# Bigger is better: Increasing Returns to Scale and Trade

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- Last Time: The Standard Model
  - Model
    - Focus on PPF and Demand
    - Leave production details unspecified
    - More careful about Demand
  - Growth
    - Export-biased growth is bad
    - Import-biased growth is good
    - Theoretically possible to be hurt by growth
  - Tariffs and subsidies
    - Tariffs on import good improve terms of trade
    - Export subsidy worsens terms of trade
    - Effect on welfare qualified
  - International lending

- This time: Increasing Returns to Scale
  - Krugman: External Economies
    - Larger industries have lower cost
    - Drives industries to concentrate
    - A reason for trade
  - Implications of external economies
    - Historical Accident
    - Money on the table
    - Infant industries
  - Melitz and Krugman: Internal Economies
    - Larger firms have lower cost
    - Each firm a different product or variety
    - Consumers like a mix
    - Reason for trade: more (and cheaper) varieties
  - Applications
    - Dumping
    - Outsourcing
    - FDI

- But first a review!

- End review!

# Chapter 7: External Economies

- A trade model quite different from those earlier
  - Technology depends upon scale and experience
  - Best to concentrate production in one location
  - Drives countries to specialize, *even if ex-ante identical!*
- Idea: Larger industries have lower costs
  - knowledge spillovers due to informal interaction
  - Specialized Labor market pooling
  - Specialized suppliers
- Room for helpful government policy
  - Historical accident: Industries can be in the 'wrong' country
  - There can be equilibrium losses from trade!
  - 'Infant' Industries may need early protection from competition

# Returns to Scale

*even if countries are ex-ante identical!*

- IKEA furniture
  - One person: All day to assemble a flipping dresser
  - Two people: Two hours for a dresser
  - Ten people: Can assemble 5 dressers in an hour
  - Factory of fifty people: Can assemble 400 dressers in eight hours
- How many hours per dresser?

# External vs Internal Increasing Returns

- Firms or locations?
  - If increasing returns happen within an industry and firm, what would the economy look like?
  - If increasing returns happen within an industry and location, what would the economy look like?
- First: increasing returns within industry and location
  - Firms are very small, no affect on aggregate production
  - The more the industry produces, the lower are average costs
  - Good model for Silicon Valley startups

# Decreasing marginal product of labor?

- Specific factors, HO – increase labor, fix capital, decreasing returns to labor
- Now we want increasing returns – what is the argument?
  - Specialized suppliers
  - Labor market pooling
  - Knowledge spillovers

# Specialized suppliers

- Production can require very specific inputs
- Maybe:
  - Specialized tool for cleaning button making machines
  - High quality polymers for production of CPU's
  - Chemicals used in pharmaceutical research
- If industry is clusters, suppliers likely to cluster as well
- Costly to open new firm in completely different location

# Labor market pooling

- We have been treating labor as costlessly mobile (equal wages)
- Now let's make it totally impossible for labor to move between locations
  - Suppose we have two universities, one in Aarhus and one in Copenhagen
  - Suppose we have 100 economists, 50 in Aarhus and 50 in Copenhagen
- Now suppose that the two universities are hit by demand shocks
  - Enrollment is high at Aarhus university sometimes, need more economists
  - Enrollment is low at Aarhus university sometimes, need fewer economists
- If the two universities were in the same location, sometimes when Aarhus university needs fewer economists, Copenhagen university would need more
  - Better for both universities, who need labor, and economists, who need jobs
  - (or is it?)

# Knowledge Spillovers

- Close to my heart
  - Academics spread citations when they move across departments
  - Can't resist showing you a couple of pictures from my paper
- People spread ideas informally and face-to-face
  - The business cliché that water-cooler discussions are more important than formal meetings
  - Recently Yahoo called all telecommuters back
- Why are industries clustered within cities?
  - Labor market pooling and suppliers can't really explain it
  - Vernon Hendersen finds that Ad agencies need to be within 300 meters to gain from external economies

# Pause

- We have explained why expect increasing returns at industry-location level
- Next
  - Setup
  - Supply, demand, and equilibrium
  - Autarchy and trade

- To start, simplest possible model
  - One country
  - One good
  - One factor: Labor
  - *External* increasing returns to scale
  - That is: industry/location scale economies

