

## **External Economies of Scale and the International Location of Production**

### **Economies of Scale and International Trade: An Overview:**

Economies of scale occur when increasing the scale of production decreases the cost per unit, meaning that doubling inputs more than doubles the output. For example, producing 10 widgets might require 15 hours of labor, while producing 25 widgets requires 30 hours, demonstrating that doubling the labor input more than doubles the output.

This concept impacts international trade by making production more efficient when concentrated in one country. If 30 hours of labor in one country (e.g., the United States) produce 25 widgets instead of 20, the same total labor produces more output, increasing global efficiency by 25%.

International trade enables countries to specialize while still consuming a variety of goods. The United States can import good 2 from Britain, and Britain can import good 1 from the United States. This trade allows countries to benefit from economies of scale without sacrificing variety in consumption.

Specialization and trade based on economies of scale lead to mutually beneficial outcomes, increasing efficiency and the variety of goods available. However, this also results in complex market structures that require careful economic modelling and analysis.

### **Economies of Scale and Market Structure:**

In the example from Table 7-1, economies of scale are shown by the decrease in labor input per unit as production increases, leading to lower average costs with higher output. It is crucial to distinguish whether this production increase comes from existing firms producing more or from an increase in the number of firms. External economies of scale occur when the cost per unit depends on the industry size, not on the size of any one firm. Internal economies of scale occur when the cost per unit depends on the size of an individual firm.

For example, if an industry initially has 10 firms each producing 100 widgets, doubling the industry size to 20 firms, each still producing 100 widgets, could reduce costs due to more efficient provision of services or machinery, demonstrating external economies of scale. In contrast, if the industry's output remains at 1,000 widgets but the number of firms is reduced to five, with each producing 200 widgets, and production costs fall, this indicates internal economies of scale.

Industries with purely external economies of scale tend to have many small firms and be perfectly competitive, while internal economies of scale give large firms a cost advantage, leading to an imperfectly competitive market structure. Both types of economies are important for international trade, but they have different implications for market structure, making it difficult to discuss them in the same model. This chapter focuses on external economies, while the next chapter will address internal economies.

### **The theory of external economies:**

External economies of scale occur when concentrating an industry in one location reduces costs, even if individual firms remain small. These economies apply at the industry level rather than the individual firm level. The concept dates back to Alfred Marshall, who observed "industrial districts"

like Sheffield for cutlery and Northampton for hosiery. Modern examples include Silicon Valley for semiconductors, New York for investment banking, and Hollywood for entertainment. In developing countries, specific towns often dominate global production of particular goods, like China's towns specializing in underwear, cigarette lighters, and magnetic tape heads.

### Specialized Suppliers

Industries often require specialized equipment or services that individual companies alone can't support. Industrial clusters solve this by combining demand to sustain specialized suppliers. Silicon Valley, for example, saw engineers start firms providing capital goods and components, which supported new semiconductor firms by reducing their internal development costs and fostering localization. Firms in these clusters benefit from cheaper, more readily available inputs and can focus on core competencies, contracting out other tasks. New entrants outside such clusters face disadvantages due to the lack of local suppliers.

### Labor Market Pooling

A cluster of firms creates a pooled market for specialized labor, benefiting both producers and workers by reducing the risk of labor shortages and unemployment. For instance, two film studios needing specialized animators benefit from being in the same city, where high demand from one can offset low demand from the other, reducing unemployment risk for workers and hiring difficulties for firms. This dynamic is well-documented in Silicon Valley, where rapid company expansion and frequent job changes among workers are common, enhancing flexibility and attractiveness for skilled labor and companies.

