

KRUGMAN | OBSTFELD | MELITZ
INTERNATIONAL
ECONOMICS
THEORY & POLICY



TENTH EDITION

ALWAYS LEARNING

Chapter 7

External Economies of Scale and the International Location of Production

PEARSON



Preview

- Types of economies of scale
- Economies of scale and market structure
- The theory of external economies
- External economies and international trade
- Dynamic increasing returns
- International trade and economic geography



Introduction

- The models of comparative advantage thus far assumed **constant returns to scale**:
 - When inputs to an industry increase at a certain rate, output increases at the same rate.
 - If inputs were doubled, output would double as well.
- But there may be **increasing returns to scale** or **economies of scale**:
 - This means that when inputs to an industry increase at a certain rate, output increases at a faster rate.
 - A larger scale is more efficient: the cost per unit of output falls as a firm or industry increases output.



Table 7-1: Relationship of Input to Output for a Hypothetical Industry

Output	Total Labor Input	Average Labor Input
5	10	2
10	15	1.5
15	20	1.333333
20	25	1.25
25	30	1.2
30	35	1.166667

For example, suppose an industry produces widgets using only one input, labor. The presence of economies of scale may be seen from the fact that

- doubling the input of labor more than doubles the industry's output.
- the average amount of labor used to produce each widget is less when the industry produces more.



Introduction

- Mutually beneficial trade can arise as a result of economies of scale.
- International trade permits each country to produce a limited range of goods without sacrificing variety in consumption.
- With trade, a country can take advantage of economies of scale to produce more efficiently than if it tried to produce everything for itself.



Economies of Scale and Market Structure

- Economies of scale could mean either that larger firms or a larger industry would be more efficient.
- **External economies of scale** occur when cost per unit of output depends on the *size of the industry*.
- **Internal economies of scale** occur when the cost per unit of output depends on the *size of a firm*.
- Both external and internal economies of scale are important causes of international trade.



Economies of Scale and Market Structure

- External and internal economies of scale have, however, different implications for the structure of industries:
 - An industry where economies of scale are purely external will typically consist of many small firms and be perfectly competitive.
 - Internal economies of scale result when large firms have a cost advantage over small firms, causing the industry to become imperfectly competitive.
- This chapter deals with a model of external economies; the next chapter will cover internal economies.



The Theory of External Economies

- Many modern examples of industries that seem to be powerful external economies:
 - In the United States, the semiconductor industry is concentrated in Silicon Valley, investment banking in New York, and the entertainment industry in Hollywood.
 - In developing countries such as China, external economies are pervasive in manufacturing.
 - One town in China produces most of the world's underwear, another nearly all cigarette lighters.
 - External economies played a key role in India's emergence as a major exporter of information services.
 - Indian information services companies are still clustered in Bangalore.



The Theory of External Economies

- There are three main reasons why concentrating production of an industry in one or a few locations can reduce the industry's costs, even if the individual firms in the industry remain small.
- 1. Specialized equipment or services** may be needed for the industry, but are only supplied by other firms if the industry is large and concentrated.
 - For example, Silicon Valley in California has a large concentration of silicon chip companies, which are serviced by companies that make special machines for manufacturing silicon chips.
 - These machines are cheaper and more easily available there than elsewhere.



The Theory of External Economies

- 2. Labor pooling:** a large and concentrated industry may attract a pool of workers, reducing employee search and hiring costs for each firm.
 - Workers in Silicon Valley who can easily switch employers. Specialized workers in Hollywood (make-up artists, stuntmen,...) who would not have a job elsewhere.
- 3. Knowledge spillovers:** workers from different firms may more easily share ideas that benefit each firm when a large and concentrated industry exists.
 - Silicon Valley



Fig. 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**.

The equilibrium level of output is Q_1 , the equilibrium price is P_1 .

Price, cost
(per widget)