# The firm's problem

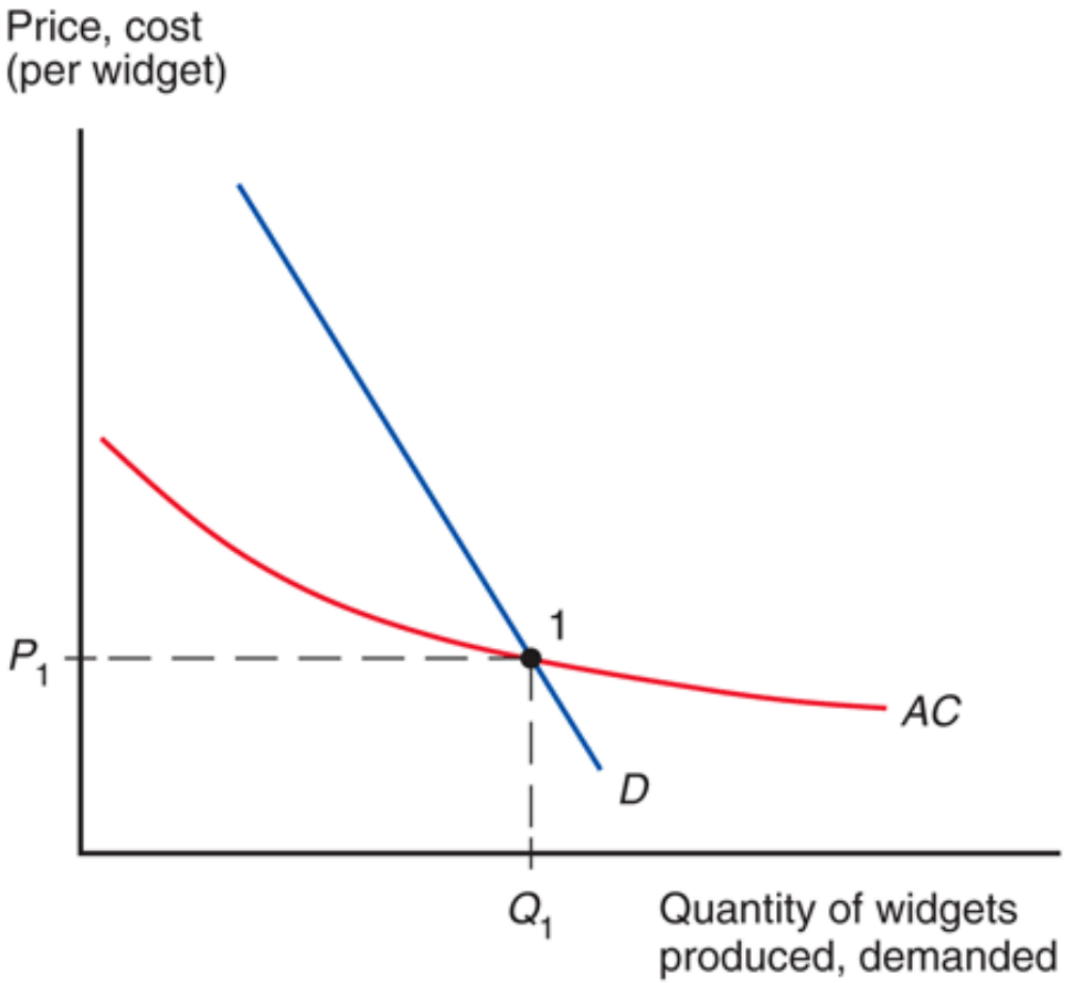
- Firms are really tiny
- They think they do not affect industry wages
- In equilibrium, zero-profits again
- What is the equilibrium wage?

# Equilibrium supply and demand

- We have been equating relative supply and relative demand
- Nothing relative here, we only have one good
- Now we are going to equate average cost and demand
- Why does avg. cost have to equal price in equilibrium?
- Hint: Labor gets everything in this model

# Equilibrium supply and demand

- Last piece: Average cost is falling due to external economies of scale




- Where does demand curve come from?

# Pause

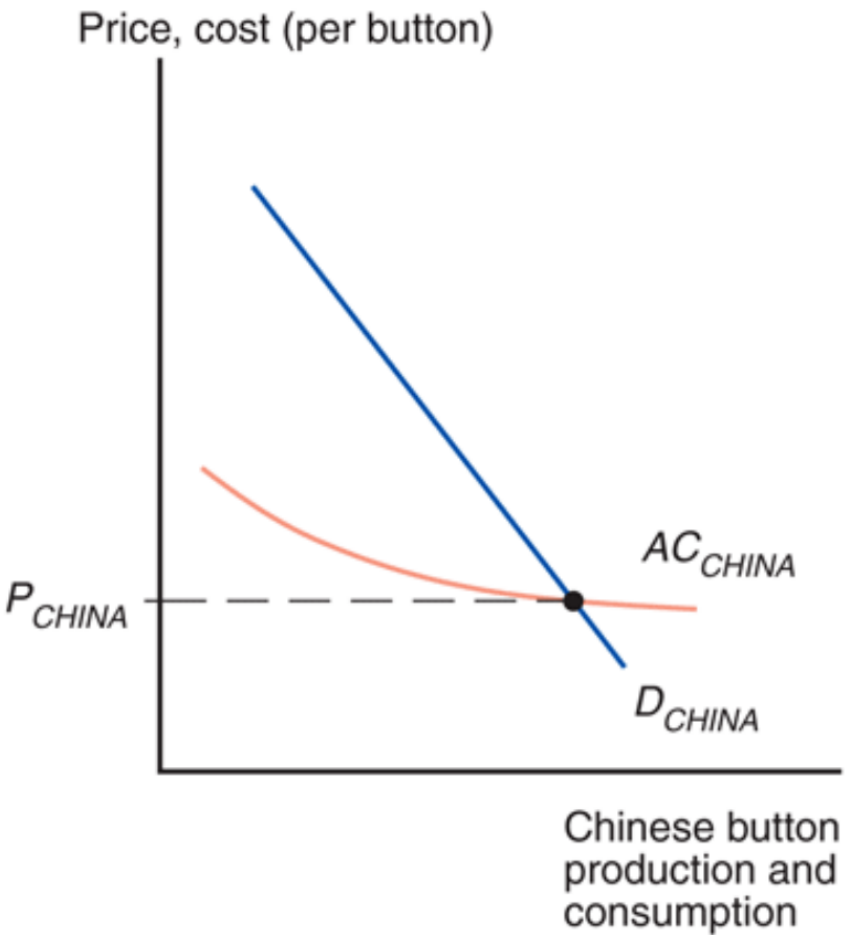
- Simple 1 x 1 x 1 model
- Now add second country
- How does trade affect price?