### Knowledge Spillovers

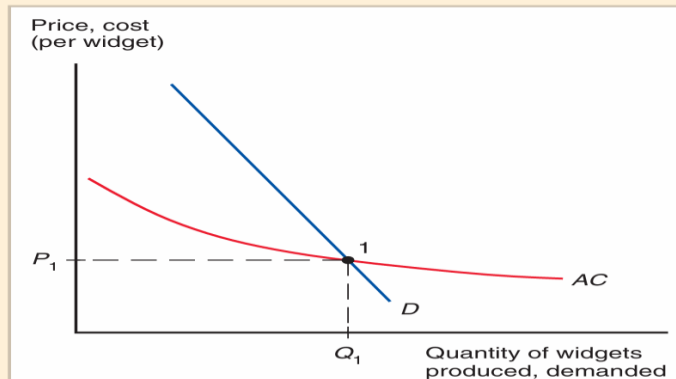
Knowledge is a critical input in innovative industries, and informal exchanges of information often occur most effectively in geographically concentrated areas. In such clusters, employees from different companies mix socially and share technical insights. Marshall described this as trade secrets being "in the air." For example, Silicon Valley's culture of after-work socializing facilitated knowledge spillovers, helping firms stay at the technological frontier. This informal knowledge flow attracts multinational firms to establish research centers and factories in these clusters to keep up with the latest technology.

### External Economies and Market Equilibrium

**Figure 7-1**

#### External Economies and Market Equilibrium

When there are external economies of scale, the average cost of producing a good falls as the quantity produced rises. Given competition among many producers, the downward-sloping average cost curve  $AC$  can be interpreted as a *forward-falling supply curve*. As in ordinary supply-and-demand analysis, market equilibrium is at point 1, where the supply curve intersects the demand curve,  $D$ . The equilibrium level of output is  $Q_1$ , the equilibrium price  $P_1$ .

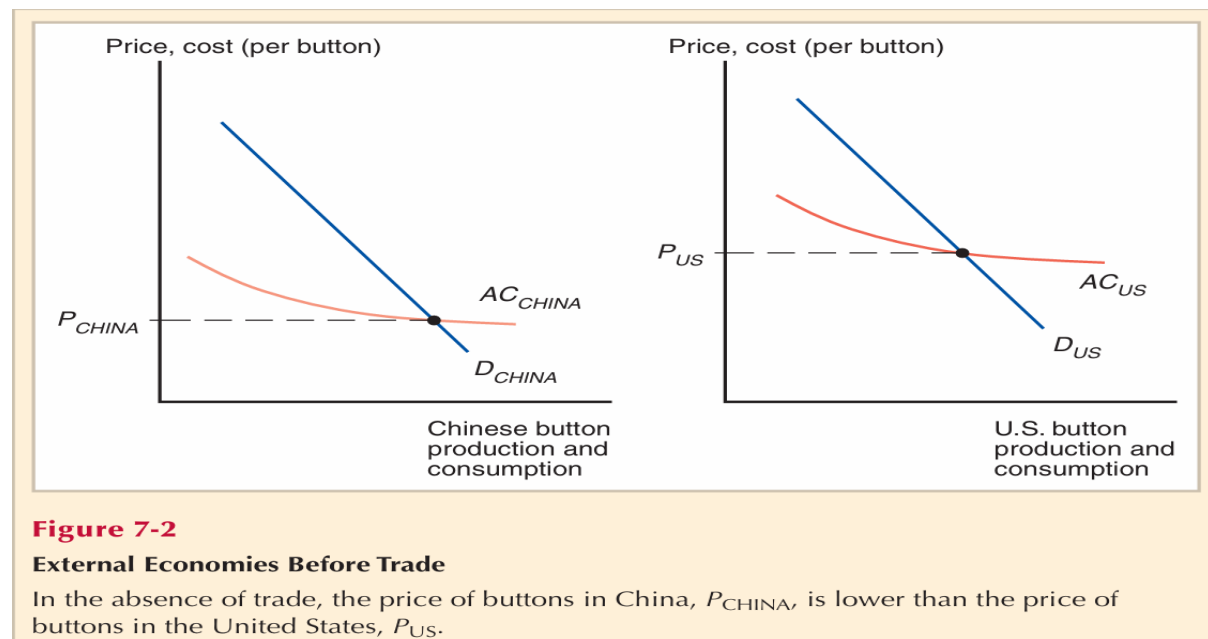


A geographically concentrated industry supports specialized suppliers, a pooled labor market, and knowledge spillovers better than a dispersed one. Larger industries generate stronger external economies, leading to lower average costs as industry size increases. Market equilibrium, in the presence of external economies, features a downward-sloping average cost curve, interpreted as a forward-falling supply curve. The equilibrium price and output are determined by the intersection of this supply curve and the demand curve. External economies of scale significantly influence international trade dynamics.

