

Lecture 7b:

# Monopolistic competition

Thibault FALLY

C181 – International Trade

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## 2- Monopolistic Competition

“Monopolistic competition”

- Firms don't take their price as given
  - Firms account for how their production affects prices
- But take the price of their competitors as given
  - Greatly simplifies equilibrium
  - “Brands” in an almost a competitive environment

## 2- Monopolistic Competition

Assumptions of the model of monopolistic competition:

**Assumption 1:** Firms produce using a technology with increasing returns to scale.

- There is a constant marginal cost  $MC = c$
- There is a fixed cost  $F > 0$

## 2- Monopolistic Competition

Assumptions of the model of monopolistic competition:

**Assumption 2:** Firms produce differentiated goods

→ *Each firm faces a downward-sloping demand curve for its product and has some control its price*

**Assumption 3:** There are “many” firms in the industry

→ *Firms take the average price across firms as given*

## 2- Monopolistic Competition

Assumptions of the model of monopolistic competition:

Demand:

$$Q = S \cdot \left[ \frac{1}{n} - b (P - \bar{P}) \right]$$

- S: total industry output (assumed fixed)
- n: number of firms
- Q: quantity produced by each firm
- b: sensitivity of demand to prices

## 2- Monopolistic Competition

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Assumptions of the model of monopolistic competition:

**Assumption 4:** Because firms can enter and exit the industry freely, profits are zero in the long run.

- Firms will enter as long as it is possible to make monopoly profits, and the more firms that enter, the lower profits per firm become.
- Profits for each firm end up as zero in the long run

## 2- Monopolistic Competition

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- Profits for each firm end up as zero in the long run
- We will also examine what happens in the “short run”, i.e. without adjusting the number of firms.

## 2- Monopolistic Competition

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### Equilibrium

We will describe the equilibrium with two key variables: price  $P$  and number of firms “ $n$ ”



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We will use two curves in the  $(P,n)$  space:

- “CC” curve: average cost as a function of “ $n$ ”
- “PP” curve: average price as a function of “ $n$ ”

## 2- Monopolistic Competition

### Equilibrium

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We will use two curves in the  $(P,n)$  space:

- “CC” curve: average cost as a function of “ $n$ ”
- “PP” curve: average price as a function of “ $n$ ”

Equilibrium with zero profits:

$P = AC \rightarrow$  Intersection between CC and PP

## 2- Monopolistic Competition

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### Equilibrium

#### Symmetric equilibrium:

Since all firms have the same costs and demand, all firms have the same P, Q, AC, etc.

Easy to retrieve quantities once we know “n”:

$$Q = S / n$$

## 2- Monopolistic Competition

“CC” curve: Average cost

Combining:

- $AC = c + F / Q$
- and:  $Q = S/n$ ,

→ We obtain the CC curve:  $AC = c + n F / S$

**Intuition:** *costs are high when there are too many firms (each firm produces in small quantities)*

## 2- Monopolistic Competition

“PP” curve:  $MR = c$

- Demand system:  $Q = S \cdot [1/n - b (P - \bar{P})]$

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## 2- Monopolistic Competition

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yields the following MR:  $MR = P - \frac{Q}{b S}$
- Equilibrium imposes:  $c = MR = P - \frac{Q}{b S}$

*But then how to get a relationship between  $P$  and “ $n$ ”?*

## 2- Monopolistic Competition

“PP” curve:  $MR = c$

- Demand system:  $Q = S \cdot [1/n - b(P - \bar{P})]$

yields the following MR:  $MR = P - \frac{Q}{bS}$

- Equilibrium imposes:  $c = MR = P - \frac{Q}{bS}$

→ With  $Q = S/n$ , we obtain the PP curve:  $P = c + \frac{1}{bn}$

**Intuition:** *Markups ( $P-c$ ) are lower and prices are closer to MC (perfect competition) with many firms*



Equilibrium:  $P = AC$  – reached for  $(n_2, P_2)$

The graph illustrates the relationship between the number of firms ( $n$ ) and the cost/price ( $C, P$ ). The vertical axis represents Cost  $C$  and Price  $P$ , and the horizontal axis represents the Number of firms,  $n$ .