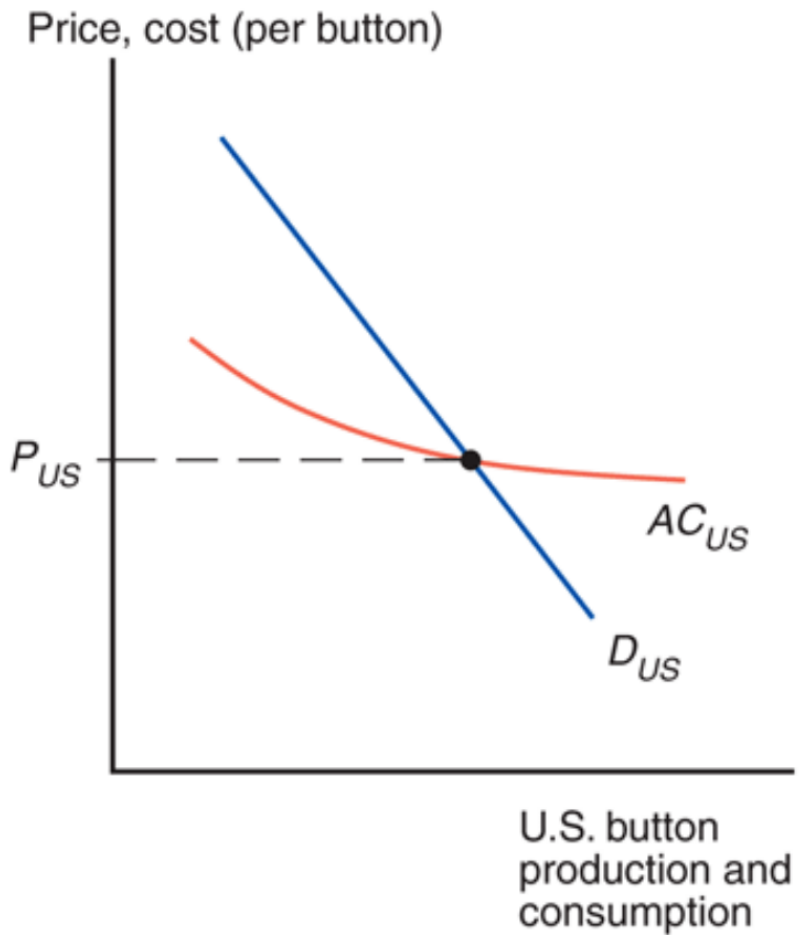
# Trade and External Economies

- Two countries: China and US
- Two goods: Buttons and Not-Buttons
- One factor: Labor
- External economies of scale

# No button trade

- Each country makes its own buttons (and not-buttons)