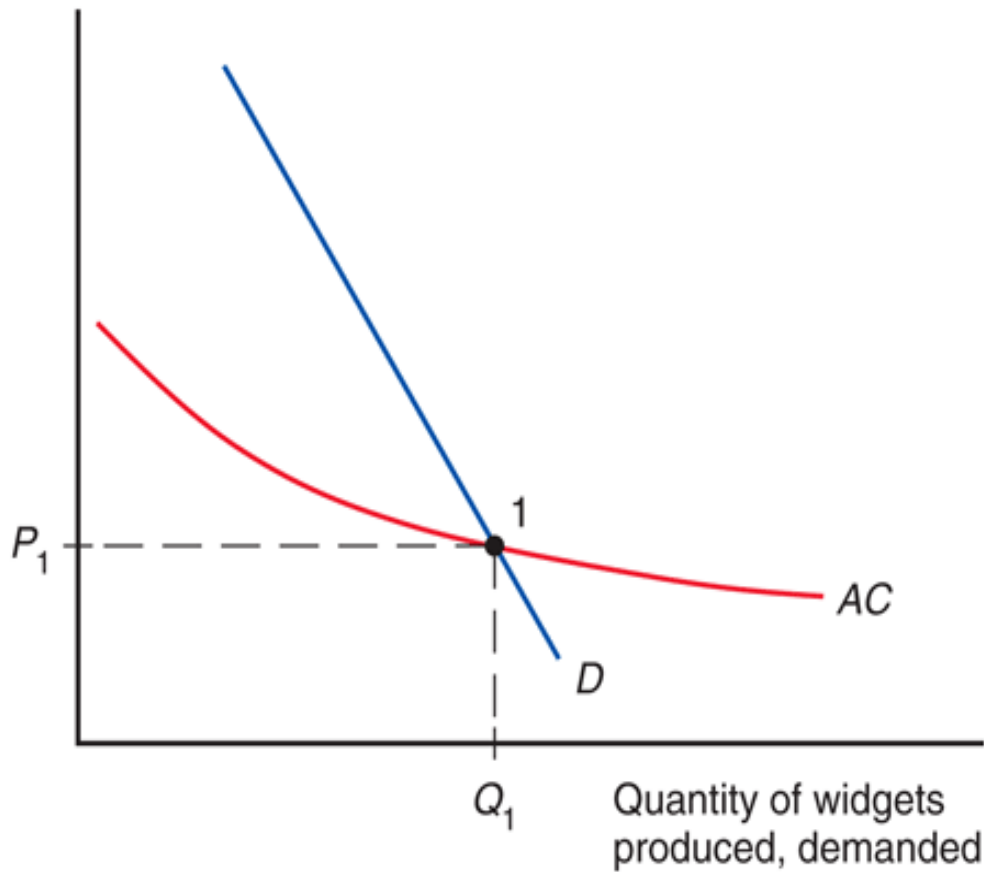
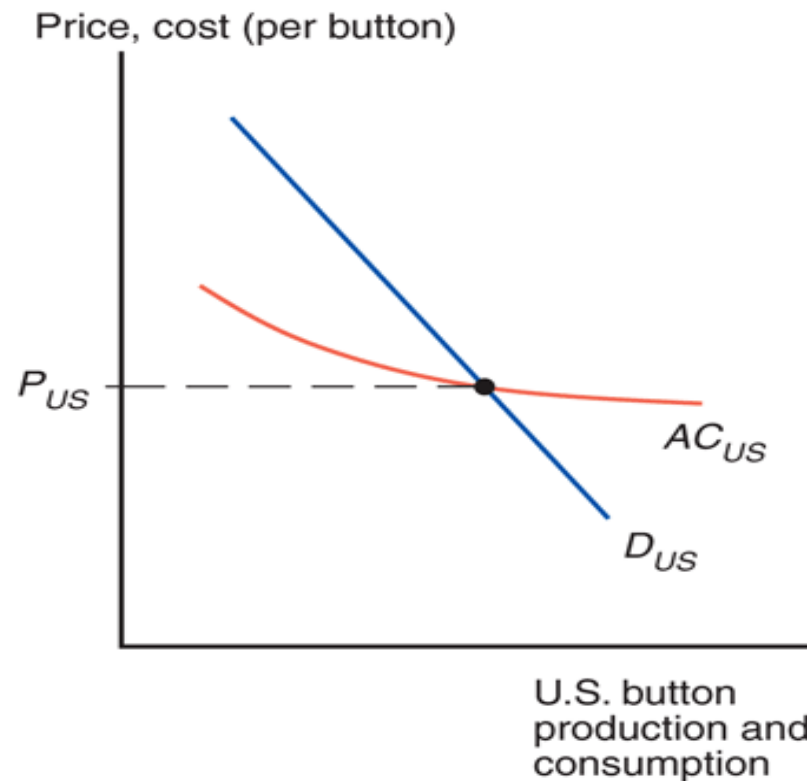
