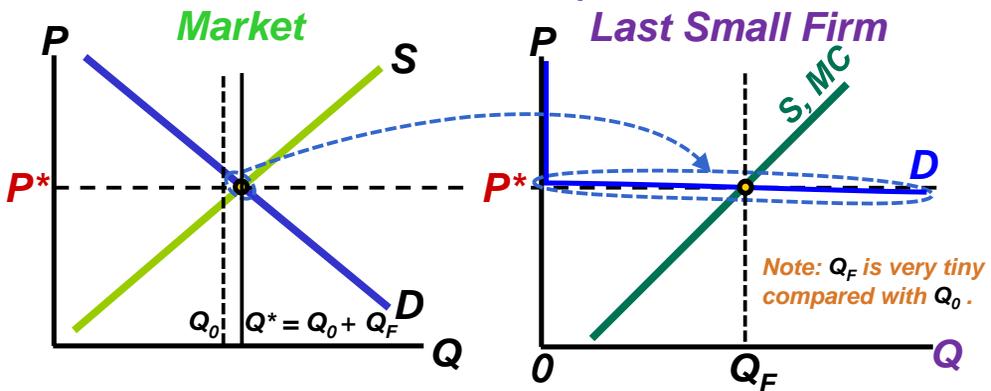


Tuesday, Nov 2, Lecture 16

Profit Maximization and Long-Run Competition



Small Firms in a Competitive Market

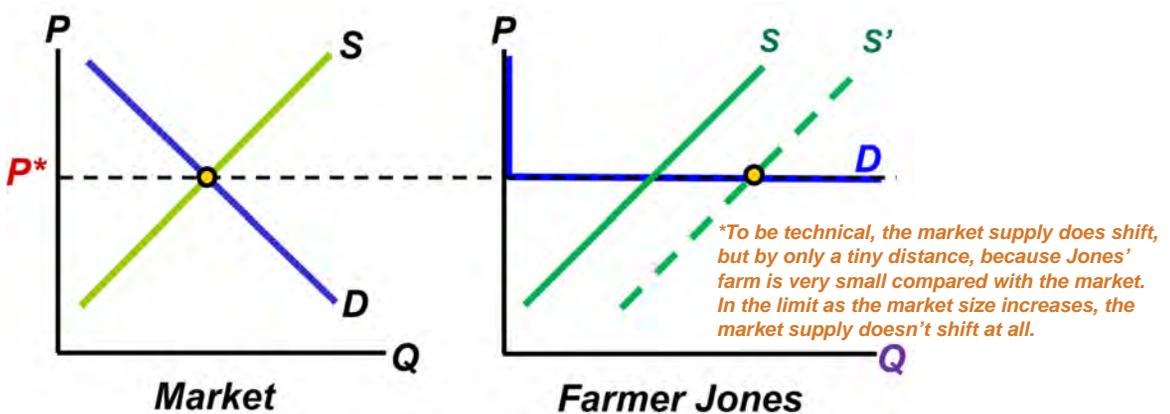


- Suppose all firms **except one** are producing total output Q_0 .
- For the last small firm, the remaining demand near what will be the market price looks stretched out and seems very elastic.
- The last firm's supply curve determines its quantity supplied Q_F , and the market equilibrium quantity will be $Q^* = Q_0 + Q_F$
- The market equilibrium price will be P^* .
- When any firm is deciding how much to produce in equilibrium, it thinks of itself as the last small firm.

Supply Shifts in a Competitive Market

- Suppose Farmer Jones discovers that hip-hop music increases his hens' output of eggs.
- Then his supply curve would shift to the right.
- But his price (the market price) wouldn't change. Why not?

- How does the shift of his supply curve affect Farmer Jones?

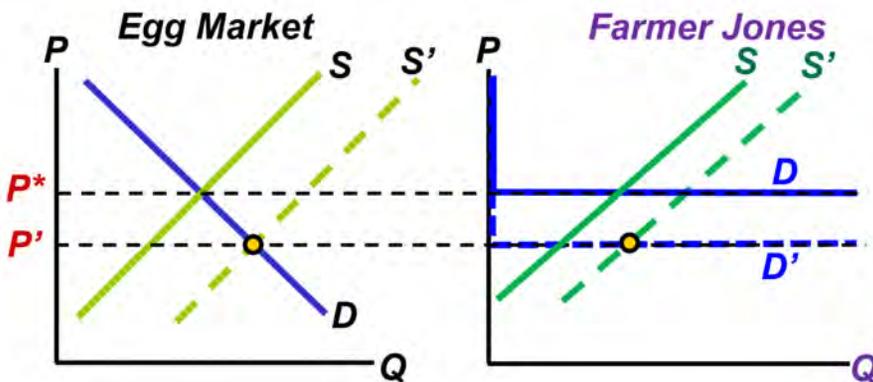


- Farmer Jones' supply shifts to the right, but his equilibrium price remains the same.
 - Doesn't the market supply shift? **No***
 - Would Farmer Jones sell more or less?