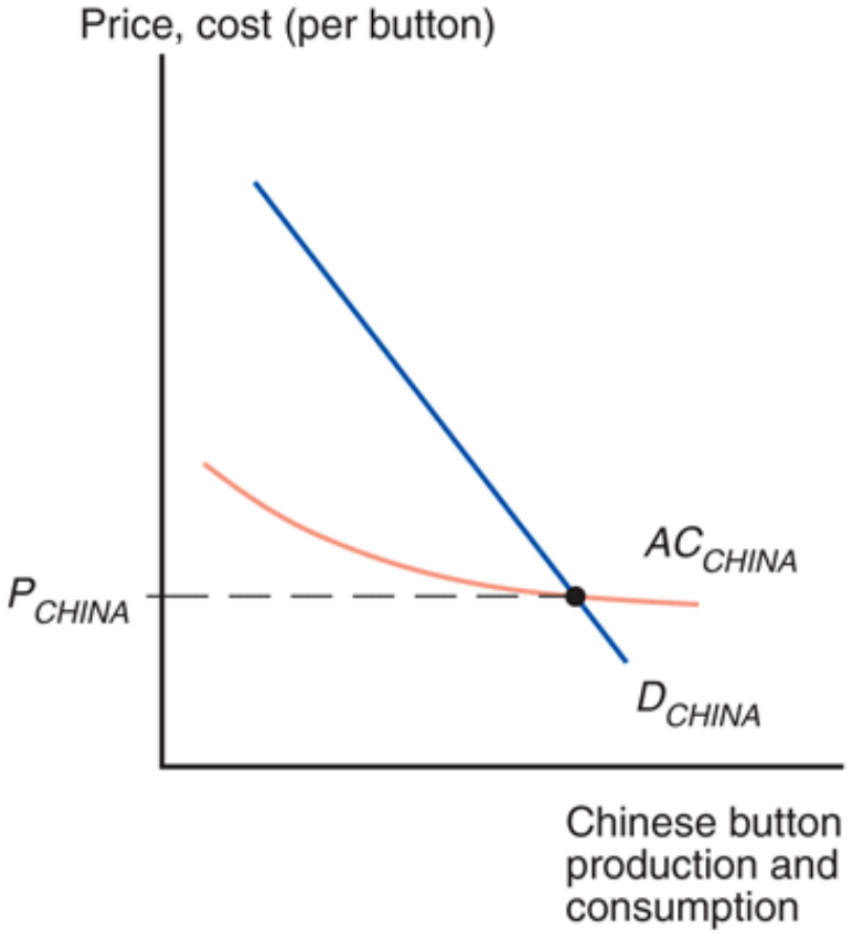


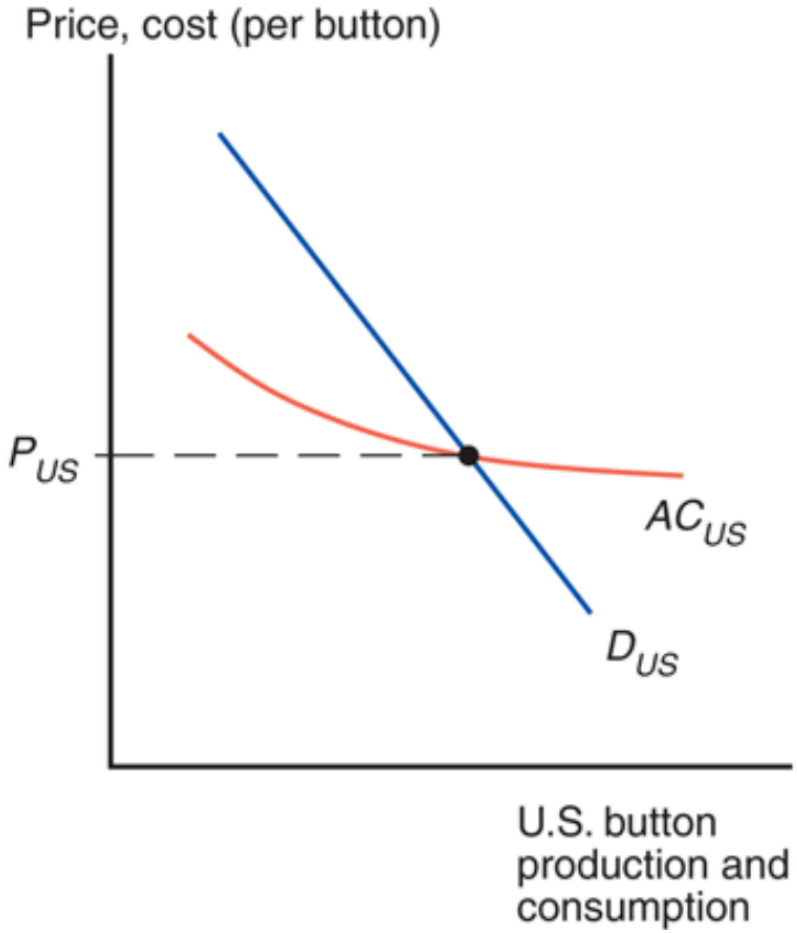



# Allow button trade

- Opening to trade
  - China can undercut all American button makers
  - True even if very little Labor in American button making
  - Increasing marginal product of labor (unlike other models)
  - Implication: China makes all the buttons
- Scale economies
  - Cost of producing buttons in China goes down
  - Cost of producing buttons in US goes up
  - Cheaper buttons everywhere!
  - What about real wages of Chinese workers?
  - What about real wages of American workers?

