer-aided manufacturing systems. These technologies permit small-batch, JIT production and distribution responsive to current market demand, as monitored by computer-based information systems.

Flexible production to a large extent requires significant acquisition of components and services from outside suppliers rather than from in-house production. For example, modular assembly, where many subsystems of a complex final product enter the plant already assembled, reduces factory space and worker requirements. The premium that flexibility places on proximity to component suppliers adds still another dimension to industrial agglomeration tendencies. *Flexible production regions* have emerged in response to the new flexible production strategies and dependencies on outside suppliers. Those regions have a different set of labor-owner relations and are usually located some distance—spatially or socially—from established concentrations of entrenched Fordist industrialization.

Comparative Advantage, Offshoring, and the New International Division of Labor

The principle of **comparative advantage** extends the capitalist division of labor from individual workers to the economies of entire regions and countries. The principle of comparative advantage asserts that areas and countries can best improve their economies and living standards through specialization and trade. Each area or country should concentrate on the production of those items for which it has the greatest relative advantage over other areas and imports all other goods. This principle is one of the most important justifications for free trade between countries.

The logic of comparative advantage was recognized by economists in the 19th century when specialization and exchange involved shipments of grain, coal, or manufactured goods whose relative costs of production in different areas were clearly evident. Today, when other countries' comparative advantages may reflect lower costs for labor, land, and capital, the application of the principle is questioned by some critics. They observe that manufacturing activities may relocate from higher-cost

developed country locations to lower-cost foreign production sites, taking jobs and income away from the developed country. The temptation is obvious when looking at the wide variation in hourly compensation costs (wages plus benefits) for manufacturing work. According to the U.S. Bureau of Labor Statistics, costs vary from $58 per hour in Norway and $35 per hour in the United States to just $6 per hour in Mexico and $1.90 per hour in the Philippines. Defenders of outsourcing, however, argue that the increased efficiencies due to such voluntary **outsourcing** increases overall prosperity.

Outsourcing has also come to mean subcontracting production and service sector work to outside (often nonunion) domestic companies. In manufacturing, outsourcing has become an important element in JIT acquisition of preassembled components for snap-together fabrication of finished products, often built only to fill orders actually received from customers. Reducing parts inventories and introducing build-to-order production demands a high level of flexible freight movement increasingly supplied by *logistics* firms that themselves may become involved in packaging, labeling, and even manufacturing products for client companies.

A clear example of the impact of outsourcing is evident in the changing nature of automobile manufacturing. Formerly, motor vehicle companies were largely self-contained production entities. At one time, Ford Motor Company even owned its own rubber plantations. Ford's River Rouge Complex near Detroit made its own steel and glass, turning raw materials into automobiles. Since the early 1990s, that self-containment has been abandoned because car companies have divested themselves of raw material production facilities and have in large part sold off their in-house parts production departments. Increasingly, they purchase parts from independent, often distant, suppliers. In fact, some observers of the changing vehicle production scene predict that established automobile companies will eventually convert themselves into "vehicle brand owners," retaining for themselves only such essential tasks as vehicle design, engineering, and marketing. All else, including final product assembly, is projected to be done through outsourcing to parts suppliers. Similar trends are already evident in consumer electronics, where a significant portion of production is outsourced.

A distinctive example of outsourcing is found along the northern border of Mexico. In the 1960s, Mexico enacted legislation permitting foreign (specifically, U.S.) companies to establish "sister" plants, called **maquiladoras,** within 20 kilometers (12 miles) of the U.S. border for the duty-free assembly of products destined for re-export. By the early 20th century, more than 3,000 such assembly and manufacturing plants had been established to produce a diversity of goods, including electronic products, textiles, furniture, leather goods, toys, and automotive parts. The plants generated direct and indirect employment for more than a million Mexican workers (**Figure 9.14**) and for large numbers of U.S. citizens, employees of growing numbers of American-side *maquila* suppliers and of diverse service-oriented businesses spawned by the "multiplier effect." The North American Free Trade Agreement (NAFTA), which created a single Canadian–U.S.–Mexican production and marketing community, simplifies outsourcing in the North American context. It has led

Figure 9.14 U.S. manufacturers, seeking lower labor costs, began in the 1960s to establish light manufacturing, component production, and assembly operations along the international border in Mexico. Outsourcing to such maquiladoras as this factory in Ciudad Juarez has moved a large proportion of U.S. electronics, small appliance, toy, and garment industries to offshore subsidiaries or contractors in Asia and Latin America. In the last few years, Mexican maquiladoras have been losing jobs to competition from lower-cost, more-efficient Chinese and other Asian producers. Comparative advantage is not a permanent condition.

to significant shifts in the location of production activities, some of which have hurt local economies (**Figure 9.15**).

On the broader world scene, outsourcing often involves production of manufactured goods by developing countries that have benefited from the transfer of technology and capital from industrialized states. For example, electrical and electronic goods from China and Southeast Asia compete with and replace in the market similar goods formerly produced by Western firms. Such outsourcing has resulted in new global patterns of industrial regions and specializations. They have also strikingly changed the developing world's share of gross global output (see Chapter 10 for more on that subject). Outsourcing not only involves manufacturing activity and blue-collar jobs but also, as we shall see later in this chapter, may be used by companies to reduce their service worker costs When that reduction involves janitorial and similar services spatially tied to the home establishment, no job losses are felt. When, however, lower-paid foreign workers can satisfactorily replace technical, professional, and white-collar workers, the outsourcing action is known as service *offshoring* and has the immediate effect of exporting the jobs of highly paid skilled workers.

Offshoring is the practice of either hiring foreign workers or, commonly, contracting with a foreign third-party service provider to take over and run particular business processes or operations, such as call centers or accounting, billing, and similar nonproduction "back-office" aspects of manufacturing. Offshoring has become an increasingly standard cost-containment strategy, due to the steep decline in communication costs, faster

Figure 9.15 Economic change in postindustrial economies. Brantford, Ontario, was once Canada's major manufacturer of agricultural machinery and equipment. The closure of this Massey-Ferguson tractor factory was a consequence of the economic changes that followed the North American Free Trade Act. Production was shifted to lower-cost locations, increasing overall economic efficiency, but harming workers and factory towns. The plant closure typifies the painful structural changes that accompany deindustrialization. The abandoned plant is a **brownfield site** facing issues of blight and pollution. Some cities have been successful in attracting service jobs and redeveloping brownfield sites for commercial, housing, or recreational uses. In Brantford, however, this site and others like it remain derelict.

Internet bandwidth, and the growing technical skills of foreign workers. With an ever-increasing portion of the developing world acquiring the education and experience to provide skilled professional services of almost every kind at a level comparable to that formerly available only in advanced countries, traditional notions of comparative advantage are disappearing in the face of a new era of *hypercompetition,* at least in business and professional services. India in particular has emerged as the dominant competitor and beneficiary of services offshoring, echoing China's position as the preferred destination of production outsourcing.

The exploitation of comparative advantage and utilization of outsourcing and offshoring, by transferring technology from economically advanced to underdeveloped economies is transforming the world economy by introducing a **new international division of labor (NIDL).** In the 19th century and the first half of the 20th century, the division of labor involved exports of manufactured goods from the "industrial" countries and raw materials from the "colonial" or "undeveloped" economies. Roles have now altered (see the feature "Where Do Your Clothes Come From?"). Manufacturing no longer is the mainstay of the economy of developed countries, and the world pattern of industrial production is shifting to reflect the growing dominance of *newly industrializing countries* that were formerly peasant societies. In recognition of that shift, the NIDL builds on the current trend toward the increased subdivision of manufacturing processes into smaller steps. That subdivision permits multiple outsourcing and offshoring opportunities based on differential land, labor, and capital costs and skill levels available in the globalized world economy, opportunities effectively exploited by transnational corporations.

Transnational Corporations (TNCs)

Outsourcing is just one small expression of the growing international structure of today's manufacturing and service enterprises. Businesses are increasingly stateless and economies borderless as giant **transnational corporations (TNCs)** become ever more important in the globalizing world economy. TNCs (also known as *multinational companies*) are private firms that have established branch operations in foreign nations. The total annual revenue of the world's largest TNCs rivals the gross domestic product (GDP) of entire countries. For example, Wal-Mart Stores in 2010 had $408 billion in revenues which, if it were a country, would have placed it 24th in the world, just behind Norway and ahead of Venezuela. The largest TNCs, with the exception of Wal-Mart, are engaged in petroleum exploration, refining and distribution, automobiles, or electrical and electronic equipment. TNCs are increasingly international in origin and administrative home, based primarily in a growing number of both economically advanced and newly industrializing countries. In 2008,

Where Do Your Clothes Come From?

One of the distinguishing characteristics of humans is that we (almost always) clothe our bodies. The clothing we wear expresses our culture, values, social status, and self-identity. In the United States, at least, clothes are required to carry a label indicating the country of origin. A quick check through your closet is likely to reveal the international nature of the clothing industry. Clothing is second only to agriculture as the leading product in international trade. Textiles and clothing production were at the heart of the original Industrial Revolution and are one of the leading ways for developing countries to begin industrialization. The clothing industry was the leader in globalizing production and creating a new international division of labor. The technological requirements are fairly simple, and the production process is labor-intensive, offering a comparative advantage to low-wage countries. After World War II, Japan used clothing production to jump-start its manufacturing sector. The newly industrializing countries, particularly China, are following that pattern. China is now the world's leading clothing manufacturer and is gaining share at the expense of most other countries. The geography of clothing production is changing rapidly. In a vintage clothing store, many of the clothes will have been manufactured in the United States.