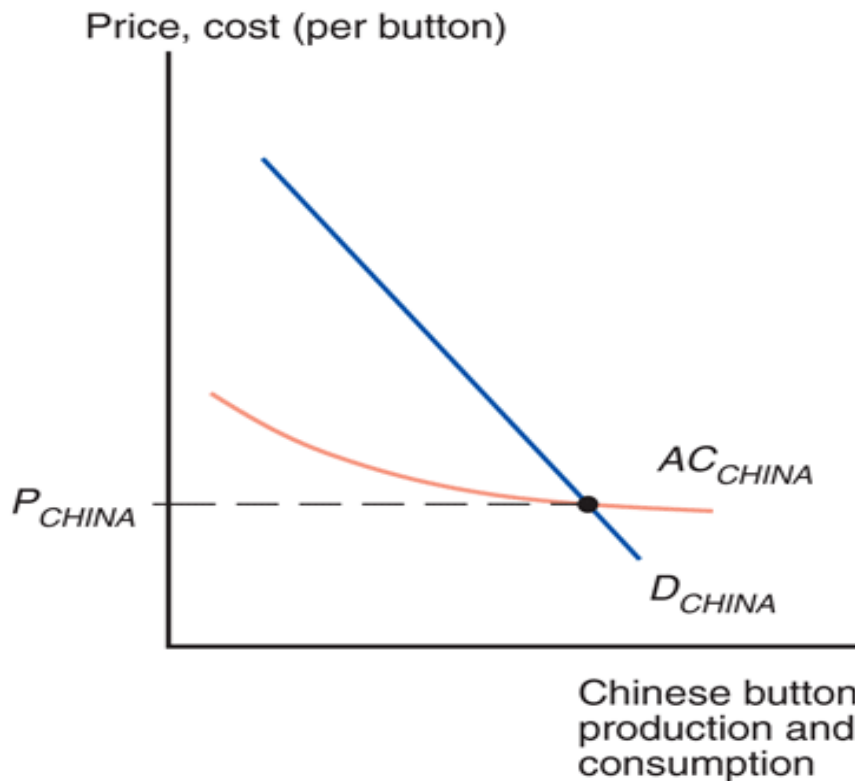