# Allow button trade



# Implications of external economies model

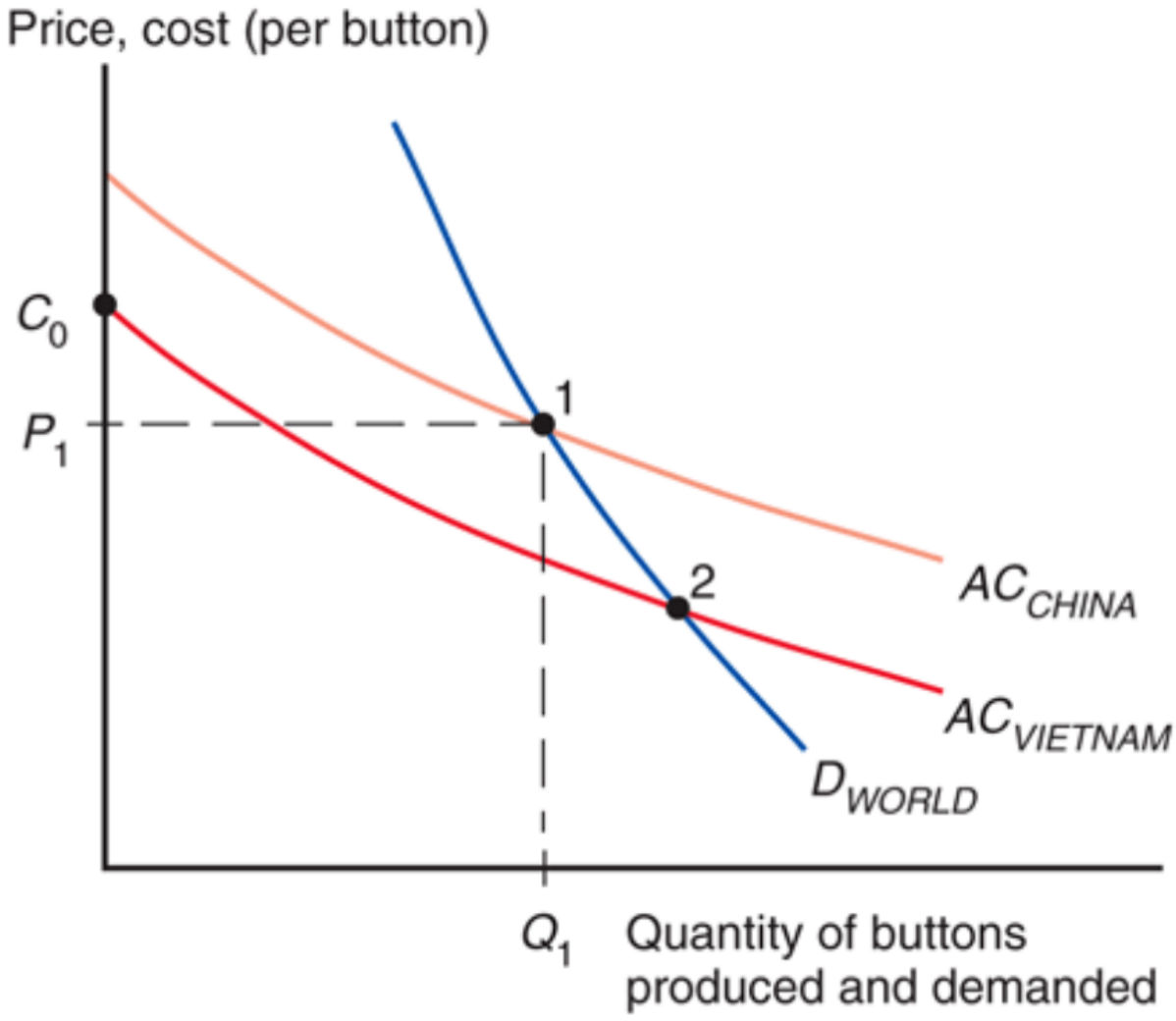
- We are going to look at three results
  1. The world poverty trap
  2. Losses from trade
  3. Beneficial protectionism

# Poverty traps and models of multiple equilibria

- Why are some countries poor and others rich?
- Destiny or luck?
- The classic poverty trap
- Models of external economies create a world poverty trap
- An industry might be in the wrong country!

# Poverty traps and models of multiple equilibria

- The idea:
  - For some reason, only one country produces a good
  - Scale lowers the price of the good significantly
  - Another country would be more efficient only if it had all production
  - At current world price, no firm in other country will enter


Price, cost (per button)
$C_0$
$P_1$
1
2
$AC_{CHINA}$
$AC_{VIETNAM}$
$D_{WORLD}$
$Q_1$
Quantity of buttons produced and demanded