Broader trends in manufacturing are also evident in the clothing industry. Export-processing zones are common for garment manufacturing. *Maquiladoras* along the Mexico-U.S. border assumed an important role after the passage of the North American Free Trade Act. JIT manufacturing and lean, flexible manufacturing has become increasingly important, along with more rapid turnover of styles with the advent of fast-fashion as pioneered by global brands such as the Swedish retailer H&M and the Spanish brand Zara. While most mass-market production has moved to developing countries, most major brands and customers are based in the developed countries. High-end fashion production must be closely connected to the designers and shows in the major fashion centers of New York, London, Paris, and Milan. Thus, most production of higher-priced, specialty fashion remains near those cities. Lower-cost fashion, especially for discount retailers, has moved relentlessly to the lowest-wage countries.

Working conditions in clothing factories (or *sweatshops* as they are sometimes known) remain a major concern of human rights watch groups. The workers, who are mostly female, may be subjected to long hours and unsafe working conditions, with little recourse to file complaints.

91 of the world's 100 largest nonfinancial TNCs had home offices in Europe, the United States, or Japan. However, cash-rich multinationals of such developing world states as China, Korea, Mexico, Malaysia, Taiwan, India, and Brazil were moving up the list. Through their own surging growth and through mergers and acquisitions, formerly developing world regional players have emerged as major global forces.

The direct impact of TNCs is limited to relatively few countries and regions. **Foreign direct investment (FDI)**—the purchase or construction of factories and other fixed assets by TNCs—has been a significant engine of globalization. Although more than half of FDI goes from one developed country to another developed country, a growing proportion is invested in less-developed economies, potentially stimulating their economic growth. The three main sources for outward FDI are the countries or regions that are home to the largest TNCs—the United States, Europe, Hong Kong, and Japan. Within Europe, the United Kingdom, Germany, and France are the leaders in FDI. The leading destinations for inward FDI are Hong Kong, China, Singapore, Mexico, Brazil, and India. Distance and proximity influence where FDI flows go. For example, FDI from the United States is more likely to go to Latin America, and Asian countries are more likely to invest in other Asian countries.

The portion of FDI going to the 50 least developed countries as a group—including nearly all African states—remains less than 5 percent. Despite poor countries' hopes for foreign investment to spur their economic growth, critics argue that it is counterproductive. Economic control is lost to a foreign firm and may undermine political sovereignty as the TNC demands subsidies and tax breaks. TNCs may rely on foreign suppliers instead of local firms, bankrupt local competitors who lack the capital to compete, and then return their profits to the home country rather than reinvesting them in the host country.

Investment outflows from companies based in India, Brazil, South Africa, Malaysia, and China (among others) have swelled, with an increasing share going to other developing countries. Because more than 80 percent of the world's 7 billion consumers live in the expanding less-developed nations, TNCs based in newly industrializing countries have the strength of familiarity with those markets and have an advantage in supplying them with goods and services that are usually cheaper and more effectively distributed than those of many Western TNCs.

The advanced-country destination of more than half of FDI capital flows is understandable: TNCs are actively engaged in merging with or purchasing competitive established firms in already developed foreign market areas, and cross-border mergers and acquisitions have been the main stimulus behind FDI. Because most transnational corporations operate in only a few industries—computers, electronics, petroleum and mining, motor vehicles, chemicals, and pharmaceuticals—the worldwide impact of their consolidations is significant. Some dominate the marketing and distribution of basic and specialized commodities. In raw materials, a few TNCs account for 85 percent or more of world trade in wheat, corn, coffee, cotton, iron ore, and timber,

Figure 9.16 The number of transnational corporations has grown rapidly since the 1970s. Of the top 100 TNCs, 91 are headquartered in the Triad—Europe, the United States, and Japan. Their recognition and impact of TNCs, however, are global, as suggested by this scene from the developing world, a Nestlé factory (headquartered in Switzerland) in Tianjin, China.

(a) ©Zhang Peng/Getty Images

for example. Because they are international in operation with multiple markets, plants, and raw material sources, TNCs actively exploit the principle of comparative advantage and seize opportunities for outsourcing and offshoring. In manufacturing, they have internationalized the plant-siting decision process and multiplied the number of locationally separate operations that must be assessed. TNCs produce in that country or region where costs of materials, labor, or other production inputs are minimized, or where existing efficient company-owned factories can be easily expanded to produce for a global, rather than simply a national, market. At the same time, they can maintain operational control and pay taxes where the economic climate is most favorable. Research and development, accounting, and other corporate activities are placed wherever economical and convenient.

TNCs have become global entities because global communications make it possible (**Figure 9.16**). Many have lost their original national identities and are no longer closely associated with or controlled by the cultures, societies, and legal systems of a nominal home country. At the same time, their multiplication of economic activities has reduced any earlier identification with single products or processes and given rise to "transnational integral conglomerates" that span a large spectrum of both service and industrial sectors.

9.3 High-Technology Manufacturing

Classic location theories are less effective in explaining the location of high-technology (or *high-tech*) research, development, and manufacturing activities. For these firms, new and different patterns of locational orientation have emerged based more on human talent than the traditional factors of raw materials and transportation costs.

High technology is more a concept than a precise definition. It probably is best understood as the application of intensive scientific and engineering research and development to the creation and manufacture of new, technologically advanced products. Professional—"white collar"—workers make up a large share of the total workforce. They include research scientists, engineers, and skilled technicians. When these highly skilled specialists are added to administrative, supervisory, marketing, and other professional staffs, they may greatly outnumber the actual production workers in a firm.

Although only a few types of industrial activity are generally reckoned as exclusively high-tech—electronics, communication, computers, software, pharmaceuticals, biotechnology, and aerospace—advanced technology is increasingly a part of the structure and processes of all types of industry. Robotics on the assembly line, computer-aided design and manufacturing, electronic controls of smelting and refining processes, and the constant development of new products of the chemical industries are cases in point.

The impact of high-tech industries on patterns of economic geography is expressed in at least three ways. First, high-tech activities are major factors in employment growth, manufacturing output, and the total gross value added (GVA)[1] for many individual countries. Relatively high wages in high-tech occupations reflect the level of training and specialization they require.

Second, high-tech industries have tended to become regionally concentrated in centers of innovation, frequently forming self-sustaining, highly specialized agglomerations (**Figure 9.17**). Third, the offshoring of less-skilled production and assembly tasks has spurred the economic development of newly industrializing countries.

Concentrations of high-tech employment include California, the Pacific Northwest (including British Columbia), New England, New Jersey, Texas, and Colorado. And within these and other states or regions of high-tech concentration, specific locales have achieved prominence: "Silicon Valley" of Santa Clara County near San Francisco; Irvine and Orange County south of Los Angeles; the "Silicon Forest" near Seattle; North Carolina's Research Triangle; Utah's "Software Valley"; Routes 128 and 495 around Boston; "Silicon Swamp" of the Washington, D.C., area; "Silicon Alley" in Manhattan; Ottawa, Canada's "Silicon Valley North"; and the Canadian Technology Triangle, west of Toronto (**Figure 9.18**).

Within such concentrations, specialization is often the rule: biomedical technologies in Minneapolis and Philadelphia; biotechnology around San Antonio; computers and semiconductors in the "Silicon Hills" of Austin, Texas; biotechnology and telecommunications in New Jersey's Princeton Corridor; and telecommunications and Internet industries

[1]GVA is linked to GDP; the link can be defined as GVA + taxes on products – subsidies on products = GDP.