■ NOW suppose that all farmers find out that hip-hop music increases their hens' output of eggs.

■ All the farmers blast hip-hop at their chickens.

■ And the chickens start laying eggs like crazy.



■ Hip-hop causes the supply curves of Farmer Jones **and the other farmers** to shift to the right,...

■ which causes market supply to shift.

■ The new market-equilibrium price would fall to P' , so Farmer Jones' demand shifts down.

■ Farmer Jones' supply has shifted to the right, but he must sell at a lower price.

Clicker Question

Farmer Jane runs a dairy farm that produces milk. If she discovers that her cows give more milk when they hear recordings of Mozart operas, then

- she would lower her price of milk.
- she would raise her price of milk.
- her producer surplus would rise.
- her producer surplus would fall.

Cost, Revenue and Profits

■ Total Cost (**TC**):

$$TC = FC + VC$$

■ Average Cost (**AC**): $AC = TC / Q$

● Sometimes called Average Total Cost (**ATC**)

■ Profits: $\pi = \text{Total Revenue} - \text{Total Cost}$

$$= (P \times Q) - TC$$

$$= (P \times Q) - AC \times Q$$

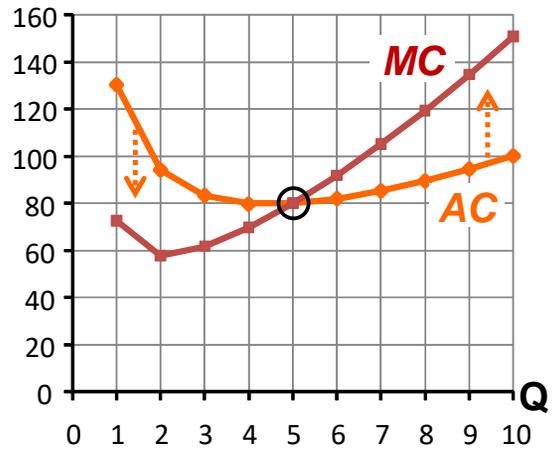
$$= (P - AC) Q$$

■ Producer surplus is the same as profits before fixed costs are deducted.

$$\begin{aligned} \pi &= \underbrace{(P \times Q) - VC}_{PS} - FC \\ &= PS - FC \end{aligned}$$

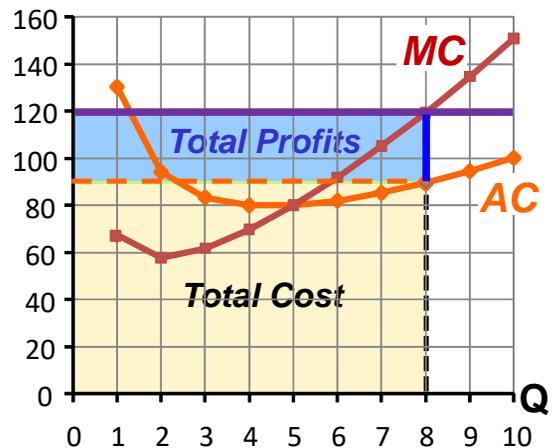
Marginal and Average Costs

- **MC** is the cost of producing one unit.
- **AC** is the average of the cost of producing *all* the units, fixed cost included.
- **MC** rises eventually – Why?
- If **FC > 0**, **AC** starts high, ...
 - but it falls as fixed cost is divided over more output, ...
 - and rises again as MC becomes more important.
- If **MC** crosses **AC**, it must cross at the bottom of the **AC** curve.
- If **MC** is under **AC**, then **MC** is pulling the average down.
- But if **MC** is above **AC**, then **MC** is pulling the average up.



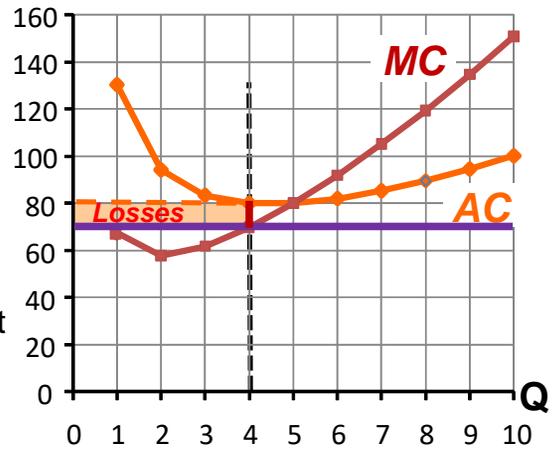
Using AC to Measure Profits

- If **P = 120** then profits would be maximized when the firm produces **8** units. Why?
- If **8** units are produced, **AC = 90**, ...
- Total revenue = **8 x 120 = 960**
- Total cost = **8 x 90 = 720**.
- Total profits are **8 x (P - AC) = 8 x 30 = 240**.