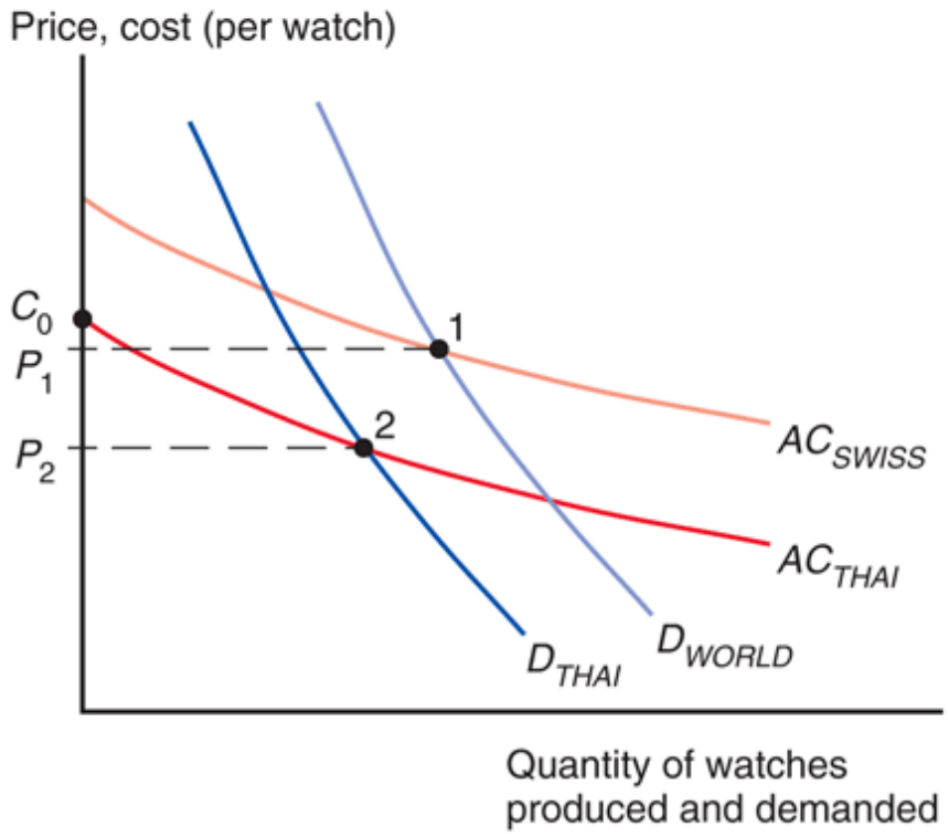
# Multiple equilibria

- Why is an industry in a certain place?
  - Often historical accident
- Scope for government intervention!

# Losses from trade

- External scale economies can also create losses from trade
- Intuition: Same story as wrong equilibrium
  - Thailand can make watches cheaper, but Switzerland started first
  - Now, even if Thailand only produced Thai watches, it would get lower price
  - Again, low world price keeps firms from entering

- What if Thai government shut down trade?
- Who benefits if Thai government shut down trade and then opened it again?



# Learning by doing

- Suppose that the more a country produces, the lower its cost
- Seems reasonable, lots of studies on WWII America show this
- Can give rise to dynamic losses from trade as well
  - Two countries, Two goods: Food and Clothing
  - Rich country has comp. adv. in Food
  - All learning in agriculture finished
  - In autarchy, both countries grow
  - Suppose Poor specializes in Food after opening to trade
  - Poor stops growing
- Trading dynamic losses for static gains

# Learning by doing

- If there is learning by doing, countries might protect industries until ready for trade
- One might call this the Singapore model
- Tough part is that it is hard to pick the right industry ex-ante: American solar subsidies