Two curves are shown:

- CC (Cost Curve):** A red line that slopes upward, representing the total cost as a function of the number of firms.
- PP (Price Curve):** A blue curve that slopes downward, representing the price as a function of the number of firms.

The equilibrium point  $E$  is the intersection of the  $CC$  and  $PP$  curves. At this point, the price  $P_2$  is equal to the average cost  $AC_2$ , and the number of firms is  $n_2$ .

Other points on the axes are marked:

- On the vertical axis:  $AC_3$ ,  $P_1$ ,  $AC_1$ , and  $P_3$ .
- On the horizontal axis:  $n_1$  and  $n_3$ .

Dashed lines indicate the following relationships:

- $P_1$  and  $AC_3$  are on the  $CC$  curve.
- $P_3$  and  $AC_1$  are on the  $PP$  curve.
- The equilibrium point  $E$  corresponds to  $(n_2, P_2, AC_2)$ .

## 2- Monopolistic Competition

What if we deviate from equilibrium  $P_2, n_2$ ?

**Starting from  $n_1 < n_2$ :**

- PP curve above the AC curve
- $P > AC$  implies that there are positive profits:  
Costs are low (large quantities) and markup are large

→ New firms enter and “n” increases

## 2- Monopolistic Competition

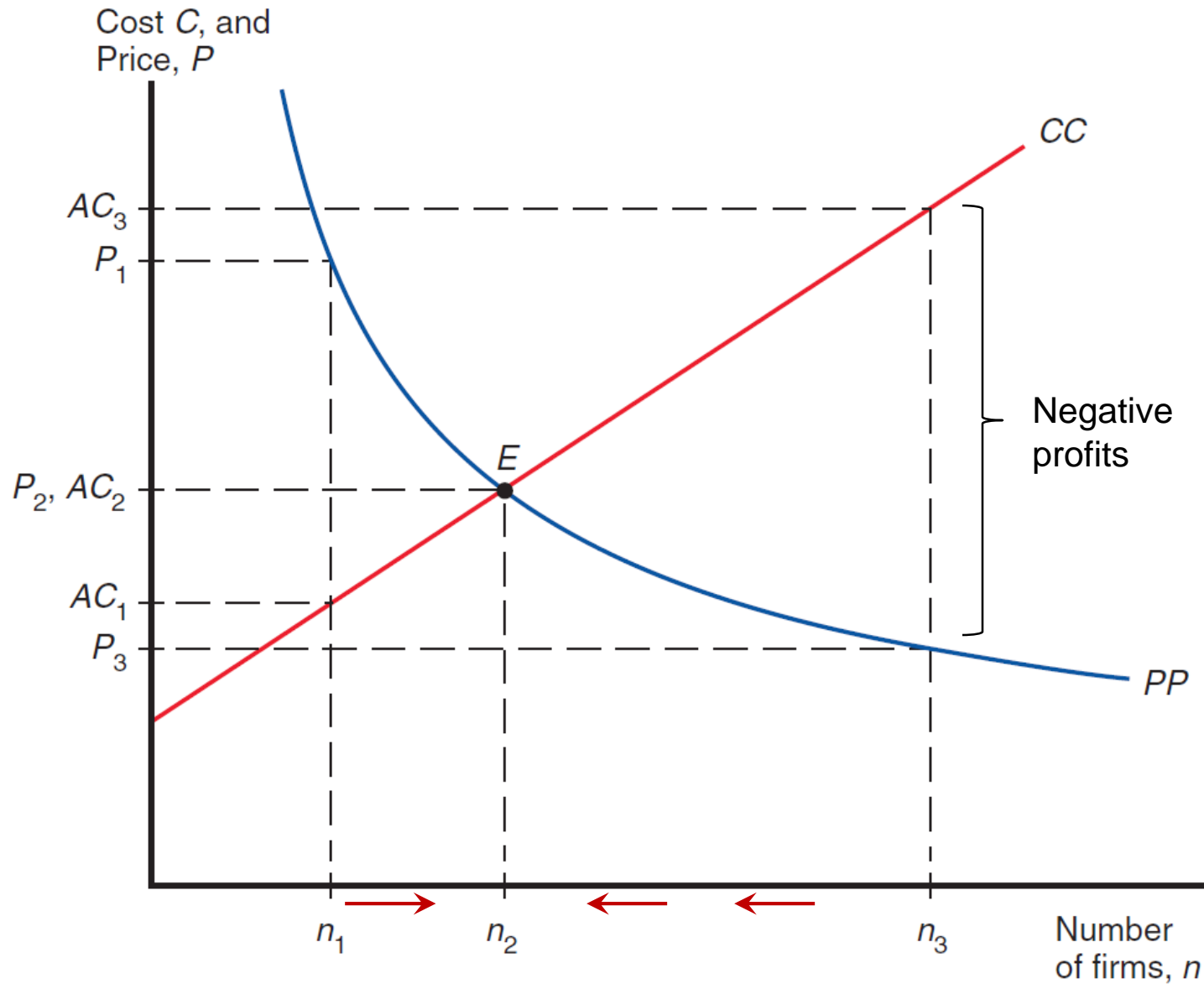
What if we deviate from equilibrium  $P_2, n_2$ ?