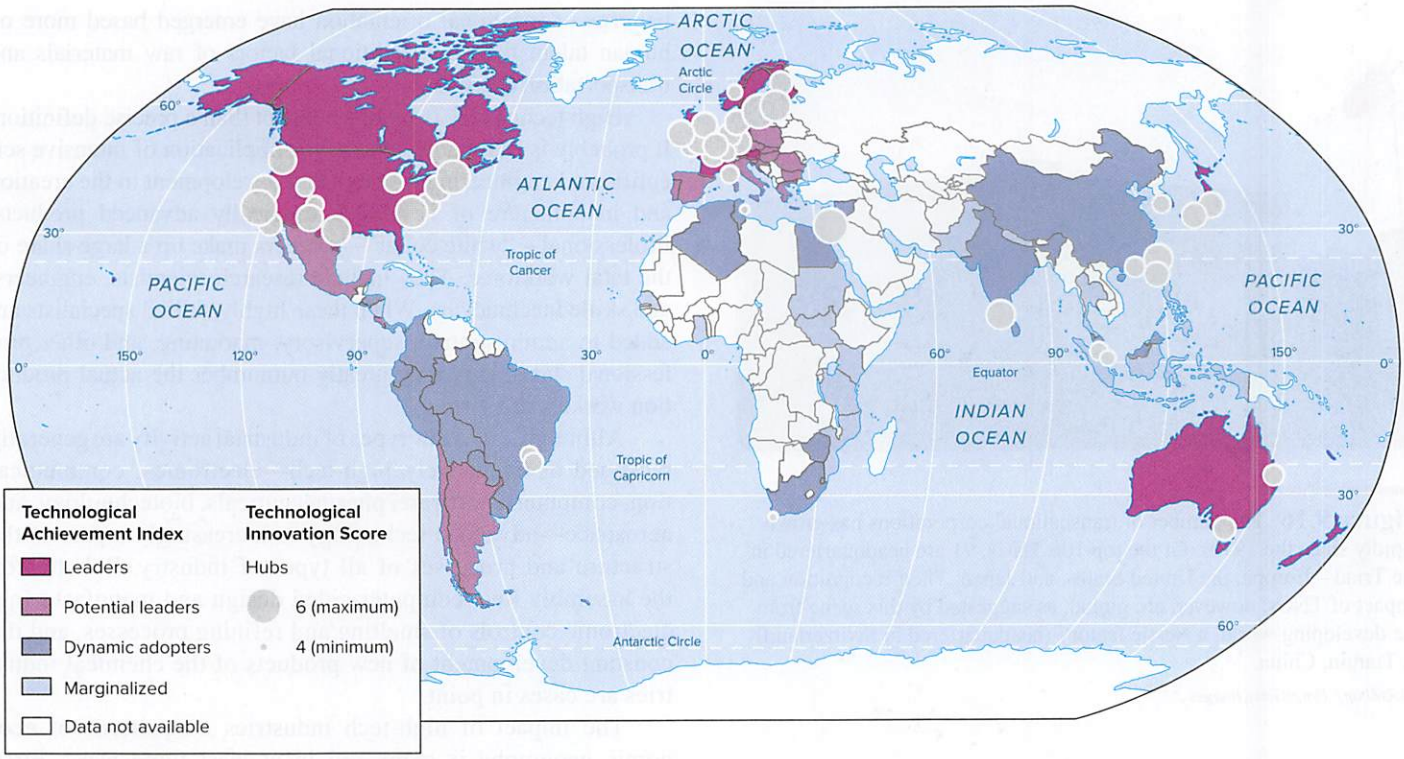

Figure 9.17 Global hubs of technological innovation. The technology innovation hubs shown with circles were identified by *Wired* magazine in 2000 based on the presence of research universities, research laboratories, established technology companies, venture capital, and entrepreneurial activity. The highest scoring regions were Silicon Valley (California), Boston (Massachusetts), Stockholm (Sweden), Israel, Research Triangle (North Carolina), and London (U.K.). The technological achievement index was generated by the United Nations.

Source: United Nations Human Development Report, *2001. Adapted from Bradshaw, White, Dymond, and Chacko, Contemporary World Regional Geography, 2009.*

Figure 9.18 Silicon Valley, the area around San Jose, California, just south of San Francisco, is the world's leading hub for high-tech innovation. The valley was once known for its orchards, but is now home to world-leading technology companies such as Apple, Cisco, eBay, Google, Hewlett-Packard, Intel, Oracle, and Yahoo. It was named for the silicon chips used in semiconductors in the computer and electronics industries. Silicon Valley illustrates agglomeration economies where in certain places, knowledge of how to make a particular product is "in the air." The region offers a high quality of life, institutions such as Stanford University and government research labs, and an incredible concentration of skilled workers who can share ideas in formal or informal social settings.

near Washington, D.C. Elsewhere, Scotland's Silicon Glen, England's Sunrise Strip and Silicon Fen, Wireless Valley in Stockholm, China's Zhong Guancum in suburban Beijing and the High-Tech Industries Zone in Xian, and Hitec City at Hyderabad, Pune, and Bangalore, India, are other examples of industrial landscapes characterized by low, modern, dispersed office-plant-laboratory buildings rather than by massive factories, mills, and railyards.

The map of high-tech industries shows that they respond to different factors than heavy manufacturing industries. At least five locational tendencies have been recognized: (1) Proximity to major research universities or government research laboratories that create a large pool of scientific and technical labor skills; (2) avoidance of areas with strong labor unionization, where rigid contracts slow innovation and workforce flexibility; (3) locally available venture capital and entrepreneurial skills; (4) a reputation for a good "quality of life"—climate, scenery, recreation, cultural activities, good schools and neighborhoods, and job opportunities for professionally trained spouses; and (5) availability of first-rate communication and transportation facilities to unite research, development, and manufacturing operations and to connect the firm with suppliers, markets, finances, and government agencies. Most major high-tech agglomerations have developed on the suburban edges of metropolitan areas, far from inner-city problems and disadvantages.

Agglomeration economies are extremely important to high-tech industries. The formation of new firms is frequent and rapid in industries where discoveries are constant and innovation is continuous. Because many are "spin-off" firms founded by employees leaving established local companies, areas of existing high-tech concentration tend to spawn new entrants and to provide necessary labor skills. In essence, talent is the essential raw material for high-tech firms and talent clusters in specific locations.

Not all phases of high-tech production, however, must be concentrated. The professional, scientific, and knowledge-intensive aspects of the high-tech economy are often located far from the component manufacturing and assembly operations. Highly automated or low-skill assembly tasks are footloose; they require highly mobile capital and technology investments, but they may be performed at a lower cost in lower-wage countries such as China, Taiwan, Singapore, Malaysia, or Mexico. Major high-tech companies such as Apple, Sony, and Microsoft outsource assembly of electronic devices to independent contract manufacturers. Most often the same factory produces similar or identical products under a number of different brand names (**Figure 9.19**). Unfortunately, extreme pressures to meet production deadlines have led to reports of abusive working conditions at a number of contract electronics manufacturers.

High-tech products often have complex, highly international **commodity chains**—steps in the production and distribution process. The iPhone was designed by U.S. engineers, but its manufacture uses rare metals from Asia and Africa and specialized components manufactured in Germany, Korea, Taiwan, and Japan, all of which come together in an assembly plant in China.

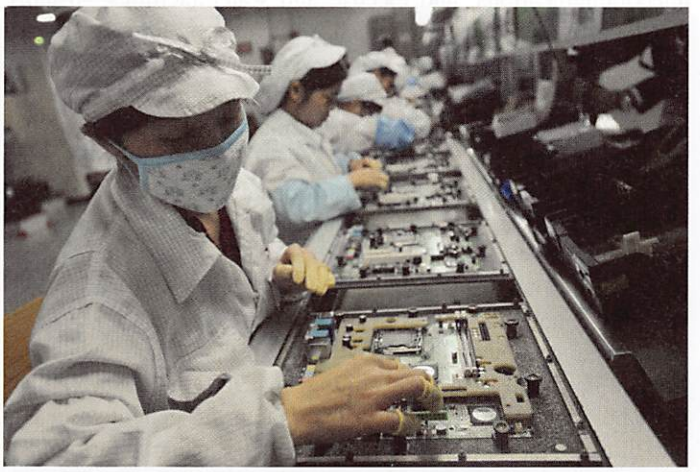

Figure 9.19 Contract electronics manufacturing. Assembly work that can be broken down into multiple, repetitive steps is often outsourced to overseas contractors, many based in Asia. The Taiwanese company FoxConn Technology Group operates large assembly plants in China, Brazil, Mexico, and the Czech Republic, employing more than 900,000 workers in 2010. It manufactures many of the most popular computer, consumer electronics, and communications devices, including the iPad, iPhone, PlayStation 4, Xbox One, and Amazon Kindle. Its largest plant in Shenzhen, China, nicknamed FoxConn City, is a walled, self-contained campus, complete with factories, dormitories, and all the services needed by its approximately 250,000 workers.

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Through such outsourcing and technology transfers, high-tech activities are spread to newly industrializing countries—from the center to the periphery. This globalization through geographic transfer and diffusion represents an important impact of high-tech activities on world economic geographic patterns. For example, by 2005, China had surpassed the United States in exporting information-technology goods, such as laptop computers, mobile phones, and digital cameras. With rising education levels, countries such as China, India, Singapore, and South Korea are producing large numbers of highly trained scientists and engineers capable of doing much more than assembly work. Thus, computer software companies have begun taking advantage of India's strengths in engineering and computer science, making Bangalore and Hyderabad major world players in software development.

9.4 World Manufacturing Patterns and Trends

Growth and change have produced a distinctive world pattern of manufacturing. While **Figure 9.20** suggests a large number of industrial concentrations, in fact four regions are commonly recognized as most significant: *Eastern North America, Western and Central Europe, Eastern Europe,* and *Eastern Asia.* Together, the industrial plants within these established regional clusters account for an estimated three-fifths of the world's manufacturing output by volume and value.

Their continuing dominance is by no means assured. The first three—those of North America and Europe—were the beneficiaries of an earlier phase in the development and spread of manufacturing following the Industrial Revolution of the 18th and 19th centuries and lasting until after World War II. The countries within them now are increasingly postindustrial, and traditional manufacturing and processing are declining in relative importance.

The fourth—the East Asian district—is part of the wider, newer pattern of world industrialization that has emerged in recent years, the result of massive international *cultural convergence* and technology transfers in the latter half of the 20th century and early in the 21st. The older, rigid economic split between the developed and developing worlds has rapidly weakened as the full range of industrial activities from primary metal processing (e.g., the iron and steel industries) through advanced electronic assembly has been established within an ever-expanding list of countries.