### **External Economies and International Trade:**

External economies significantly influence trade within and between countries. For example, New York exports financial services across the United States, and London does the same for Europe due to concentrated financial firms benefiting from external economies. The implications of this trade include effects on output, prices, trade patterns, and welfare.

### **External Economies, Output, and Prices**



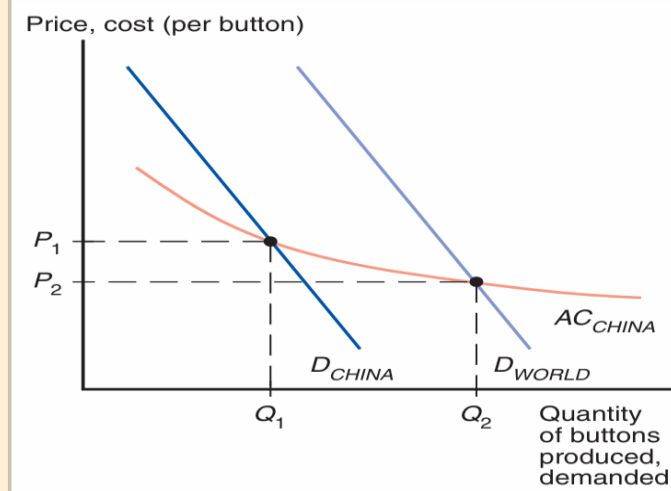
In a hypothetical world where button trade across borders is impossible, with only China and the United States producing buttons subject to external economies of scale, domestic supply intersects with domestic demand to determine equilibrium prices and output. Initially, China's button prices are lower than those in the U.S. due to lower costs of production.

Opening trade causes the Chinese button industry to expand while the U.S. industry contracts. This self-reinforcing process leads to all button production concentrating in China. As China's output rises, costs fall further, and as the U.S. output falls, costs rise. Eventually, China supplies both its domestic market and the U.S. market, leading to lower global button prices than before trade.

This outcome differs from standard trade models, where relative prices converge due to trade. Here, trade reduces prices globally because concentrating production in one location maximizes external economies of scale, reducing costs more significantly.

**Figure 7-3****Trade and Prices**

When trade is opened, China ends up producing buttons for the world market, which consists both of its own domestic market and of the U.S. market. Output rises from  $Q_1$  to  $Q_2$ , leading to a fall in the price of buttons from  $P_1$  to  $P_2$ , which is lower than the price of buttons in either country before trade.

**External Economies and the Pattern of Trade**

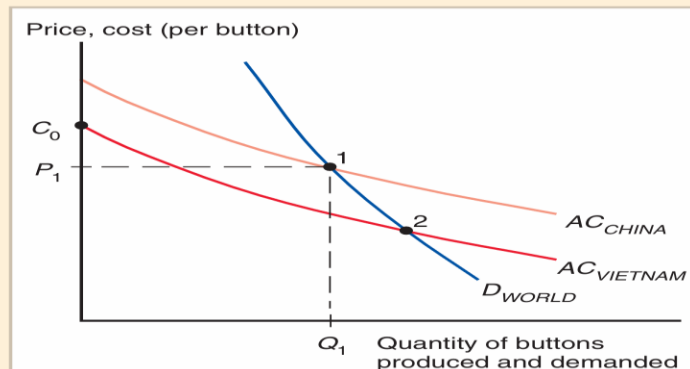
In the case of world trade in buttons, the initial advantage of the Chinese industry was presumed to be lower production costs. This initial advantage could arise from comparative advantage due to differences in technology and resources. For instance, high-technology industries thrive in Silicon Valley, California, due to the availability of a highly skilled workforce. Similarly, labor-intensive industries like button production thrive in countries with low labor costs, like China.