Fig. 7-2: External Economies Before Trade



Prior to international trade, equilibrium prices and output for each country would be at the point where the domestic supply curve intersects the domestic demand curve. Suppose Chinese button prices in the absence of trade would be lower than U.S. button prices.

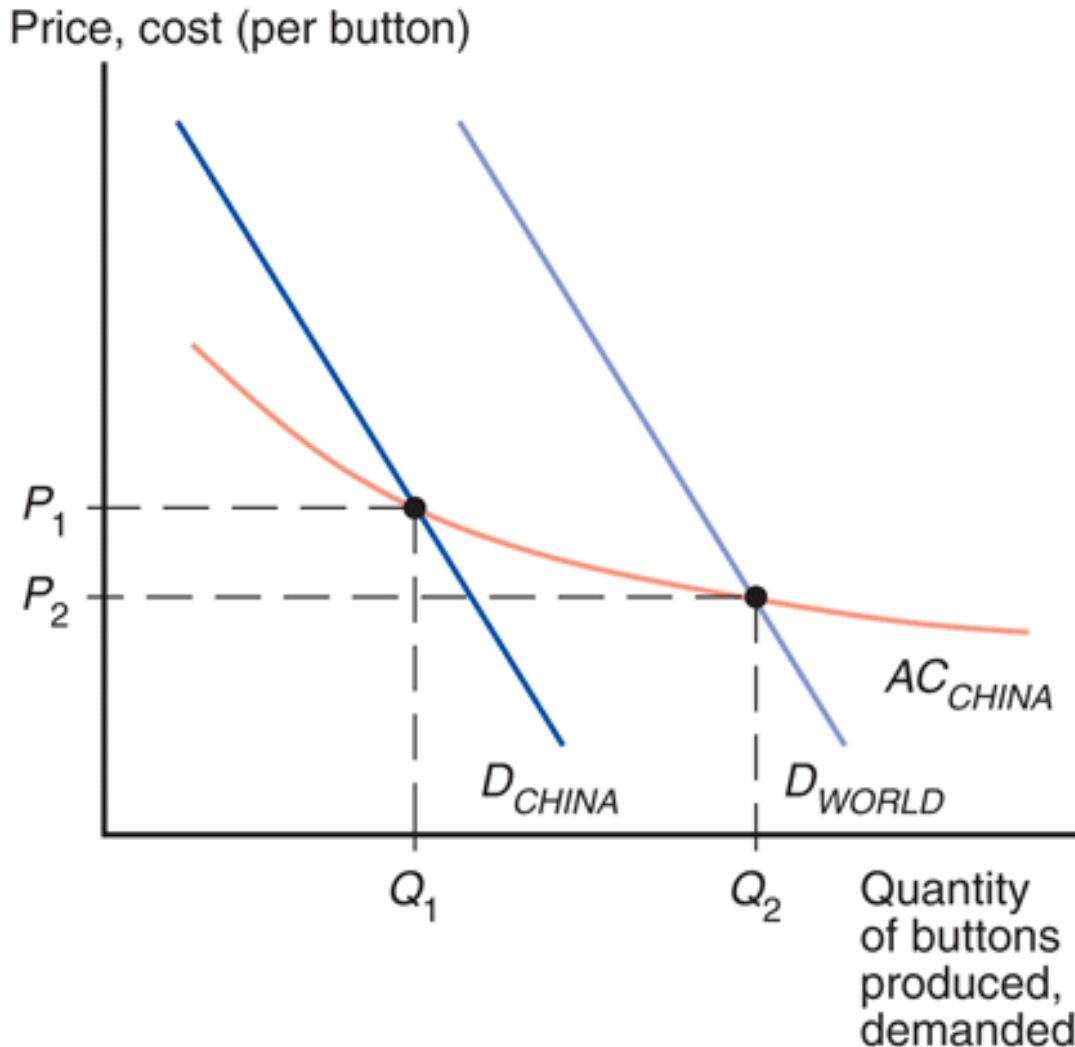


External Economies and International Trade

- Suppose Chinese button prices in the absence of trade would be lower than U.S. button prices.
- What will happen when the countries open up the potential for trade in buttons?
- The Chinese button industry will expand, while the U.S. button industry will contract.
- This process feeds on itself: As the Chinese industry's output rises, its costs will fall further; as the U.S. industry's output falls, its costs will rise.
- In the end, all button production will be in China.
- How does this concentration of production affect prices?



Fig. 7-3: Trade and Prices



Chinese button prices were lower than U.S. button prices before trade.

Because China's supply curve is forward-falling, increased production as a result of trade leads to a button price that is lower than the price before trade.

Trade leads to prices that are lower than the prices in either country before trade!



External Economies and International Trade

- Very different from the implications of models without increasing returns.
- In the standard trade model relative prices converge as a result of trade.
 - If cloth is relatively cheap in the home country and relatively expensive in the foreign country before trade opens, the effect of trade was to raise cloth prices in Home and reduce them in Foreign.
- *With external economies, by contrast, the effect of trade is to reduce prices everywhere.*



External Economies and International Trade

- What might cause one country to have an initial advantage from having a lower price?
- One possibility is comparative advantage due to underlying differences in technology and resources.
 - The reason why Silicon Valley is in California and not in Mexico is that there is higher availability of highly skilled work force in U.S. than in Mexico (portion of college-educated workers: 40% in USA vs 16% in Mexico)
 - The reason why button production is concentrated in China and not in Germany is that button production is a labor-intensive industry which is profitable in countries where workers earn relatively low wages.