Such states as Mexico, Brazil, China, and others of the developing world have created industrial regions of international significance, and the contribution to world manufacturing activity of the smaller newly industrializing countries (NICs) has been growing significantly. The list of NICs includes the four Asian tigers: South Korea, Hong Kong, Singapore, and Taiwan. They each developed by combining a well-educated workforce,

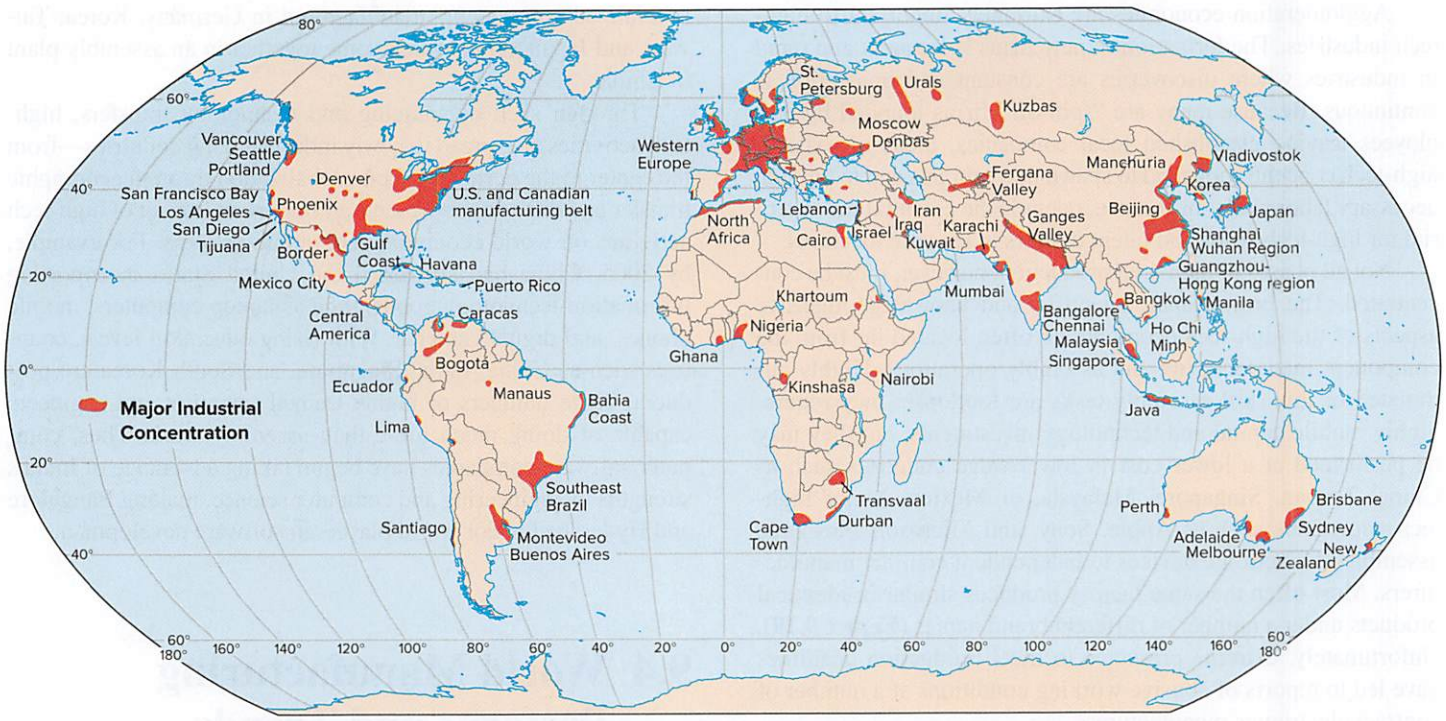

Figure 9.20 World industrial regions. Industrial districts are not as continuous or "solid" as the map suggests. Manufacturing is a relatively minor user of land even in the areas of greatest concentration.

infrastructure investments, and policies supporting export-oriented industrialization. Following them came the Asian dragons: Malaysia, Indonesia, and Thailand. The largest of all NICs is China, the world's most populous country, which has seen phenomenal economic growth since the 1970s, passing Japan in 2010 to become the world's second-largest economy after the United States. Latin American NICs include Mexico, Chile, and Brazil.

The spreading use of efficient and secure containerized shipment of high-value goods has been a major contributor to the competitive success of NICs. Even economies that until recently were dominated by the **primary sector** have become important players in world manufacturing. Foreign branch plant investment in low-wage Asian, African, and Latin American states has not only created an industrial infrastructure but also increased their gross national products (GNPs) and per capita incomes sufficiently to permit expanded production for growing domestic—not just export—markets.

Much of that new plant investment and expanded developing country industrial production has concentrated within the great number of *export processing zones (EPZs)* recently created within those countries. An EPZ may be either a delimited geographical area or, frequently, an export-oriented manufacturing enterprise located anywhere within a host country that benefits from special investment incentives. These incentives usually include exemptions from customs duties, preferential treatment from various regulatory and financial regulations, and the provision of high-quality infrastructure—airports, highways, telecommunications, and electric and water facilities—usually provided by the local or national governments. Enterprises operating within or as an EPZ usually enjoy preferential conditions under which they can import equipment, components, and raw materials duty free to produce goods mainly for export. And exports from those zones generally are afforded **tariff** reductions or duty-free entry into receiving European and North American markets. Because of their obvious production-site advantages, therefore, EPZs are both favored locations for transnational corporation outsourcing and an economic development tool for developing countries competing for TNC investments.

The importance of manufacturing in the United States and Canada has been steadily declining. In 1960, the 28 percent of the labor force that engaged in manufacturing generated nearly one-third of the region's wealth. By 2010, manufacturing employment had dropped to just over 10 percent of a much larger labor force.

Deindustrialization—the declining relative share of manufacturing in a nation's economy—has picked up pace in the past two decades. Outsourcing and the new international division have shifted the spatial patterns of industrial production. While the map of production is dynamic, communities are fixed in space and can be devastated by the closure of large manufacturing plants. Cities that lose major employers can enter a downward cycle of falling incomes, declining tax revenues, and higher social services costs. High unemployment, closed factories, closed stores, abandoned houses, and less money for roads and schools become the norm. Between 1998 and 2008,

the United States lost about one-fourth of its manufacturing jobs, many of them high-wage jobs. The decline in manufacturing employment was due to a combination of replacing labor with capital (equipment) and overseas competition. Particularly hard hit were the industrial cities of the manufacturing belt and the Southeast, where unemployment rates have been among the highest in the country.

The Industrial Revolution that began in England in the late 1700s and spread to the continent during the 19th century established Western and Central Europe as the world's premier manufacturing regions and the source areas for the diffusion of industrialization across the globe. Europe accounted for 80 percent of the world's industrial output by 1900, although, of course, its relative position has since eroded, particularly after World War II.

Water-powered textile mills in England began the Industrial Revolution, but it was coal that fueled the full industrialization of Europe. Consequently, coal fields were the sites of new manufacturing districts in England, northern France, Belgium, central Germany, the northern Czech Republic, southern Poland, and eastward to southern Ukraine.

9.5 Tertiary Activities

Primary activities are connected directly to the Earth through gathering, extracting, or growing raw materials. *Secondary* industries, we have seen in this chapter, turn the raw materials of primary industry into useful products through manufacturing or processing. A major and growing segment of both domestic and international economic activity, however, involves *services* rather than the production of commodities. These **tertiary activities** consist of business and labor specialties that provide services to the primary and secondary sectors, to the general community, and to individuals.[2] They provide intangible products ranging from education to haircuts, rather than tangible commodities such as finished goods.

As we have seen, regional and national economies undergo fundamental changes in emphasis in the course of their development. Subsistence societies exclusively dependent on primary industries may progress to secondary stage processing and manufacturing activities. In that progression, the importance of agriculture as an employer of labor or a contributor to national income declines as manufacturing expands. Many parts of the formerly underdeveloped world have made or are making that developmental transition, as we shall review in Chapter 10.

In contrast, many of the economically advanced countries that originally dominated the world manufacturing scene experienced deindustrialization in the late 20th and early 21st centuries. Rising labor costs in advanced economies, space-shrinking technologies for communications and transportation, the growth of transnational corporations, technology transfer to developing countries, and outsourcing of processing or assembly work have produced a new international division of labor. The earlier competitive manufacturing advantages of the developed countries could no longer be maintained and were replaced by a new focus on service activities. Based on the contribution of each sector to their GDPs, it is the advanced economies that have most completely made that transition and are often referred to as *postindustrial* (Table 9.1).

Table 9.1

Contribution of the Service Sector to GDP

	Percentage of GDP		
Country Group	**1960**	**1980**	**2010**
Low-income	32	30	50
Middle-income	47	46	56
High-income	54	59	73
United States	58	63	77
World		55	70

Source: *Data from World Bank*, World Development Indicators, 2011.

Perhaps more than any other major country, the United States has reached postindustrial status. Its primary sector component fell from 66 percent of the labor force in 1850 to 1 percent in 2010, and the service sector rose from 18 percent to 86 percent (Figure 9.21). Virtually all job growth in the past two decades occurred in services. Comparable changes are found in other countries. Today, between 65 percent and 80 percent of jobs in such economies as Japan, Australia, Canada, Israel, and all major Western European countries are also in the services sector.