However, in industries with external economies of scale, comparative advantage only partially explains trade patterns. Historical contingencies often determine industrial specialization and trade. An initial advantage, once established, can be “locked in” by external economies of scale, even if the original advantage is no longer relevant. For example, London and New York remain financial centers due to historical reasons, not current economic conditions.

Accidents also play a role in industrial concentration. For example, the carpet industry around Dalton, Georgia, began due to a single tufted bedspread crafted as a wedding gift. Similarly, Silicon Valley owes its existence to early ventures like Hewlett and Packard starting a business in the area.

**Figure 7-4****The Importance of Established Advantage**

The average cost curve for Vietnam,  $AC_{VIETNAM}$ , lies below the average cost curve for China,  $AC_{CHINA}$ . Thus Vietnam could potentially supply the world market more cheaply than China. If the Chinese industry gets established first, however, it may be able to sell buttons at the price  $P_1$ , which is below the cost  $C_0$  that an individual Vietnamese firm would face if it began production on its own. So a pattern of specialization established by historical accident may persist even when new producers could potentially have lower costs.



Industries are not always located in the most economically optimal locations. Once a country establishes an advantage in an industry, it may retain that advantage even if another country could potentially produce the goods more cheaply. For example, China’s button industry could persist

even if Vietnam could produce buttons more cheaply due to lower wages. The established Chinese industry can produce at lower costs due to external economies of scale, making it difficult for a new entrant like Vietnam to compete initially.

### Trade and Welfare with External Economies

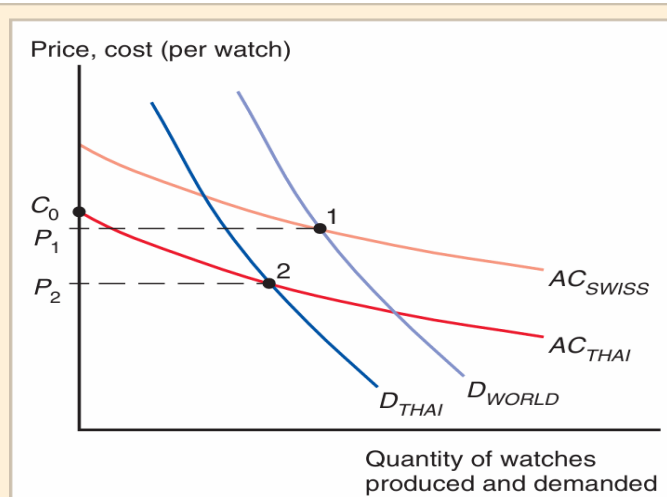
External economies of scale generally lead to additional gains from trade beyond those from comparative advantage. Specialization and trade allow countries to reap the benefits of external economies, making the world more efficient and richer.

However, established advantages mean that the right country may not always produce a good. Trade based on external economies can potentially leave a country worse off than without trade. For example, if Thailand and Switzerland both produce watches, and Switzerland's industry is established first, Thailand may find it cheaper to produce watches domestically if trade were blocked. In such cases, trade protection could be justified to support potential industries. However, identifying such situations is challenging, which complicates the argument for protectionism.

**Figure 7-5**

#### External Economies and Losses from Trade

When there are external economies, trade can potentially leave a country worse off than it would be in the absence of trade. In this example, Thailand imports watches from Switzerland, which is able to supply the world market ( $D_{WORLD}$ ) at a price ( $P_1$ ) low enough to block entry by Thai producers, who must initially produce the watches at cost  $C_0$ . Yet if Thailand were to block all trade in watches, it would be able to supply its domestic market ( $D_{THAI}$ ) at the lower price,  $P_2$ .



Despite potential drawbacks, it is beneficial for the world economy to take advantage of the gains from concentrating industries. While some countries might benefit from relocating industries, overall, the concentration of industries in specific locations is advantageous.

### Dynamic Increasing Returns

External economies often arise from the accumulation of knowledge. When a firm improves its products or production techniques, other firms benefit from this knowledge spillover. This reduces production costs for the entire industry over time, a phenomenon captured by the learning curve, which relates unit cost to cumulative output.