**Starting from  $n_3 > n_2$ :**

- PP curve below the AC curve
- $P < AC$  implies that there are negative profits:  
Costs are high (small scale), markup are low (competition)

→ Firms exit and “n” decreases

# Equilibrium: $P = AC$



## 2- Monopolistic Competition

Optimal costs and number of Firms (brands)

- Why aren't there more firms?
- Why aren't there fewer firms?

## 2- Monopolistic Competition

Optimal costs and number of Firms (brands)

- Why aren't there more firms?

If there are too many firms, production scale is too small, markups are too small → negative profits

- Why aren't there fewer firms?

If there are too few firms, profits are positive  
→ New firms enter

## 2- Monopolistic Competition

Quantitative analysis:

$$\left\{ \begin{array}{l} \text{PP curve: } P = c + \frac{1}{b n} \\ \text{CC curve: } P = AC = c + n F / S \end{array} \right.$$

## 2- Monopolistic Competition

Quantitative analysis:

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Implies:  $c + \frac{1}{b n} = c + n F / S \Rightarrow n = \sqrt{\frac{S}{b F}}$



## 2- Monopolistic Competition

### Quantitative analysis:

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Implies:  $c + \frac{1}{b n} = c + n F / S \Rightarrow n = \sqrt{\frac{S}{b F}}$

### Example:

Doubling fixed costs → Divide  $n$  by  $\sqrt{2} = 1.414$

Doubling market size → Multiply  $n$  by  $\sqrt{2} = 1.414$

## 2- Monopolistic Competition

Quantitative analysis:

$$\left\{ \begin{array}{l} \text{PP curve: } P = c + \frac{1}{b n} \\ \text{Nb. firms: } n = \sqrt{\frac{S}{b F}} \end{array} \right.$$

Implies following markup:  $P - c = \sqrt{\frac{F}{b S}}$

## 2- Monopolistic Competition

### Quantitative analysis:

$$\left\{ \begin{array}{l} \text{PP curve: } P = c + \frac{1}{b n} \\ \text{Nb. firms: } n = \sqrt{\frac{S}{b F}} \end{array} \right.$$

Implies following markup:  $P - c = \sqrt{\frac{F}{b S}}$

### Example:

Doubling fixed costs → Multiply markups by  $\sqrt{2} = 1.414$

Doubling market size → Divide markups by  $\sqrt{2} = 1.414$

# 3- Trade under monopolistic competition

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## Trade

Next step:

What is the effect of trade on:

- production?
- Number of firms?
- prices?