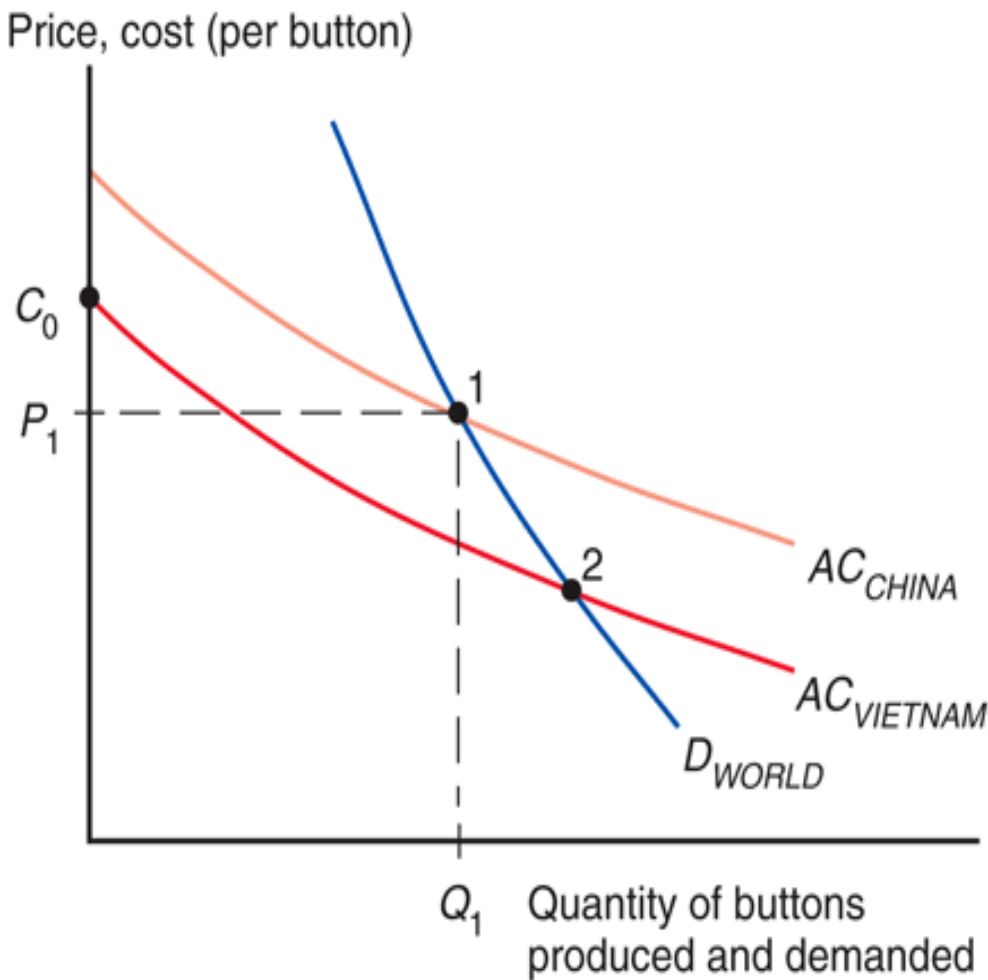


External Economies and International Trade

- If external economies exist, however, the pattern of trade could be due to historical accidents.
 - Using comparative advantage, we are able to explain why Silicon Valley is in USA, rather than in Mexico. But why is Silicon Valley in California and not in Texas?
 - Similarly, we are able to explain why button production is in China and not in Germany. But why is it in China and not in Vietnam?
- Countries that start as large producers in certain industries tend to remain large producers even if another country could potentially produce more cheaply.



Fig. 7-4: The Importance of Established Advantage



Assume that the Vietnamese cost curve lies below the Chinese curve because Vietnamese wages are lower than Chinese wages.

At any given level of production, Vietnam could manufacture buttons more cheaply than China.

One might hope that this would always imply that Vietnam will in fact supply the world market.

But this need not always be the case if China has enough of a head start. **Why?**



Concentration of Industries and Their Historical Background

- London and New York are financial centers
 - GB was the dominant economic force in 19th century and that is why London became financial center. It has retained that role even though modern Britain is nowadays no longer the dominant force in the world economy.
 - NY owes its position to Erie Canal which connect NY with Great Lakes. Because of that, NY became the main U.S. port and consequently also the financial center. It has retained its role even though the canal is currently used mainly for recreational purposes.



Concentration of Industries and Their Historical Background

- Silicon Valley may owe its existence to two Stanford graduates named Hewlett and Packard who started a business in a garage there.
- A tufted blanket, crafted as a wedding gift by a 19th-century teenager, gave rise to the cluster of carpet manufacturers around Dalton, Georgia.
- Bangalore as a center of information services might look differently if Texas Instruments had not chosen it in 1984 for its investment project.



Concentration of Industries and Their Historical Background

- The most important export sector in U.S. is the entertainment industry (movies)
 - External economies: specialized services and labor pooling
 - USA is much larger market than Italy or France which enables to make blockbusters with huge budgets
 - “American” films are often made by foreigners.
- Hollywood is located in LA because of good weather. Historically, movies were shot outdoors.
 - Nowadays, movies are shot indoors, however, film industry is (and will be) still located in Hollywood.
- Similar clusters in other countries
 - Indian Bollywood in Bombay, African Nollywood in Nigeria, Chinese films in Hong-Kong, Latin American telenovelas in Caracas