# Summary: Chapter 7

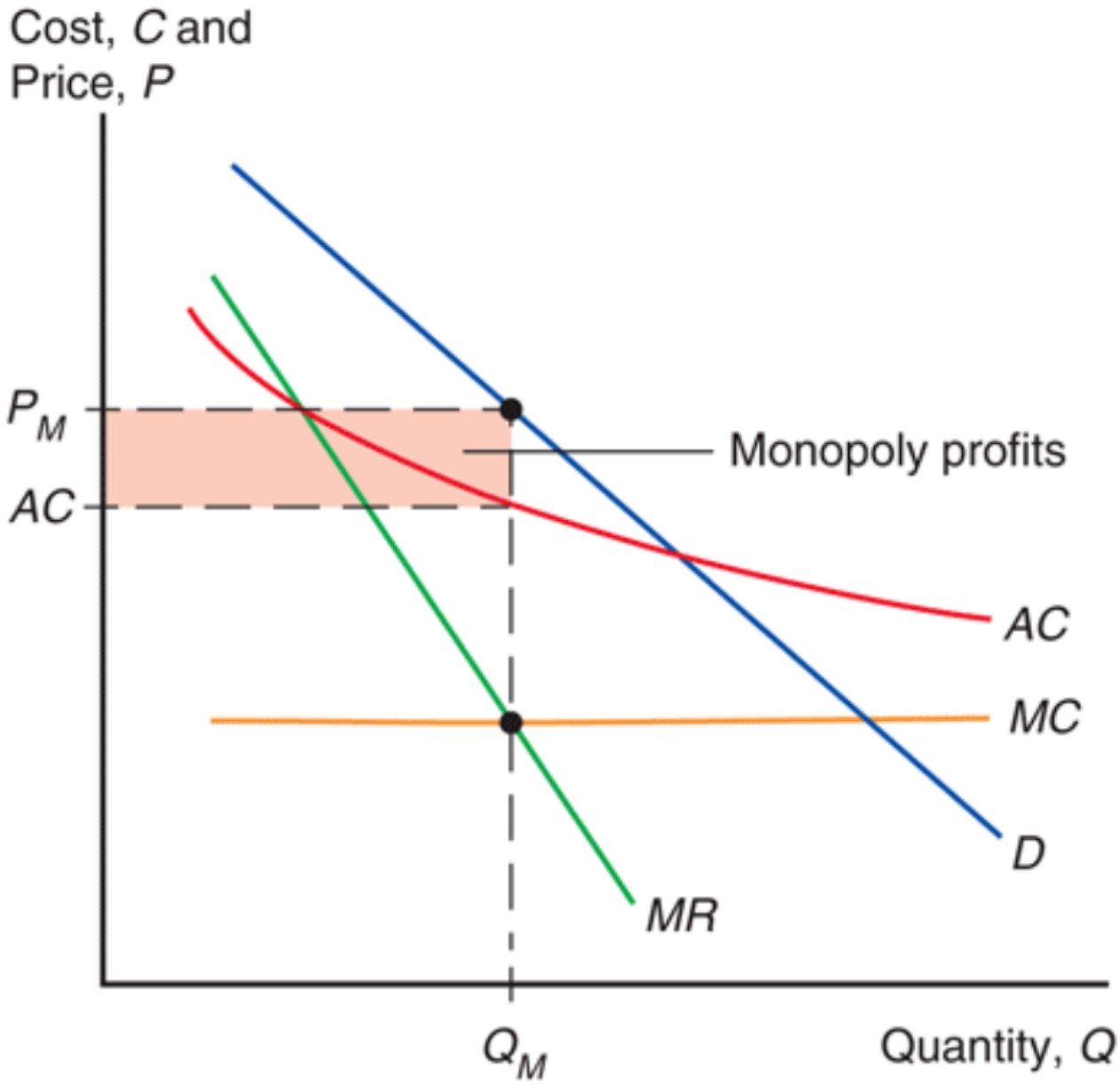
- Implications of external economies model are quite different
- . . . and somewhat disturbing
- Potential losses from trade
- Large beneficial role for government
- What is causing these results?
  - For one thing, partial equilibrium

# Next up: Chapter 8

- Now, internal increasing returns to scale
- The bigger the firm, the lower its cost
  - Issue: How many firms if we have two goods?
  - Solution: Each firm makes a different product
  - Implication: Each firm has a monopoly on its product
- Recently very popular, generate firm size distributions
- Past chapters: how does trade affect workers and factor owners
  - Firms were basically ignored
  - Side note: If we have L workers, how many free-entry, CRS firms are there?
- Main point of chapter: how does trade affect firms?

# Monopoly

- Each firm has a monopoly over its own product
- Deconfusifying the textbook review of monopoly, go!
  - Price takers vs price makers
  - Gap between MR and Demand curves
  - Suppose linear demand: $Q = A - BP$
  - Average cost vs marginal cost


Cost, C and
Price, P
$P_M$
AC
Monopoly profits
AC
MC
D
MR
$Q_M$
Quantity, Q

# Monopolistic Competition

- Monopoly models are easy to analyze
- One firm doesn't make an interesting distribution
- Oligopoly models are hard
  - Pricing decisions depend on beliefs about other firm behavior
  - With strange beliefs, strange equilibria
- Solution: Monopolistic competition
  - Firms are very small
  - Firms care about market-wide average prices
  - Individual firm deviations don't change aggregate

# Active trade literature

- Starting with Melitz (2002), much active trade literature models of Monop. comp.
- Goal: how does trade affect firms
- Monopolistic competition models extremely popular and useful
- Differing opinion: *The theory of monopolistic competition offers no tools for the analysis of an industry and so no stopping place between the firm at one extreme and general equilibrium at the other. It is therefore incompetent to contribute to the analysis of a host of important problems: the one extreme is too narrow to be of great interest; the other, too broad to permit meaningful generalisations.* – Milton Friedman (1953), Nobel prize 1976

# What we are after

- How does opening up to trade affect firms?
  - Do less productive firms close down?
  - Do more firms start operating?
  - Does each firm get bigger?
- How to get there
  1. First Monop. Comp. equilibrium in a closed economy
  2. Trade equilibrium with identical firms
  3. Trade equilibrium with heterogenous firms

# Monop. Comp. equilibrium

- Plan:
  - Show average cost increasing with number of firms
  - Show price decreasing with number of firms
  - Show equilibrium number of firms is intersection (zero profits)

# Avg. cost increasing in firm number

- Suppose firms face the demand:

$$Q = S\left(\frac{1}{n} - b(P - \overline{P})\right)$$

- If firms are all the same, charge $\overline{P}$
- Production of a firm is $Q = \frac{S}{n}$
- What happens to production if $n$ increases?
- What happens to the average cost of each firm?