# 3- Trade under monopolistic competition

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Summary of assumptions:

Assumption 1:  $TC = c \cdot Q + F$

Assumption 2: Firms produce differentiated goods

Assumption 3: There are many firms in the industry

Assumption 4: Because firms can enter and exit the industry freely, profits are zero in the long run.

# 3- Trade under monopolistic competition

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## Trade

Free trade (for now): no transport cost

Both markets have the same technology and the same demand

# 3- Trade under monopolistic competition

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## Trade

Free trade (for now): no transport cost

Both markets have the same technology and the same demand

One market has a size  $S$

The other market has a size  $S^*$

→ New market with total size  $S+S^*$

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## Preview of results from the model

Clicker question:

1- When a country opens to trade, does the number of brands available to consumers increase?

a) Yes

b) No



# 3- Trade under monopolistic competition

## Clicker question

2- When a country opens to trade, does production in each firm increase?

a) Yes

b) No

# 3- Trade under monopolistic competition

## Clicker question

3- When a country opens to trade, does the number of firms in each country increase?

a) Yes

b) No

# 3- Trade under monopolistic competition

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## Clicker question

4- When a country opens to trade, do prices increase?

a) Yes

b) No

# 3- Trade under monopolistic competition

Trade = increasing market size:

How does an increased market size affect the equilibrium?

1) Average cost “CC” curve combines:

- $AC = c + F / Q$

- and:  $Q = (S + S^*) / N,$

→ New CC curve:  $AC = c + N F / (S + S^*)$

→ **CC curve shifts downward**

# 3- Trade under monopolistic competition

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Trade = increasing market size:

How does an increased market size affect the equilibrium?

2) Price “PP” curve combines:

- Equilibrium imposes:  $c = MR = P - \frac{Q}{b(S + S^*)}$

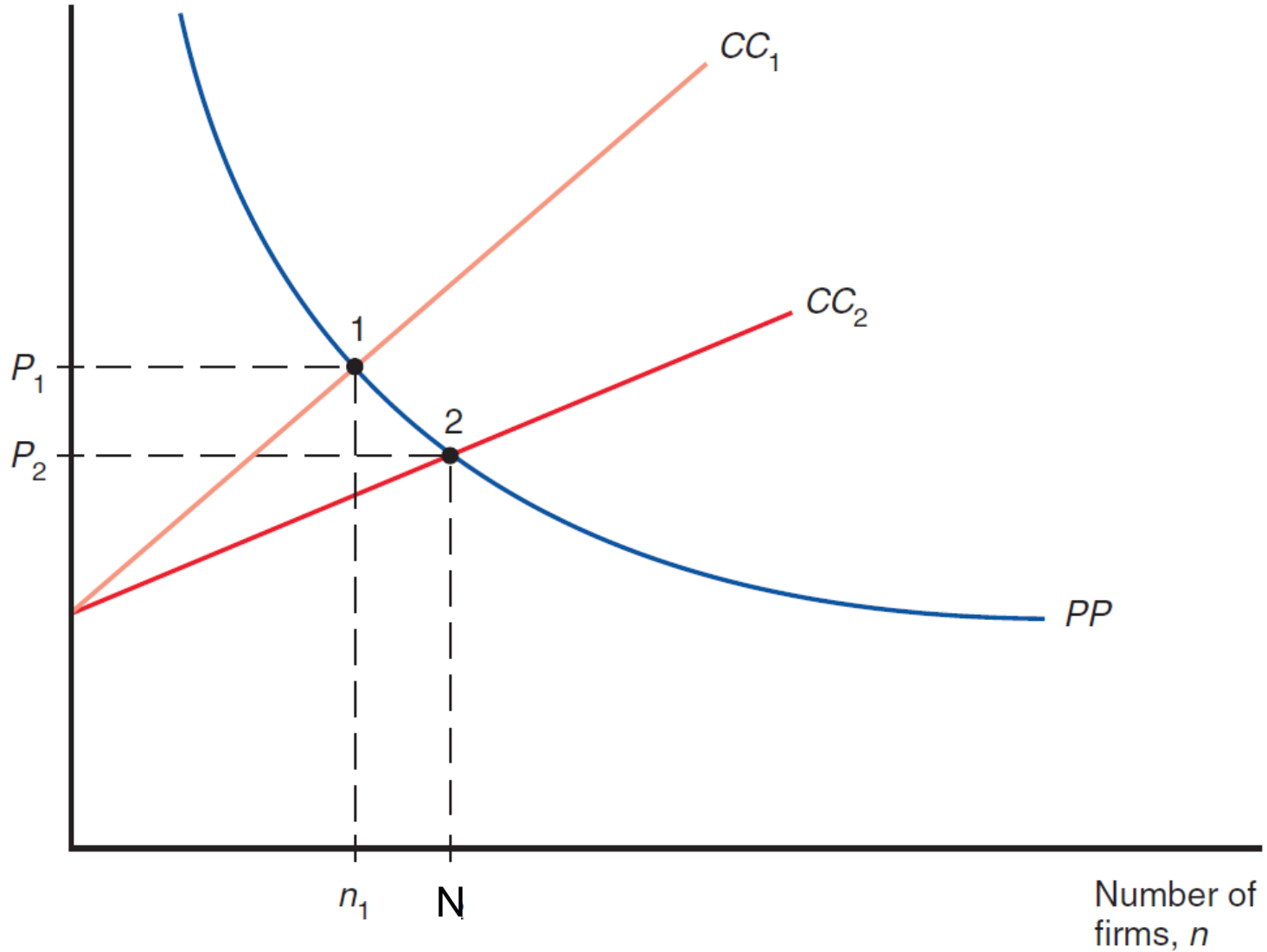
- and:  $Q = (S + S^*) / N$ ,

→ New PP curve = old PP curve:  $P = c + \frac{1}{bN}$

→ **PP curve doesn't change**

# Effect of a market size increase:

Cost,  $C$  and  
Price,  $P$