Concentration of Industries in China

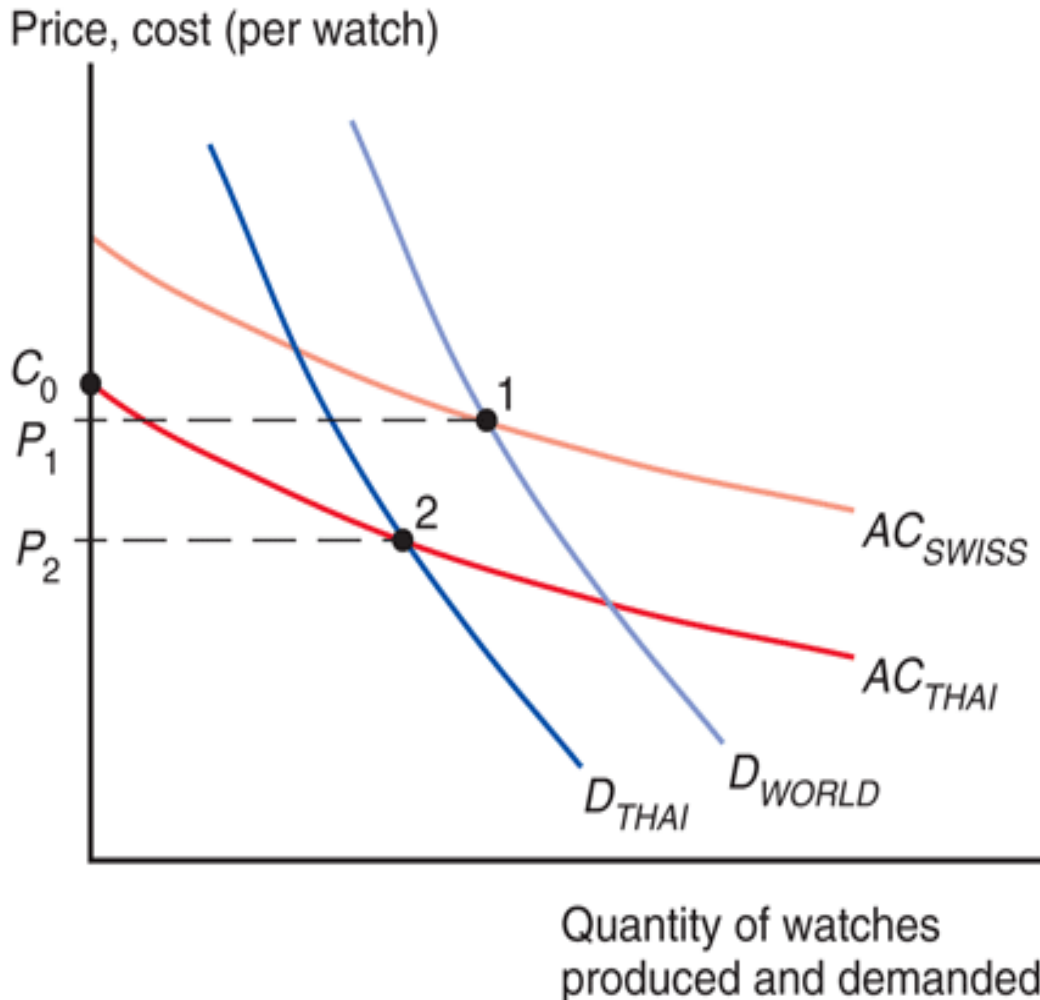
- Qiatou – 60% of world production of buttons and large portion of world production of zipper
 - A large number of small firms which benefit from being close to each other.
 - The origins lie in historical accident: In 1980, three brothers spotted some discarded buttons in the street and they repaired and sold them. Then, they decided to start the button business.
- Hang Ji – toothbrushes
- Sheng Zhou – ties
- Zhang Qi – cigarette lighters
- Wen Ling – shoes
- Yiwu - socks



External Economies and International Trade

- *No guarantee that the right country will produce a good that is subject to external economies.*
 - *The right country means country that is able to produce given level of production with the lowest costs.*
- Trade based on external economies has an ambiguous effect on national welfare.
 - There will be gains to the world economy by concentrating production of industries with external economies.
 - *It's possible that a country is worse off with trade than it would have been without trade:* a country may be better off if it produces everything for its domestic market rather than pay for imports, see next Fig. 7-5.

Fig. 7-5: External Economies and Losses from Trade



Imagine that Thailand could make watches more cheaply, but Switzerland got there first.