The significance of tertiary activities to national economies and the contrast between more developed and less-developed states are made clear not just by employment but also by the differential contribution of services to the GDPs of states. The

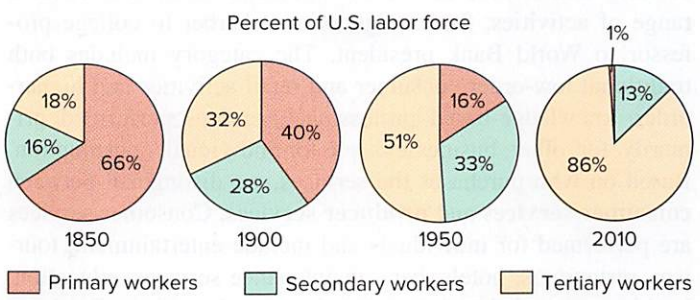

Figure 9.21 Changing sectoral allocation. The changing sectoral allocation of the U.S. labor force demonstrates the transition from a largely agricultural to postindustrial status.

[2] *Quaternary activities* are a subset of tertiary services that consist of information and administrative services, including media, education, research, and information technology.

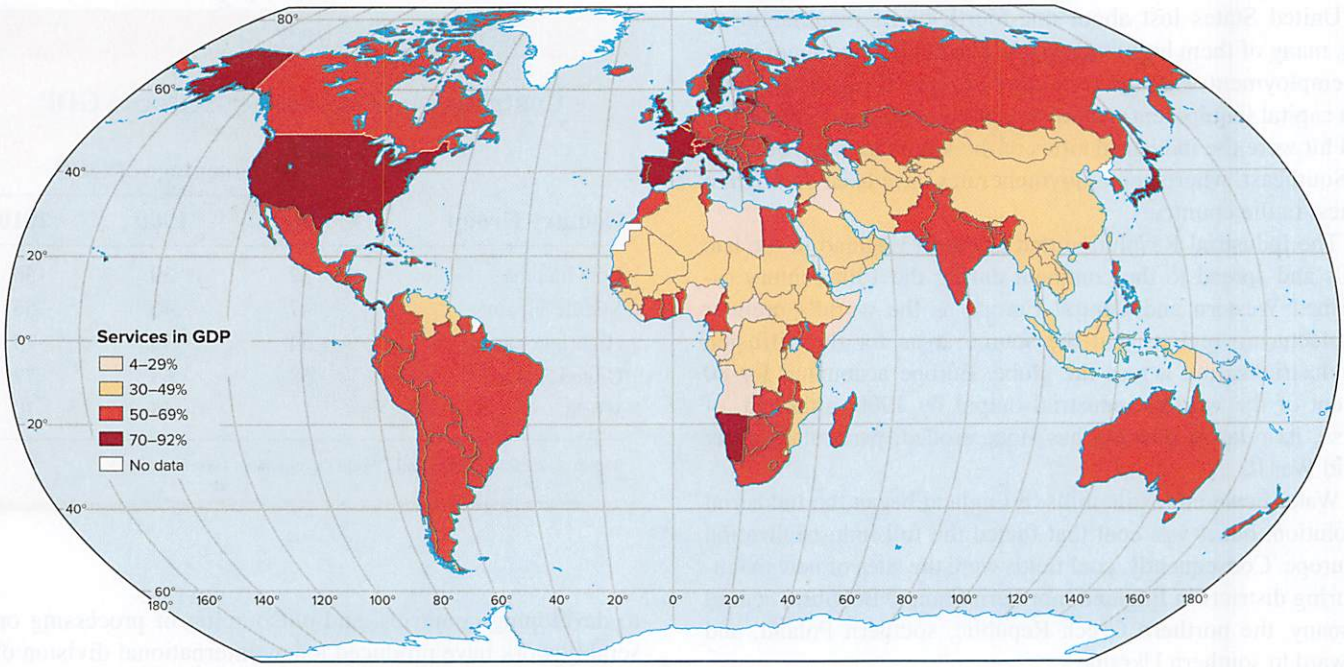

Figure 9.22 Services accounted for 70 percent of global GDP in 2010, up sharply from 55 percent 30 years earlier. As the map documents, the contribution of services to individual national economies varied greatly; Table 9.1 indicates all national income categories shared to some degree in the expansion of service activities.

Source: World Bank, World Development Indicators.

relative importance of services displayed in **Figure 9.22** shows a marked contrast between advanced and subsistence societies. The greater the service share of an economy, the greater the average incomes and economic complexity of that society. That share has grown over time among most regions, and all national income categories as all economies have shared to some degree in economic growth and integration into the world economy. Indeed, the expansion of the tertiary sector in modernizing East Asia, South Asia, and the Pacific has exceeded the world average in recent decades as these regions catch up. In Latin America and the Caribbean, for example, services accounted for 64 percent of total output in 2010.

Types of Service Activities

Tertiary and *service* are broad, imprecise terms that cover a range of activities, from neighborhood barber to college professor to World Bank president. The category includes both traditional low-order consumer and retail activities and higher-order, knowledge-based professional services performed primarily for other businesses, not for individual consumption. Based on who purchases the services, we distinguish between **consumer services** and **producer services.** Consumer services are performed for individuals and include entertainment, tourism, restaurants, hotels, bars, maintenance services, education, health care, and the vast array of personal services. Producer services are performed for corporations and include finance, insurance, real estate, legal services, accounting, architecture, and engineering consulting services. Wholesale and retail trade are categories of services that link producers and consumers. Transportation and communication services also serve both producers and consumers. In addition, government and nonprofit service providers are important components of the service economy.

Growth in the tertiary sector has numerous explanations. It reflects the development of ever more complex social, economic, and administrative structures, the effects of rising personal incomes and changes in family structure and individual lifestyles. For example, in subsistence economies, families care for their own children, produce and prepare their own food, and build and repair their own houses. In postindustrial societies, people hire childcare workers to care for the children, send their children to formal schools and universities, purchase prepared meals in restaurants, and hire contractors to build and/or repair their houses. Similar needs are met, but with very different employment structures.

As personal incomes rise, a greater proportion of income is spent on services rather than primary products or durable goods. If a person gets a raise, he or she might take a cruise vacation or dine out at restaurants more often, but probably will not add a second washing machine. Growth in the health care industry is driven by both rising incomes and the aging of society that inevitably occurs when a society completes the demographic transition. Growing complexity in the economy translates into the need for higher levels of education and training, as well as more government employees to collect taxes, control borders, alleviate poverty, ensure public safety, plan community development, monitor commerce, protect the environment, and maintain safe workplaces.

Part of the growth in the tertiary component is statistical, rather than functional. We saw in our discussion of manufacturing that *outsourcing* was increasingly used to reduce costs and improve efficiency. In the same way, outsourcing of services formerly provided in-house is also characteristic of current business practice. Cleaning and maintenance of factories, shops, and offices—formerly done by the company itself as part of internal operations—now are subcontracted to specialized service providers. The jobs are still done, perhaps even by the same personnel, but worker status has changed from *secondary* (as employees of a manufacturing plant, for example) to *tertiary* (as employees of a service company).

Locational Interdependence Theory for Services

The locational controls for tertiary enterprises are simpler than those for the manufacturing sector. Service activities are by definition market-oriented. Those dealing with transportation and communication are concerned with the location of people and commodities to be connected or moved; their locational determinants are, therefore, the patterns of population distribution and the spatial structure of production and consumption. Just as Weber offered a classic location theory for manufacturing enterprises, economist Harold Hotelling (1895–1973) used simplifying assumptions to create the **locational interdependence** model for retail services. In the locational interdependence model, the location decisions of firms are influenced by those of its competitors. Firms choose locations that give them a measure of *spatial monopoly* so that they maximize revenues, rather than minimizing costs as in Weber's model.

Imagine the location decisions of two firms in competition with each other, each selling identical goods to customers evenly spaced along a linear market. The usual example cited is of two ice cream vendors, each selling the same brand at the same price along a stretch of beach with a uniform distribution of people. Beachgoers will purchase the same amount of ice cream no matter where the store is located (that is, demand is *inelastic*—is not very sensitive to a change in the price or the effort required to obtain a commodity) and will patronize the store closest to them. **Figure 9.23** suggests that the two sellers would eventually cluster at the midpoint of the linear market (the beach) so that each vendor could supply customers to each side of the market area without yielding locational advantage to the other competitor.