# Equil. price decreasing with number of firms

- Suppose firms face the demand:

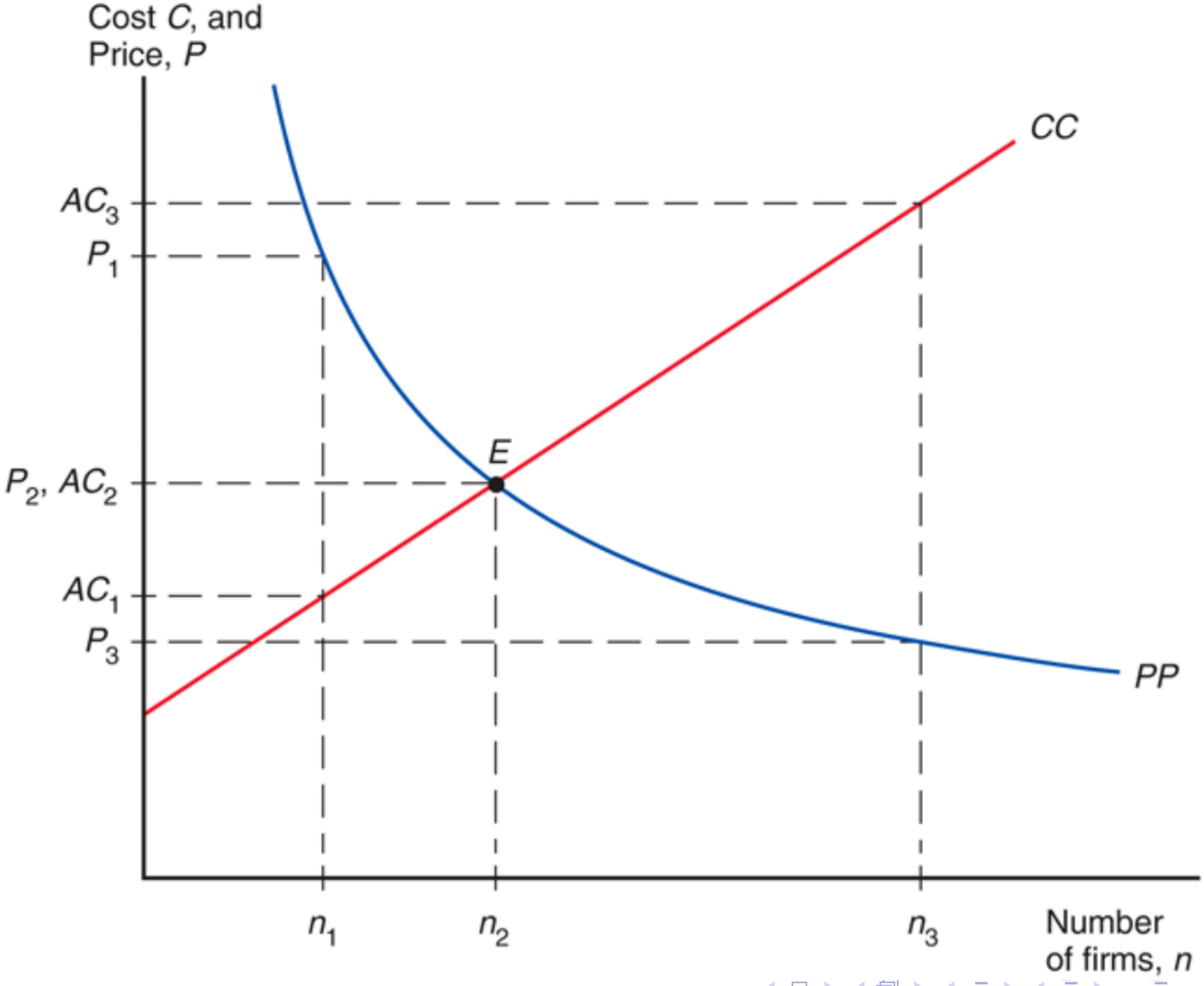
$$Q = S\left(\frac{1}{n} - b(P - \overline{P})\right)$$

- Get price as a function of quantity
- Write down firm problem
- Write first order condition
- Substitute $Q = \frac{S}{n}$

# Price equals average cost

- Suppose price were higher than average cost
  - A new firm would enter
- Suppose price less than average cost
  - Some firm would exit
- Must be that price equals average cost

# Autarchy equilibrium number of firms



# Opening up to trade

- First let's show that an increase in market size
  - Increases number of active firms (products)
  - Lowers equilibrium price of each product
- Firms produce $\frac{S}{n}$
- Market size $S$ increases, each firm produces more
- Average cost falls
- Price firm's charge is $P = c + \frac{1}{bn}$
- Unrelated to market size

# Increased market size