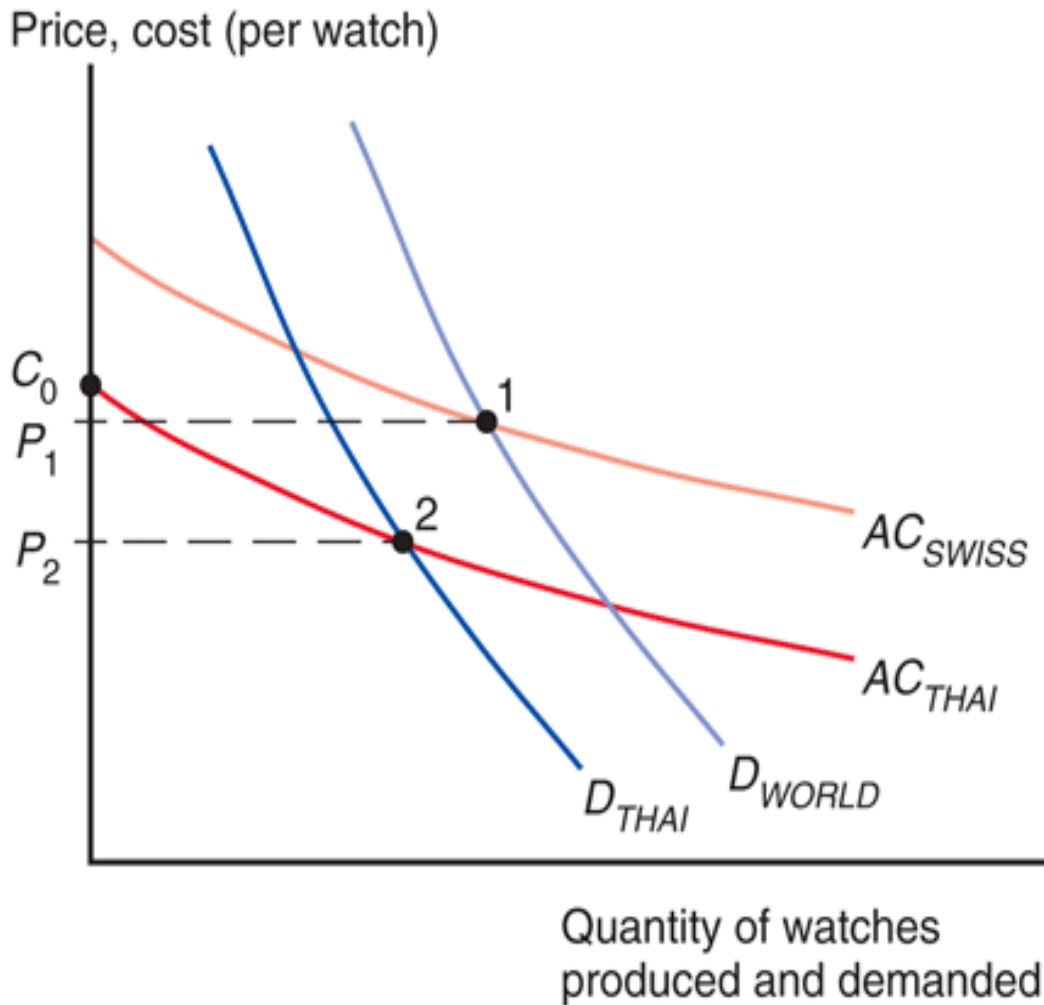
The price of watches could be lower in Thailand with no trade.

Trade could make Thailand worse off, creating an incentive to protect its potential watch industry from foreign competition.

What if Thailand reverts to autarky?



Fig. 7-5: External Economies and Losses from Trade



Note, that it's still to the benefit of the *world* economy to take advantage of the gains from concentrating industries *somewhere*.

Each country wanting to reap the benefits of housing an industry with economies of scale creates trade conflicts.

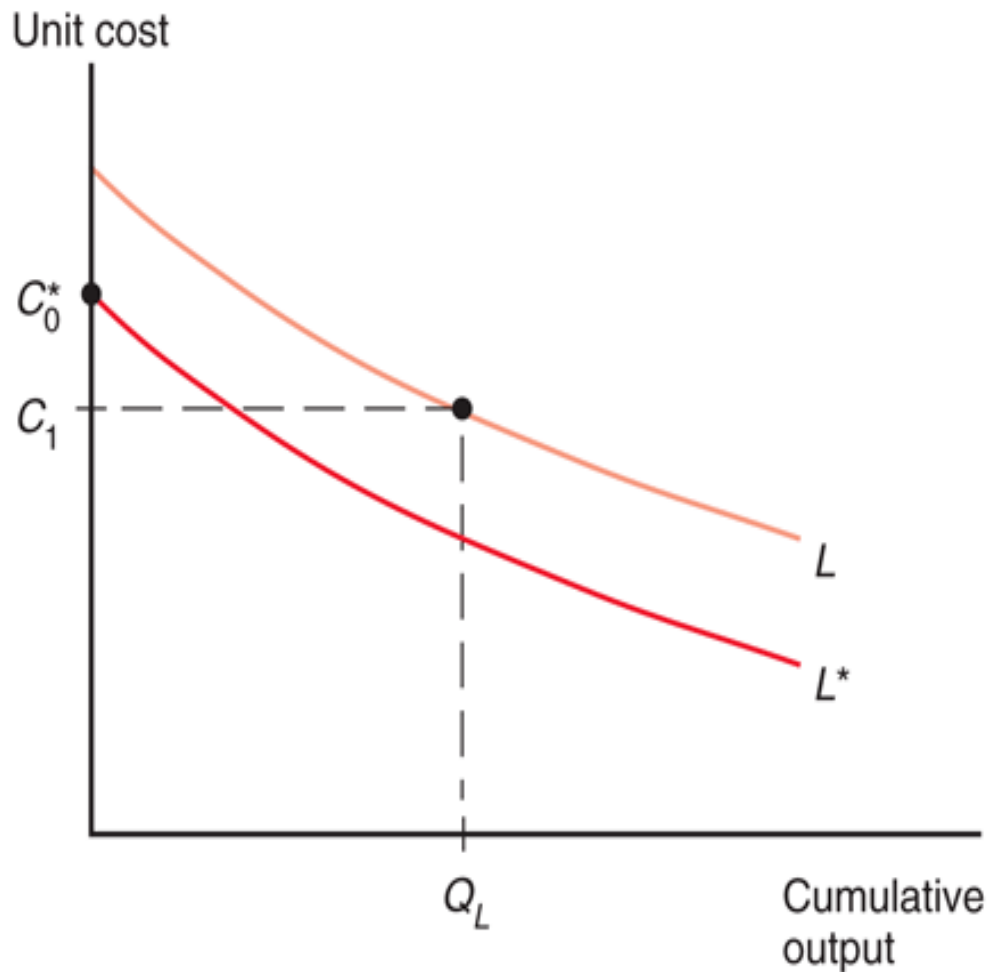
In reality, it is hard to identify when external economies of scale really exist.