This is a spatial solution that maximizes revenues for sellers but does not minimize costs for customers. The lowest total cost location would be for each vendor to locate at the midpoint of his or her half of the beach, as shown at the top of Figure 9.23, where the total effort expended by customers walking to the ice cream stands (or cost by sellers delivering the product) is least. To maximize market share, however, one seller might decide to relocate immediately next to the competitor (Figure 9.23b), capturing three-fourths of the market. The logical retaliation would be for the second vendor to jump back over the first to recapture market share. Ultimately, side-by-side location at

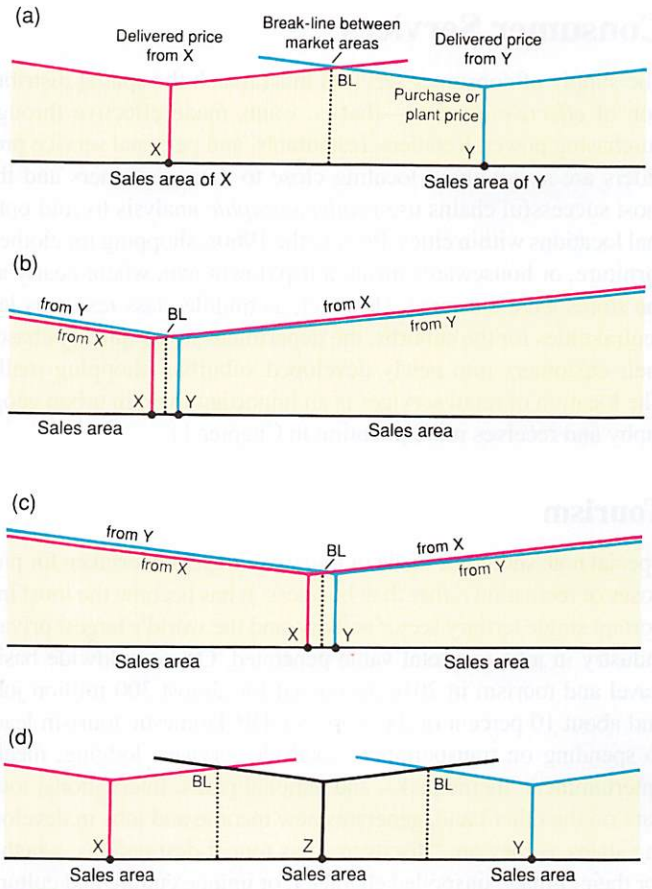

Figure 9.23 Locational interdependence in retail location. The Hotelling model assumes customers evenly spread in a linear market. An example would be vacationers along a beach. (*a*) The initial *socially optimal* locations that minimize total delivery costs (b) will be vacated in the search for market advantage (*c*), eventually resulting in *competitive equilibrium* at the center of the market. This competitive equilibrium poorly serves customers at the periphery. (*d*). Spatial dispersion may occur if another competitor enters the market or the sellers subdivide the market by agreement.

the center line of the beach is inevitable, and a stable placement is achieved because neither seller can gain any further advantage from moving. But now the average customer has to walk farther to satisfy his or her desire for ice cream than initially; that is, the total cost or delivered price (ice cream purchase plus effort expended) has increased. This situation will be a problem for vendors if demand for ice cream is actually *elastic,* which it probably is in most situations. If a third vendor enters the market, the optimal locations for each vendor change to a more dispersed pattern (Figure 9.23d).

The locational interdependence model offers some simple lessons. First, the locational controls for services depend on the locations of both customers and competitors and, under one set of conditions, may produce a clustered pattern and under another set, a dispersed pattern. Second, the Hotelling model suggests that a location solution that optimizes revenue for sellers may not be optimal from the point of view of the customers.

Consumer Services

The supply of consumer services must match the spatial distribution of *effective demand*—that is, wants made effective through purchasing power. Retailers, restaurants, and personal service providers are savvy about locating close to their customers and the most successful chains use *geodemographic* analysis to find optimal locations within cities. Prior to the 1960s, shopping for clothes, furniture, or housewares meant a trip downtown, where nearly all the stores were clustered. However, as middle-class residents left central cities for the suburbs, the department stores quickly chased their customers into newly developed suburban shopping malls. The location of retail services is an important topic in urban geography and receives more attention in Chapter 11.

Tourism

Special note should be made of *tourism*—travel undertaken for purposes of recreation rather than business. It has become the most important single tertiary sector activity, and the world's largest private industry in jobs and total value generated. On a worldwide basis, travel and tourism in 2016 accounted for almost 300 million jobs and about 10 percent of the world's GDP. Domestic tourism leads to spending on transportation, roadside services, lodging, meals, entertainment, theme parks, and national parks. International tourism, on the other hand, generates new income and jobs in developing states as they are "discovered" as tourist destinations, whether for their climate, unspoiled character, or unique culture and cultural landscapes. For half of the world's 50 poorest countries, tourism has become the leading service export sector.

The growth of tourism is part of a broader shift in emphasis from production to consumption that accompanies rising standards of living. Like manufacturing, the tourism industry has experienced a post-Fordist transition away from one-size-fits-all, mass-produced tourist destinations to numerous fragmented consumer niches. Consumers with enough money can choose between cruise vacations, beach vacations, African safaris, ecotourism to "unspoiled" wilderness areas, adventure tourism such as helicopter skiing in the Canadian Rockies or kayaking in Alaska, cultural tourism to exotic places such as Bali or Guatemala, heritage tourism in historic villages and cities, sex tourism, bicycle tours through Europe, wine tourism, gambling, and more (**Figure 9.24**).

The geographic pattern of tourist destinations is highly uneven. Just imagine the different challenges facing a tourism and convention organization working to promote Iowa versus one working on behalf of Hawaii. The geographic features of the destination matter, but so does the level of tourism infrastructure and proximity to potential customers. Modest hills that would hardly qualify as hills in the mountainous western United States have been turned into downhill ski resorts in the Midwest. The important factors are proximity to major cities, such as Chicago or Detroit, and the developer's willingness to add the necessary infrastructure such as snowmaking and lifts. Tourism is an important tool in economic development, but geographers have raised a number of critical questions about the industry. Many of the jobs in the tourism industry are low-skill, low-wage positions such as hotel maids, and the profits often return to developed countries that are the home of the transnational corporations who own and operate the resorts. Tourism can be exploitative, particularly

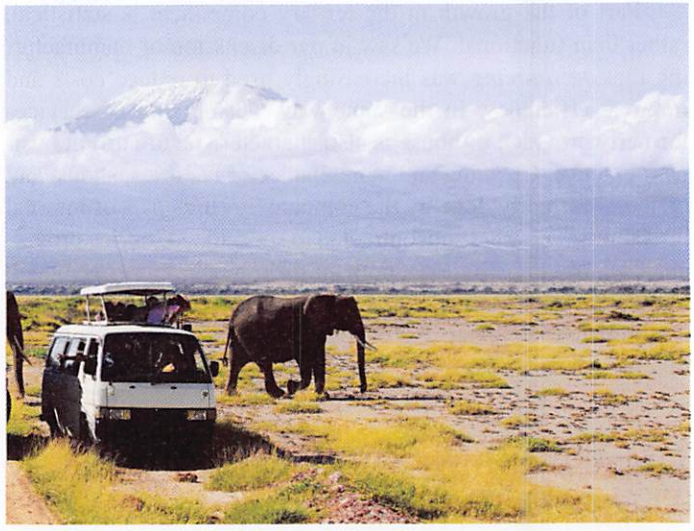

Figure 9.24 Tourism is the world's largest private industry and comes in many forms. Ecotourism seeks to empower local communities and preserve wildlife habitat and environmental quality.

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sex tourism. Tourist visits are often highly seasonal and this creates stresses on the destination, both during the on-season and off-season. Tourist destinations, like other expressions of popular culture, can go in and out of style, destabilizing the local economy. Tourism transforms places, often dramatically, and in some cases undermines the original tourist attraction. For example, in the United States, the areas just outside designated wilderness areas have become magnets for new housing, hotels, amusement parks, and other development. Cultural tourism inevitably changes the culture and cultural landscapes on which it is based. In response, ecotourism has emerged as an ethical form of tourism that focuses on education, minimizing environmental impacts, and using locally owned service providers.

Gambling

Gambling is a fast-growing industry that draws large numbers of tourists and in the process remakes places and local economies. In the United States, the gambling industry attracts almost 15 percent of all entertainment or recreation spending and generates more revenue than professional sports, museums, performing arts, fitness centers, golf courses, or amusement parks. The geography of gambling is determined by legal structures, political boundaries, and proximity to consumers. Gambling was once concentrated in a few select locations where it was permitted: Las Vegas, Nevada; Atlantic City, New Jersey; cruise ships (some of which never left shore); Monte Carlo, Monaco; and Macau, the only Chinese territory where gambling is permitted. The dominance of those gambling centers is being challenged by the rise of lotteries and Internet gambling. The Indian Gaming Regulatory Act of 1988 allowed states to permit casino gambling on Indian reservations, and today there are more than 450 Indian casinos in the United States (**Figure 9.25**). Indian reservations located near major population centers or interstate highways are major beneficiaries, and have often funneled their

Figure 9.25 Indian casinos have proliferated across the United States since the 1988 Indian Gaming Regulatory Act, which recognized the right of tribes to operate casinos as a way of addressing high unemployment and poverty on reservations. More than 450 Indian casinos bring in revenues, which are often invested in education, social services, infrastructure improvements, and natural resource conservation on the reservations. As in all service industries, location is essential, and reservations in or near major metropolitan areas have profited the most.

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substantial profits into improving conditions on the reservation. Reservations in Florida, California, and Connecticut are among the most profitable, although many of the jobs go to outsiders. Unfortunately, reservations in remote locations have usually not benefited from casinos.

Producer Services

Producer services are specialized activities performed for other businesses. They allow producers to realize cost savings by outsourcing specialized tasks when they are needed, without the expense of adding to their own labor force.

One difference between consumer services and producer services is that knowledge and skill-based producer service establishments can be spatially divorced from their clients; they are not tied to resources, affected by the environment, or necessarily localized by market. Of course, when high-level personal, face-to-face contacts are required, service firms will often locate close to their clients, the primary, secondary, tertiary, or quaternary industries they serve. But the transportability of producer services also means that many of them can be spatially isolated from their client base.