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Effect of Trade

Gains for consumers?

# 3- Trade under monopolistic competition

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## Effect of Trade

### Gains for consumers?

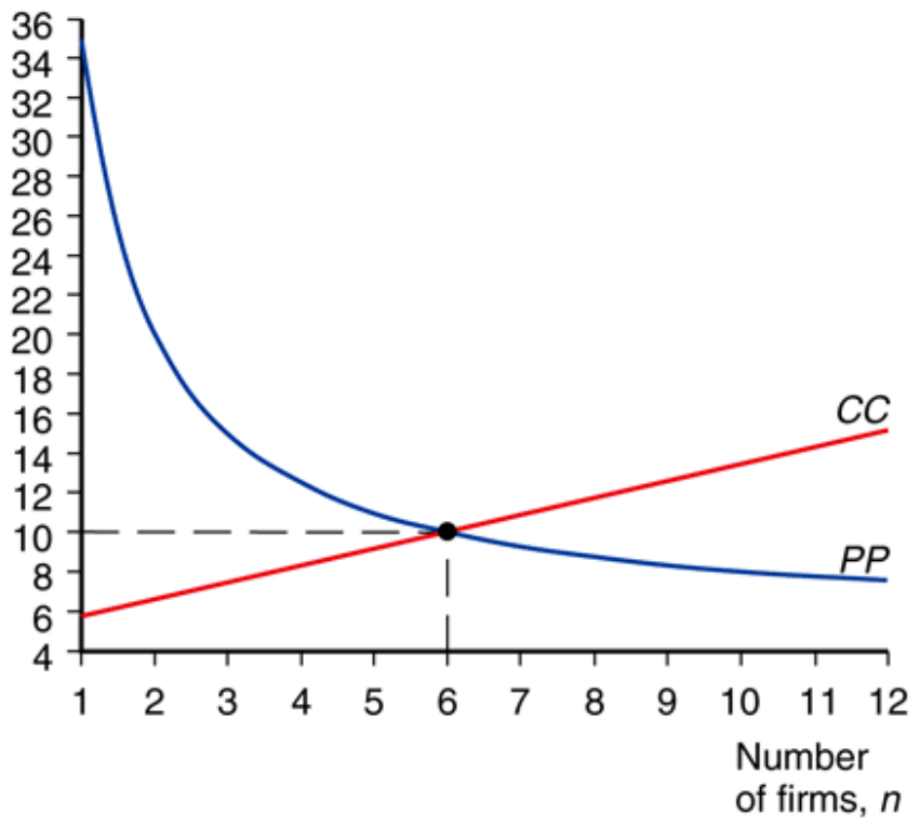
TWO sources of gains for consumers:

- Lower prices
- More brands to choose from



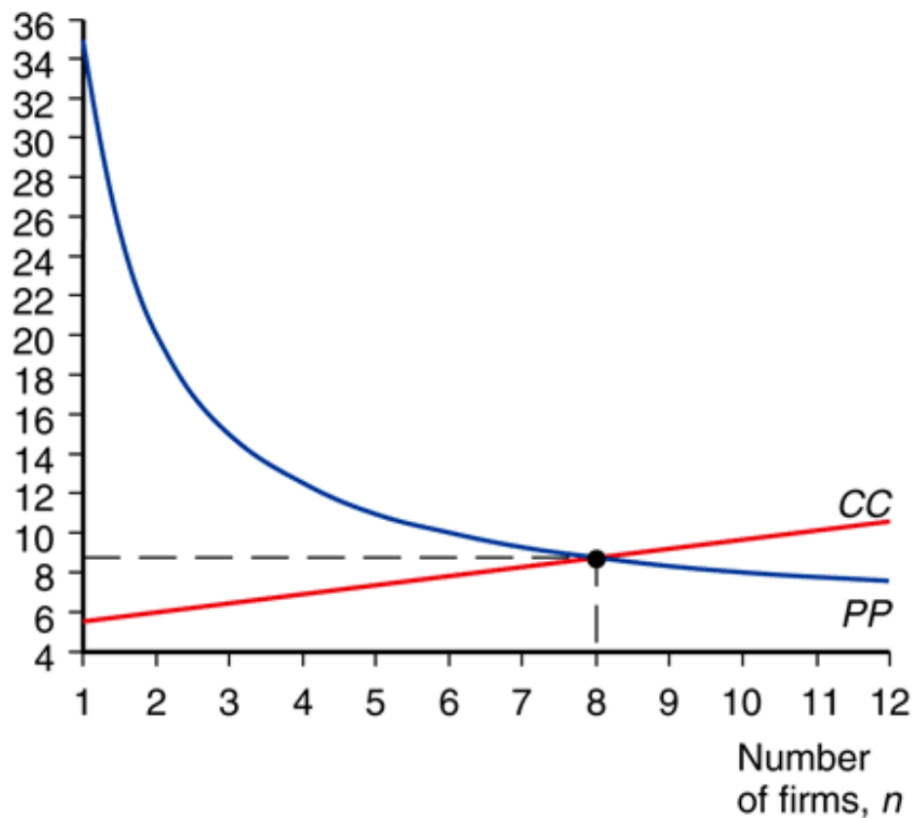
# Hypothetical example: Auto industry

Price per auto,  
in thousands of dollars



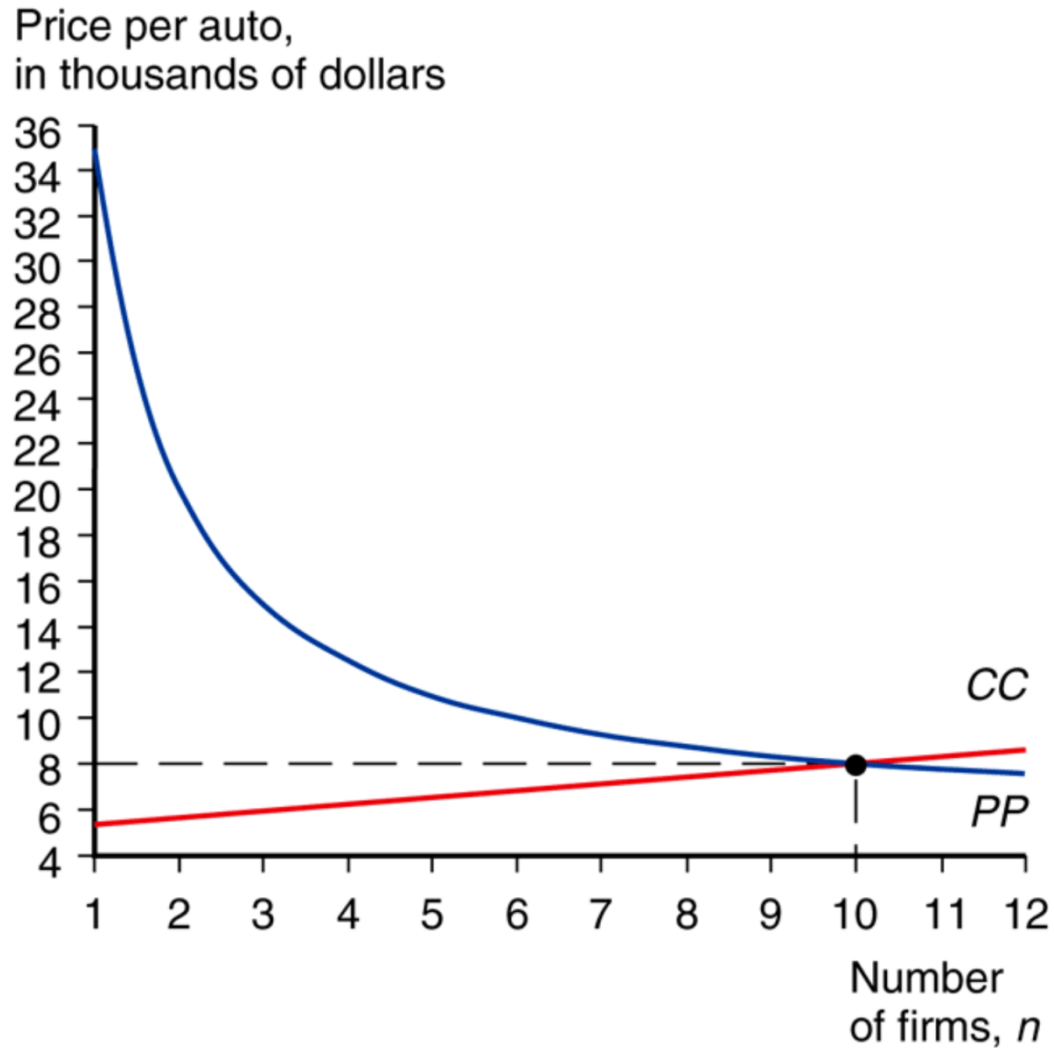
(a) Home

Price per auto,  
in thousands of dollars



(b) Foreign

# Hypothetical example: Auto industry



(c) Integrated

## Hypothetical example: Auto industry

	<b>Home Market, Before Trade</b>	<b>Foreign Market, Before Trade</b>	<b>Integrated Market, After Trade</b>
Industry output (# of autos)	900,000	1,600,000	2,500,000
Number of firms	6	8	10
Output per firm (# of autos)	150,000	200,000	250,000
Average cost	\$10,000	\$8,750	\$8,000
Price	\$10,000	\$8,750	\$8,000

# 3- Trade under monopolistic competition

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Effect of Trade

Gains for firms?