Dynamic Increasing Returns

- So far, we have considered cases where external economies depend on the amount of *current output* at a point in time.
- But external economies may also depend on the amount of *cumulative output over time*.
- **Dynamic increasing returns to scale** exist if average costs fall as cumulative output over time rises.
- Dynamic increasing returns to scale could arise if the cost of production depends on the accumulation of knowledge and experience, which depend on the production process over time.

Fig. 7-6: The Learning Curve



A graphical representation of dynamic increasing returns to scale is called a **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 a 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.



Dynamic Increasing Returns

- Like external economies of scale at a point in time, dynamic increasing returns to scale can lock in an initial advantage or a head start in an industry.
- Can also be used to justify protectionism.
 - Temporary protection of industries enables them to gain experience: **infant industry argument**.
 - But temporary is often for a long time, and it is hard to identify when external economies of scale really exist.



International Trade and Economic Geography

- External economies may also be important for **interregional trade** within a country.
 - Many movie producers located in Los Angeles produce movies for consumers throughout the U.S.
 - Many financial firms located in New York provide financial services for consumers throughout the U.S.
- Some nontradable goods like veterinary services must usually be supplied locally.
 - 60% of U.S. workers are employed by industries whose output is nontradable even within USA. The share of nontradable industries in employment is pretty much the same across the U.S.
 - On the other hand, tradable industries vary greatly in importance across regions.



Table 7-2: Some Examples of Tradable and Nontradable Industries

Tradable Industries

Motion pictures
Securities, commodities, etc.
Scientific research

Nontradable Industries

Newspaper publishers
Savings institutions
Veterinary services

Source: J. Bradford Jensen and Lori. G. Kletzer, “Tradable Services: Understanding the Scope and Impact of Services Outsourcing,” in Lael Brainard and Susan M. Collins, eds., *Brookings Trade Forum 2005: Offshoring White Collar Work* (Washington, D.C.: Brookings Institution, 2005), pp. 75–116.



International Trade and Economic Geography

- **Economic geography** examines international and interregional trade and the organization of economic activity in metropolitan and rural areas.
- What determines the location of tradable industries?
 - In some cases, natural resources play a key role. For example, Houston is a center for the oil industry because east Texas is where the oil is.
- In the case of interregional trade, labor and capital are much more mobile than in the case of international trade.
 - Resources tend to move where the industries are rather than the other way round, see Silicon Valley.
 - In such case, the patterns of trade are much more influenced by external economies and historical accidents.



Summary

1. Trade need not be the result of comparative advantage. Instead, it can result from increasing returns or economies of scale, that is, from a tendency of unit costs to be lower with larger output.
2. Economies of scale give countries an incentive to specialize and trade even in the absence of differences in resources or technology between countries.
3. Economies of scale can be internal (depending on the size of the firm) or external (depending on the size of the industry).
4. Economies of scale can lead to a breakdown of perfect competition, unless they take the form of external economies, which occur at the level of the industry instead of the firm.



Summary

5. External economies give an important role to history and accident in determining the pattern of international trade.
 - When external economies are important, a country starting with a large advantage may retain that advantage even if another country could potentially produce the same goods more cheaply.
6. Trade based on external economies of scale may increase or decrease national welfare, and countries may benefit from temporary protectionism if their industries exhibit external economies of scale either at a point in time or over time.