As with other industries, the trade-off between costs and proximity is one of the central tensions when a producer services firm chooses office space. The clients for producer services firms are the major companies, many of which are headquartered in the largest cities, where real estate and labor costs are highest.

Producer services are quaternary *knowledge* activities that are highly dependent on communication. The spatial dispersion of some kinds of tasks has been facilitated by innovations in information and communication technologies. Satellite and fiber-optic cables, wireless communications, and the Internet permit the spatial separation of office work into *front-office* and *back-office* tasks. Front-office tasks involve face-to-face interactions with clients where projecting the correct corporate image is imperative. Front-office work requires and can bear the high costs of the most prestigious commercial real estate—in high-quality office buildings with prestigious addresses (Park Avenue, Wall Street) or well-known signature office buildings (Transamerica Tower, Seagram Building). The back office was once literally in the back of the same office building, but now it may be spatially distant from the headquarters of either the service or client firms. Insurance claims, credit card billings, mutual fund and stock market transactions, and consumer help requests are more cost effectively handled in low-rent, low-labor-cost locations—often in suburbs or small towns in rural states—than in the financial districts of major cities. Many suburban back-office operations employ part-time female workers who want to stay close to home because they have primary responsibility for childcare—leading to the label "pink-collar" work. While New York remains the center of the financial sector, the relatively small city of Sioux Falls, South Dakota, has several thousand employees engaged in back-office work for major banks and credit card companies.

Different types of service sector professionals have different locational needs and preferences. Political lobbyists and companies that do consulting work for federal government agencies need to be in Washington, D.C., and often cluster along the famed Capital Beltway. Investment and law firms prefer the most prestigious downtown addresses. Scientific and engineering firms prefer suburban office parks or research campuses. Advertising, architecture, and other design professions often try to project a more relaxed, creative image, frequently choosing old, brick factories or warehouse buildings that have been converted to office space.

The list of services employment is long. Its diversity and familiarity remind us of the complexity of modern life and of how far removed we are from subsistence economies. As societies advance economically, the share of employment and national income generated by the primary, secondary, tertiary, and quaternary sectors continually changes; the spatial patterns of human activity reflect those changes. The shift is steadily away from production and processing, and toward the trade, personal, and professional services of the tertiary and quaternary sectors. That transition is the essence of the now-familiar term *postindustrial.*

9.6 Services in World Trade

Just as service activities have been major engines of national economic growth, so too have they become an increasing factor in international trade flows and economic interdependence. Between 1980 and 2010, services increased from 15 percent of total world trade to 20 percent. Rapid advances and reduced costs in information and communications technology have been central elements in the internationalization of services, as wired and wireless communication and data transmission costs have dropped to negligible levels. Many services considered nontradable, even late in the 1990s, are now actively exchanged at long distance, as the growth of services offshoring clearly shows.

Developing countries have been particular beneficiaries of the new technologies. The increasing tradability of services has expanded the comparative advantage of developing states in labor-intensive service activities, such as data processing. At the same time, they have benefited from increased access to efficient, state-of-the-art equipment and techniques transferred from advanced economies.

That global integration has shifted to higher level economic and professional services. There are clear cost advantages to outsourcing skilled functions such as paralegal and legal services, accountancy, medical analysis and technical services, architectural and engineering design, and research and development. Wired and wireless transmission of data, documents, medical and technical records, charts, and X-rays make distant consumer and producer services immediately and efficiently accessible. Further, many higher-level services are easily subdivided and performable either in sequence or simultaneously in multiple locations. The well-known "follow the sun" practices of software developers who finish a day's tasks only to pass the work to colleagues elsewhere in the world, who then pass it back to them when their workday is over, are now increasingly used by professionals in many other fields. As transnational corporations use computers around the clock for data processing, they can exploit or eliminate time zone differences between home office countries and host countries of their affiliates. Such cross-border intra-firm service transactions are not usually recorded in trade statistics but are part of the growing volume of international services flows. When the practice involves highly educated and talented specialists receiving developing world compensation levels, the cost attractions for developed country companies are irresistible. Increasing volumes of back-office work for Western insurance, finance, accounting, and legal services firms are being performed overseas.

With its large population of well-educated English speakers, India has been particularly successful in attracting outsourced service sector jobs. Customer interaction services ("call centers") formerly based in the United States are now increasingly relocated to India, employing workers trained to use an American nickname and speak in perfect American English (**Figure 9.26**). Claims processing for life and health insurance firms formerly were concentrated in English-speaking Caribbean states though increasingly such business process outsourcing (BPO) has shifted to India, Eastern Europe, and China. In all such cases, the result is accelerated technology transfer in such key areas as information and telecommunications services.

Despite the increasing share of global services trade held by developing countries, world trade—imports plus exports—in services is still overwhelmingly dominated by a very few of the most advanced states (**Table 9.2**). The country and category contrasts are great, as a comparison of the "high-income" and "low-income" group documents. At a different level, the single small island state of Singapore has a larger share of world services trade than all of sub-Saharan Africa.

Figure 9.26 Call center in India. With its large number of well-educated, English speakers, India has benefited from the globalization of back-office service sector work. These New Delhi workers are recent university graduates who work night shifts to cater to European and North American customers.

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The same cost and skill advantages that enhance the growth and territorial expansion of domestic service sector firms also operate internationally. Principal banks of all advanced countries have established foreign branches, and the world's leading banks have become major presences in the primary financial capitals.

Table 9.2

Shares of World Trade in Commercial Services (Exports, 2016)

Country or Category	% of World
United States	15.1
United Kingdom	6.7
China (with Hong Kong)	6.3
Germany	5.7
France	4.8
Japan	4.2
India	3.3
Singapore	3.1
Ireland	3.0
Netherlands	3.0
High-income states	78.7
Low-income states	0.5
Sub-Saharan Africa	1.2

Source: *Data from World Bank,* World Development Indicators, 2016.

In turn, a relatively few world cities have emerged as international business and financial centers whose operations and influence are continuous and borderless (**Figure 9.27**). The world's key cities for banking, securities firms, and stock exchanges are spread across the globe, allowing almost continuous 24-hour per day trading. Meanwhile, a host of offshore banking havens have emerged to exploit gaps in regulatory controls and tax laws (**Figure 9.28**).

Accounting firms, advertising agencies, management consulting companies, and similar establishments of primarily North American or European origin have increasingly established their international presence, with main branches located in principal business centers worldwide. Those advanced and specialized service components help swell the dominating role of the United States and European Union in the structure of world trade in services.

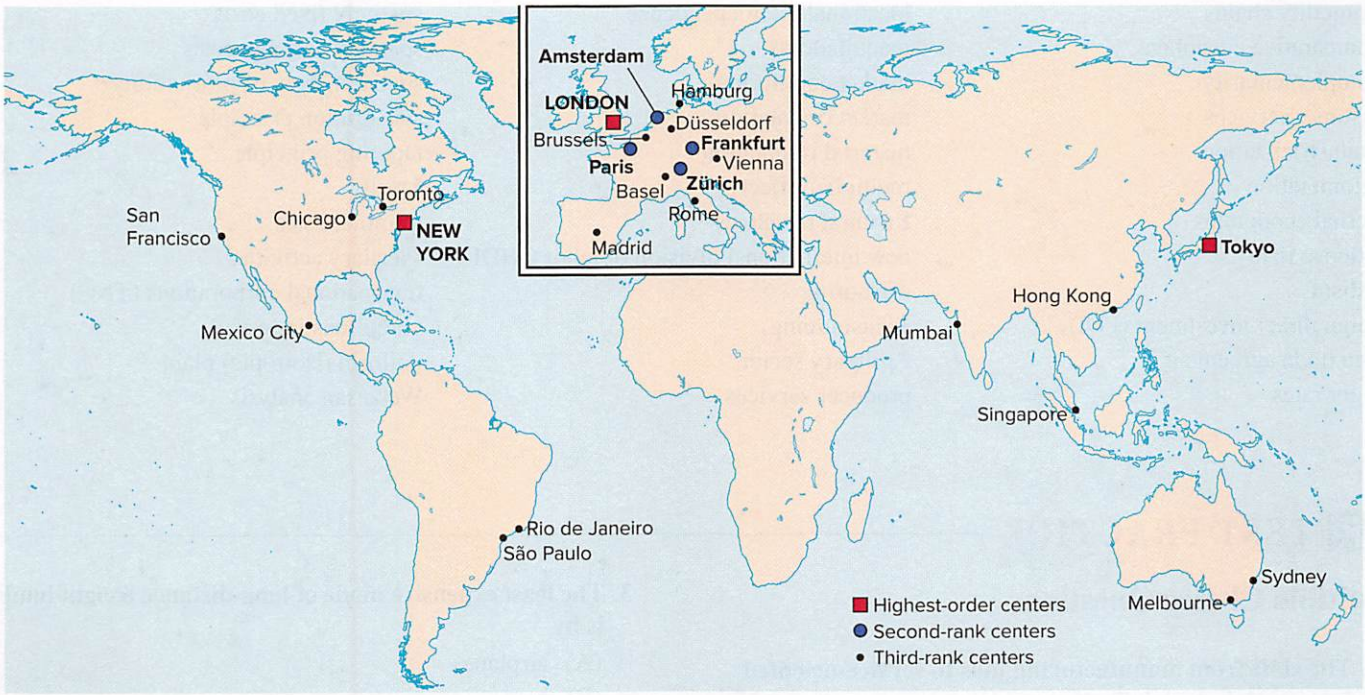

Figure 9.27 The hierarchy of international financial centers, topped by New York, London, and Tokyo, indicates the tendency of highest-order producer services to concentrate in a few world and national centers.