# 3- Trade under monopolistic competition

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## Effect of Trade

### Gains for firms?

- Zero profits before trade liberalization
  - Zero profits after trade liberalization
- No change

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## Effect of Trade

Another important/subtle question:

Starting from two isolated markets, are there more firms before or after trade liberalization?

## Clicker question

Suppose that we start from two separate markets (Home & Foreign) with  $n$  firms at Home and  $n^*$  firms in Foreign. Also assume that  $n > n^*$ . Now, with trade integration, the total number of firms  $N$  is such that:

a)  $n + n^* < N$

b)  $n < N < n + n^*$

c)  $n^* < N < n$

d)  $N < n^*$

## Clicker question

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Answer:



# 3- Trade under monopolistic competition

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## Effect of Trade

Starting from two isolated markets, are there more firms before or after trade liberalization?

→ With trade, the combined market has more firms than each individual market

→ But there are fewer firms with trade than initially if we take the sum of the two markets

# 3- Trade under monopolistic competition

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## Effect of Trade

Starting from two isolated markets, are there more firms before or after trade liberalization?

→ With trade, the combined market has more firms than each individual market

→ But there are fewer firms with trade than initially if we take the sum of the two markets

→ Trade induces an exit of firms in each market

### 3- Trade under monopolistic competition

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#### Effect of Trade

Initially:

Home has  $n$  firms with:  $n = \sqrt{\frac{S}{b F}}$

Foreign has  $n^*$  firms with:  $n^* = \sqrt{\frac{S^*}{b F}}$

With trade, the total number of firms is:

$$N = \sqrt{\frac{S + S^*}{b F}} < n + n^*$$

# 3- Trade under monopolistic competition

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## Effect of Trade

Intuition:

- There are more brands available to each consumers, and therefore more competition
  - To compensate, each firm has to produce in larger quantities in order to reduce average costs
- If each firm produces more than in Autarky, the combined number of firms has to decrease!

$$(N < n + n^*)$$

# 3- Trade under monopolistic competition

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Numerical example:

If we merge two identical markets:

- **Total number of firms?**

# 3- Trade under monopolistic competition

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Numerical example:

If we merge two identical markets:

- **Total number of firms** multiplied by  $\sqrt{2} = 1.414$ 
  - Number of firms is multiplied by LESS than 2
  - Survival rate:  $1.41 / 2 = 71\%$  in each market
- Consumer brands? Quantities?

# 3- Trade under monopolistic competition

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## Numerical example:

If we merge two identical markets:

- **Total number of firms** multiplied by  $\sqrt{2} = 1.414$ 
  - Number of firms is multiplied by LESS than 2
  - Survival rate:  $1.41 / 2 = 71\%$  in each market
- Consumers have access to 41% **more brands**
- **Quantities** produced by each firm also increase by 41% (they are multiplied by  $\sqrt{2} = 1.414$ )

# 3- Trade under monopolistic competition

## **“Short-run” vs. “long-run” effects:**

In the long-run: the number of firms adjusts so that firms have zero profits, with or without trade.

Questions:

- What if the number of firms does not adjust?
- Would there be positive or negative profits?



## Clicker question:

When a country opens to trade:

- a) In the short run, firms make **positive profits** and therefore the number of firms tends to increase, and firms become smaller
- b) In the short run, firms make **positive profits** and therefore the number of firms tends to decrease, and firms become bigger
- c) In the short run, firms make **negative profits** and therefore the number of firms tends to decrease, and firms become bigger
- d) In the short run, firms make **negative profits** and therefore the number of firms tends to increase, and firms become smaller

Clicker question:

When a country opens to trade:

# 3- Trade under monopolistic competition

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# 3- Trade under monopolistic competition

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## Effect of Trade

Summary of long-term effects of Trade:

- Lower prices, lower markups
- More brands available to consumers
- Each firm produces more
- But total number of firms decreases