Using AC to Measure Losses

- If $P = 70$ then profits would be maximized when the firm produces 4 units. Why?
- If 4 units are produced, $AC = 80$,...
- so the firm's average loss is 10 per unit (even though profits were maximized).



- Total losses are $4 \times 10 = 40$.
- The firm cannot be profitable at this price, and it should shut down.

The Shut-Down Condition

- If a firm is producing at the profit-maximizing level of output,
- yet still cannot earn a positive profit,...
- then it should shut down.
- This happens when price is less than the lowest possible average cost. Why?
- So, if $P < \min AC$, the firm should stop producing.

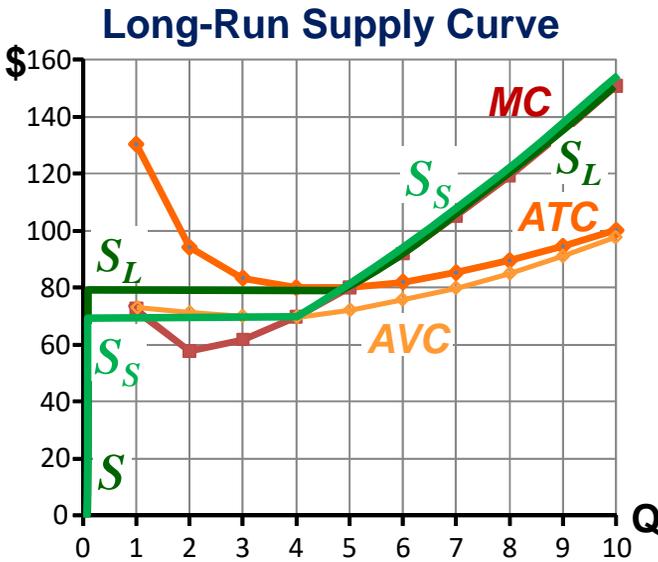
■ But *in the short run*, fixed costs *that are already paid* should **not** be treated as a costs in making the shut-down decision.

- Why not?
- Because they are **sunk costs** (not avoidable).
- So maybe the firm can stay open for a while.
- Often, in the short run, only variable costs are avoidable, so we should use **AVC** (*average variable cost*) as the value of **AC**.
- In the long run, all costs are avoidable, so we should use **ATC** (*average total cost*) as the value of **AC**.

The Firm's Long-Run Supply Curve

- If there are no fixed costs (**$FC = 0$**), then all costs are avoidable, and the firm is always operating in the long run.
- If **$FC = 0$** and marginal cost is always increasing, then the [long-run] supply curve is the same as the **MC** curve.
- If **$FC = 0$** and **MC** is U-shaped the supply curve may stay at **0** until a profitable price **P_0** is reached and then jump out to the **MC** curve at any **$P > P_0$**
- When there is a fixed cost **$FC > 0$** , the long-run profitable price **P_0** may be greater than the short-run profitable price, as we shall see.

Long-Run Supply on a Graph



- In the long run, **AC** is the same as **ATC**.
- Can you tell how much the firm will want to sell if the price is
 - \$120 per unit?
 - \$81?
 - \$60?
 - \$40?
- If $P < \min ATC$, then net profits must be negative at any output level, and the firm will shut down.
- See the supply curve.

- In the short run, **AC** is often the same as **AVC** instead of **ATC**.
(The short-run MC could be higher, but we ignore that possibility.)

Clicker Question

The rising part of the **MC** curve is often the same as the supply curve...

- a. for prices greater than the minimum **MC**.
- b. for quantities greater than the equilibrium quantity.
- c. for quantities less than the equilibrium quantity.
- d. for prices greater than the minimum **AC**.

Do real-world firms maximize profits?

- In the competitive model, **maximizing profits** also maximizes **social surplus**.
- But firms have some of the same problems maximizing profits that consumers have maximizing utility.
 - The maximization problem is very difficult.
 - ◆ Firms may not know their own marginal costs.
 - ◆ They may not be acquainted with all feasible production methods.
 - The psychology of entrepreneurs may create problems.
 - ◆ Entrepreneurs tend to be biased by optimism.
 - ◆ Or they may suffer from hubris (overconfidence).

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- The owners of firms face problems that individuals do not.
 - Controlling their employees
 - ◆ How to get workers to work hard?
 - ◆ How to get managers to pursue the interests of the owner (instead of their own)?
 - Fear of risk
 - ◆ Maximizing profits may be risky,...
 - ◆ so managers may choose very safe bets that are less profitable .
 - ◆ Very safe business ventures are often not in the social interest, because new technologies and economic growth require a reasonable amount of risk.
 - Is profit maximization a good approximation of what real firms do in a free market?