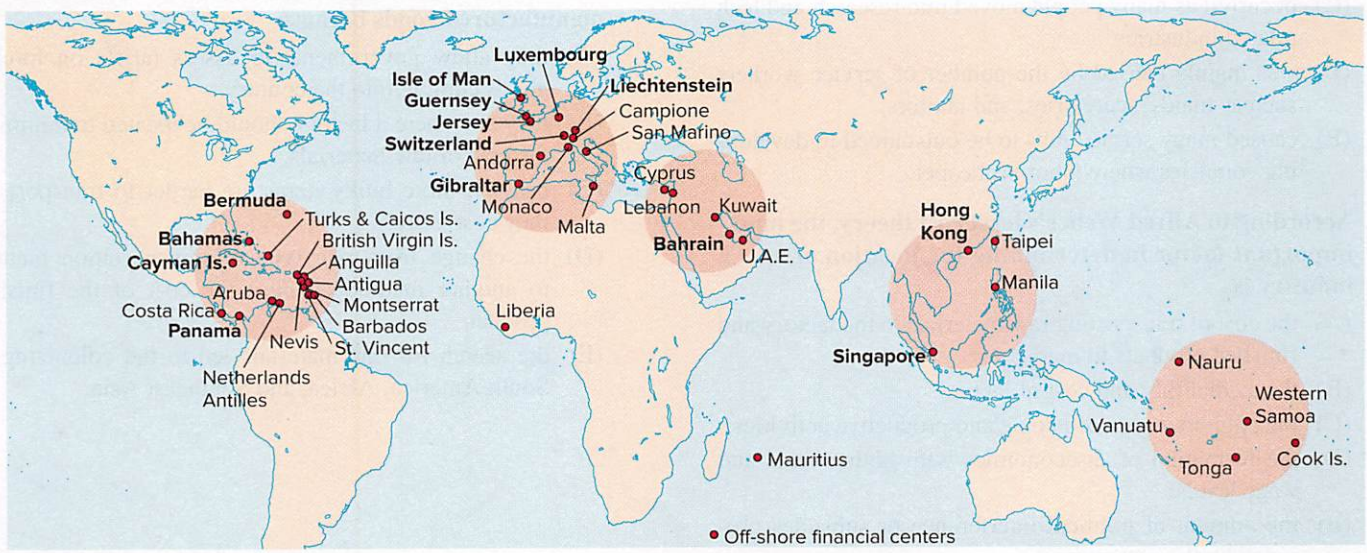

Figure 9.28 Offshore banking. Offshore financial centers, mostly in small island countries and micro-states, allow "furtive money" to avoid taxation and regulatory scrutiny. These financial havens have low tax rates and relaxed financial regulations. They are spread around the world to offer proximity to international financial centers and 24-hour trading. International pressure has led most of the tax havens to agree to greater openness and less protective secrecy.

Source: Peter Dicken, Global Shift, *6th ed. New York: Guilford Press, 2011, Figure 12.9.*

AP KEY WORDS

Use the terms below with a ▮ to focus your study of AP Human Geography key words in this chapter.

agglomeration
agglomeration economies
▮ break-of-bulk point
brownfield site
commodity chains
▮ comparative advantage
▮ complementarity
consumer services
deindustrialization
deglomeration
external economies
footloose firm
Fordism
foreign direct investment (FDI)
▮ free trade agreement
freight rates
▮ Industrial Revolution
infrastructure
▮ least-cost theory
line-haul costs
locational interdependence
maquiladoras
market equilibrium
market orientation
material orientation
multiplier effect
▮ natural resources
new international division of labor (NIDL)
offshoring
▮ outsourcing
▮ primary sector
producer services
▮ quaternary sector
▮ quinary sector
satisficing locations
▮ secondary activities
spatially fixed costs
spatially variable costs
spatial margin of profitability
substitution principle
tapering principle
▮ tariff
terminal costs
▮ tertiary activities
transnational corporations (TNC)
ubiquitous industry
uniform (isotropic) plain
Weberian analysis

AP TEST PRACTICE

Multiple Choice Questions

1. **The shift from manufacturing jobs to service-oriented jobs, or deindustrialization,**
   (A) caused new steel mills to open in Silicon Valley even as the old mills closed in the northeastern United States.
   (B) was caused by the high prices of manufactured goods in developing countries such as China.
   (C) occurred as many people moved into research and tech related industries.
   (D) was mainly caused by the number of service workers such as maids, secretaries, and janitors.
   (E) caused many service jobs to be outsourced to developing countries where labor is cheaper.

2. **According to Alfred Weber's least cost theory, the most important factor in determining the location of an industry is**
   (A) the cost of transporting raw materials to the factory and finished products to market.
   (B) the availability and cost of labor.
   (C) the agglomeration of people and productive activities.
   (D) the formation of diseconomies with higher rents and wage levels.
   (E) the amount of political interference or subsidies provided by the government.

3. **The least expensive mode of long-distance freight hauling is by**
   (A) airplane.
   (B) boat.
   (C) truck.
   (D) railroad.
   (E) pipeline.

4. **Break-of-bulk points are important to the production of manufactured goods because**
   (A) they allow governments to assess tariffs on foreign goods coming into the country.
   (B) they are where a factory should be located to minimize the cost of raw materials.
   (C) heavier, more bulky items are harder to transport, so they cost more.
   (D) the change from one type of transportation method to another method changes the cost of the finished product.
   (E) the search for raw materials led to the colonizing of South America, Africa, and Southeast Asia.

5. **Governments can influence industrial development by all the following methods EXCEPT**
   (A) building highways and regulating interstate commerce.
   (B) offering incentive programs to bring industry into an area.
   (C) passing lenient land use and zoning laws.
   (D) enforcing strict environmental codes.
   (E) building industrial parks and investing in large development projects.

6. **The practice of establishing maquiladoras along the Mexican border**
   (A) was made illegal by the Mexican government in the 1960s.
   (B) has led to the immigration of many Mexicans, who are searching for better jobs, in the United States.
   (C) allows goods to be made in Mexico at a low cost and then transported to the United States for sale.
   (D) has led to a flood of cheap, badly made products coming into the United States.
   (E) has hurt the Mexican economy since it takes jobs and money away from Mexican people.

7. **The main impact of transnational corporations comes from**
   (A) foreign direct investment in the 50 least developed countries.
   (B) investment in countries that are the farthest away geographically from the parent company.
   (C) interdependence in the world economy between the more-developed countries and those that provide raw materials and manufacturing.
   (D) shipments of manufactured goods from more-developed countries.
   (E) outsourcing of services to call centers.

8. **According to the chart in Figure 9.21 on page 307, the largest change in the economic sectors of the economy occurred when**
   (A) the secondary sector grew between 1850 and 1900 due to the Industrial Revolution.
   (B) the number of farmers shrank to only 1 percent in 2010.
   (C) the number of agricultural and manufacturing jobs grew at the expense of tertiary work.
   (D) the number of people in manufacturing greatly outnumbered farmers in the 1920s.
   (E) the tertiary sector grew between 1950 and 2010 at the expense of primary and secondary jobs.

9. **A major difference between consumer services and producer services is that**
   (A) consumer services, unlike producer services, provide something that can be used up or consumed.
   (B) producer services are performed for corporations, while consumer services are performed for individuals.
   (C) the locational interdependence model does not apply to consumer services.
   (D) the demand for consumer services far surpasses the demand for producer services.
   (E) consumer services usually require workers to have a higher level of education than producer services do.

10. **According to the map of major cities in Figures 9.27 on page 313,**
    (A) New York, Rio di Janeiro, and Tokyo are the three most important cities for finance and world trade.
    (B) consumer services are scattered in many cities around the world.
    (C) highest order producer services are concentrated in a few major cities.
    (D) the fact that there are many smaller cities that provide services negates the importance of the three largest cities.
    (E) New York City is the only place with a major stock exchange and important financial services.

Free Response Questions

1. **Answer Parts A, B, and C below.**
   (A) Explain two major causes of the development of tourism.
   (B) Give two examples and explain how the geography of a place affects tourism.
   (C) Explain two consequences of tourism for developing countries.

2. **Answer Parts A, B, and C below.**
   (A) Define the term *agglomeration* and explain how it pertains to high-tech industries in one of the following areas:
   Silicon Valley, CA
   Washington, D.C.
   Research Triangle, NC
   (B) Explain three important factors that lead to agglomeration in these areas.
   (C) Explain one reason for commodity chains in high-tech industries.

3. **Answer Parts A, B, and C below.**
   (A) Explain one economic and one environmental reason that a business might outsource some of its work.
   (B) Explain one consequence of outsourcing for developed countries and one consequence of outsourcing for developing countries.
   (C) Explain one impact of governmental policies on outsourcing and provide a specific example.