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?

*To be technical, the market supply does shift, but by only a tiny distance, because Jones’ farm is very small compared with the market. In the limit as the market size increases, the market supply doesn’t shift at all.
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

a. she would lower her price of milk.

b. she would raise her price of milk.

c. her producer surplus would rise.

d. her producer surplus would fall.

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**Cost, Revenue and Profits**

- **Total Cost** \( (TC) \):
  \[ TC = FC + VC \]

- **Average Cost** \( (AC) \): \[ AC = \frac{TC}{Q} \]
  - Sometimes called **Average Total Cost** \( (ATC) \)

- **Profits**: \[ \pi = Total\ Revenue - Total\ Cost \]
  \[ = (P \times Q) - TC \]
  \[ = (P \times Q) - AC \times Q \]
  \[ = (P - AC) Q \]

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

  \[ \pi = \frac{(P \times Q) - VC - FC}{PS} \]
  \[ = PS - FC \]
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 $P < \text{min } AC$, 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).

- 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 \textit{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.

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**Equilibrium when Entry Stops**

- Entry of firms continues until $P = \text{min } AC$, 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.