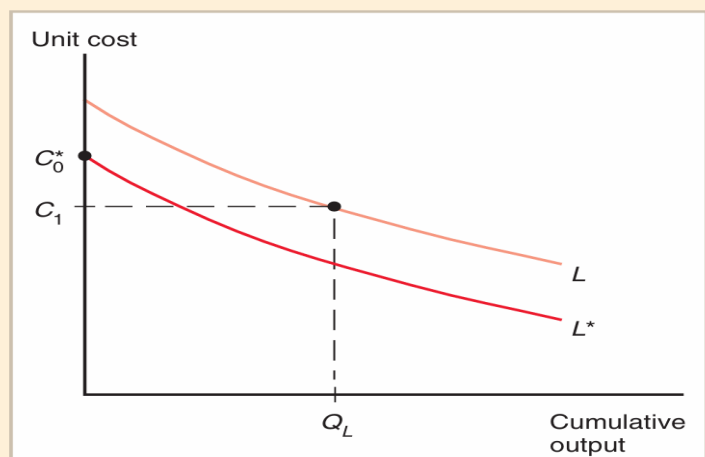
Dynamic external economies can lock in an initial advantage in an industry. For example, if one country has a head start in an industry, it can maintain lower unit costs than a country with lower wages but less experience. This can justify temporary protectionism, **allowing a country to develop its industry to achieve lower long-term costs. This concept, known as the infant industry**

**argument**, is significant in debates over trade policy and economic development. Identifying such situations in practice is as challenging as identifying nondynamic increasing returns.

**Figure 7-6**

### The Learning Curve

The learning curve shows that unit cost is lower the greater the cumulative output of a country's industry to date. A country that has extensive experience in an industry ( $L$ ) may have lower unit cost than a country with little or no experience, even if that second country's learning curve ( $L^*$ ) is lower—for example, because of lower wages.



## Interregional Trade and Economic Geography:

External economies significantly influence the pattern of international trade and are even more crucial in shaping interregional trade within countries. To grasp this, we need to understand regional economics, which examines how regional economies fit into the national economy.

Studies show that over 60 percent of U.S. workers are employed in industries whose output is Non tradable within the country and must be supplied locally. For example, motion pictures made in Hollywood are shown nationwide, but newspapers are primarily read locally. Similarly, Wall Street serves national clients, while local savings banks serve regional depositors. Scientists at national institutes impact the entire country, while local veterinarians serve nearby residents.

The share of Non tradable industries in employment is consistent across U.S. cities, such as the restaurant industry employing about 5 percent of the workforce in every major city. However, tradable industries vary significantly by region. For instance, Manhattan represents only 2 percent of U.S. employment but accounts for 25 percent of stock trading and 14 percent of advertising employment.

### Determinants of Tradable Industries Location

Natural resources sometimes dictate the location of tradable industries, such as Houston's oil industry due to East Texas oil reserves. However, labor and capital are more mobile within countries, so they tend to move to where the industries are. For example, Silicon Valley's highly educated workforce is there because engineers relocate to take jobs in the high-tech industry, not because California produces many engineers.

### Role of External Economies

External economies mainly drive specialization and interregional trade. For instance, New York's concentration of advertising agencies exists because many such agencies are already there, facilitating information sharing and creativity. Studies suggest these benefits are very localized, with agencies needing to be within 300 yards of each other to maximize spillovers.

### **Historical Accidents in Regional Specialization**

Historical accidents often determine which regions develop the external economies supporting an industry. For example, New York became America's financial center due to its port and access to the Great Lakes via the Erie Canal. It remains the financial center because of the external economies generated by the financial industry. Similarly, Los Angeles became the film industry center due to good weather for outdoor shooting and remains so due to established externalities, even though many films are now shot indoors or on location.

### **Interregional vs. International Trade**

The forces driving interregional trade are similar to those driving international trade, especially between closely integrated national economies like those in Western Europe. London serves as Europe's financial capital, akin to New York's role in America. Economists increasingly model interregional and international trade, and urban development, as aspects of the same phenomenon—economic interaction across space, known as economic geography.