The Search for Profits

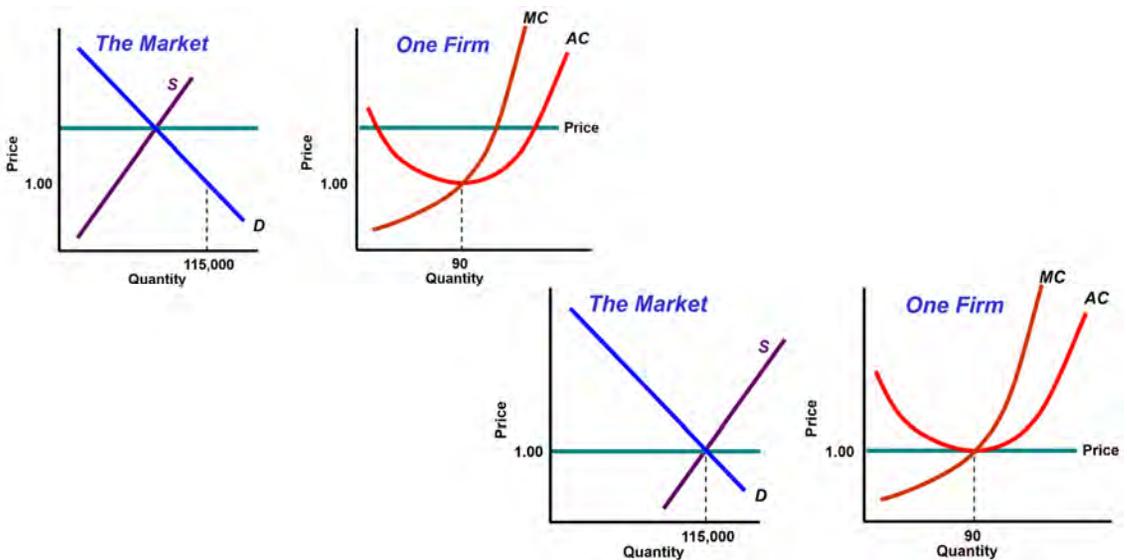
- In the competitive model, firms maximize profits.
- Moreover, a large number of (greedy) entrepreneurs are searching for profitable business opportunities.
- If the market price is high enough to generate economic profits,...
- some entrepreneurs will start new firms and enter the industry.
- But if the market price is too low, firms will face losses...
- and some will close down.

Entry and Exit in the Long Run

- When an entrepreneur considers starting a firm, she has ***no sunk costs***.
- So in the competitive model, she enters only if long-run economic profits can be found.
- Firms will continue to enter as long as some profits are available.
- But as they enter,
 - the market supply shifts out,
 - the market price falls,
 - and further entry becomes less profitable.

- Entry stops when new firms would no longer be able to obtain economic profits.
- At that point, the **economic profits** of existing firms are zero.

Equilibrium when Entry Stops



- Entry of firms continues until $P = \min AC$, so that all firms earn **0 (zero)** long-run economic profits.
- At this point, there are more firms, and each firm is producing at lower cost.

Economic Losses

- A market price below the minimum **AC** will result in economic losses.
- In the presence of long-run losses,
- firms will exit from the industry, and the market price will increase.
- Exit will stop when losses disappear, and economic profits reach zero.
- Again, production will occur at minimum **AC**.

Firm Size in Perfect Competition

- Profits = Producer Surplus – Fixed Costs
- Large firms spread the fixed costs over many units and tend to be profitable.
 - But the profits cause entry, increased competition and lower prices.
 - At lower prices firms supply less and become smaller.
- Small firms have high fixed costs per unit and tend to lose money.
 - But the losses cause exit, less competition and higher prices.
 - At higher prices firms supply more and become larger.

- Perfect competition with free entry and exit causes firms to adjust to the most efficient size.
 - Average cost is minimized, and the market price equals minimum average cost.
 - Otherwise, entry or exit would continue.
- The number of firms in the market is also efficient.

Imperfect Competition

- In the long run, perfect competition balances the number and size of firms perfectly.
- But imperfect competition does not.
- Later in the course, we show that some kinds of imperfect competition yield too many small firms.
- But perfect competition cannot create the iPhone.

Clicker Question

Which of the following is true about perfectly competitive firms in the long run?

- a. All firms will have positive economic profits in equilibrium.
- b. Firms will enter if positive economic profits are available.
- c. All firms with zero economic profits will exit.
- d. A firm operating at a loss will increase output until economic profits are zero.

End of Lecture 16