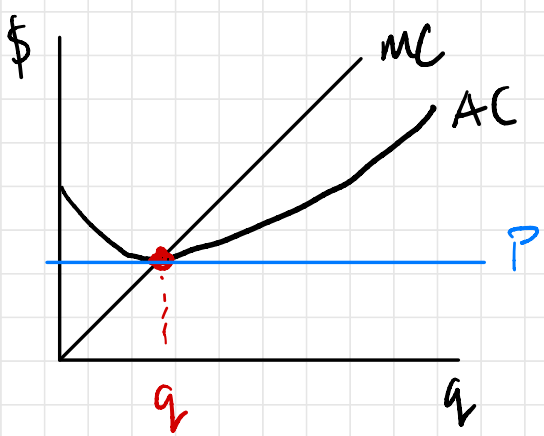
11-3 -23

- $C(q) = FC + VC$, $AC = \frac{C(q)}{q}$

  FC: doesn't depend on q

  VC: does depend on q

Short run	Long run
- FC are sunk	- Can choose to pay FC
- Operate if Revenue $\geq$ VC - Shut down if $R < VC$	- Firms will enter/exit until $P = MC = AC$
- can have pocitive or negative profits	- Firms will earn 0 profit
- Number of firms fixed	- Supply is perfectly elastic
	- Number of firms determined by Supply = demand



- Licensing - increase fited costs
  $\Rightarrow$ increase AC

- if $P = MC = AC$

  $\Rightarrow$ $P \uparrow$

- fewer firms

- higher quantity per firm

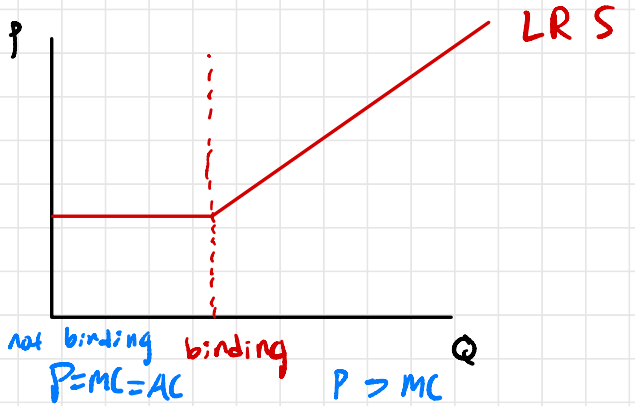
- taxes - per unit taxes T

  $P_p = P_c - T$

  - reduce # of firms
  - each firm's behavior stays the same

$$P_p = MC = AC$$

- caps on number of firms - ex: zoning laws
  - may be binding or not



1. $c(q) = 50 + 60q$

$VC = 60q$, $FC = 50$

in Short run: operate if $R \geq VC$

price taker $\Rightarrow$ $R = P \cdot q$

to operate in SR, need $\frac{P \cdot q}{q} \geq \frac{60q}{q}$

$P \geq 60$

2. each firm $c(q) = 3q^2 + 5q + 27$

Long run: $P = MC = AC$

$MC = \frac{\partial C}{\partial q} = 3 \cdot 2 \cdot q + 5 \cdot q^0 + 0$

$= 6q + 5$

$AC = \frac{c(q)}{q} = \frac{3q^2 + 5q + 27}{q}$

$= 3q + 5 + \frac{27}{q}$

to find q: $MC = AC$

$6q + 5 = 3q + 5 + \frac{27}{q}$

$-3q \quad -3q$

$$\Rightarrow 3q = \frac{27}{q}$$

$$\Rightarrow 3q^2 = 27$$

$$\Rightarrow q^2 = 9 \quad \Rightarrow \boxed{q = 3}$$

to get P: $P = MC(q^*)$

$= 6 \cdot q^* + 5 \quad = 6 \cdot 3 + 5$

$= 23$

$\boxed{P = 23}$

total Supply $= N \cdot q \quad = N \cdot 3$

total Demand $= D(P) = D(23) = 53 - 23$

$= 30$

Supply = demand $\quad N \cdot q = D(P)$

$\Rightarrow 3N = 30$

$\Rightarrow \boxed{N = 10}$

3. $C(q) = 3q^2 + 5q + 48$

$MC = 6q + 5$

$AC = C(q)/q = 3q + 5 + \boxed{\frac{48}{q}}$

$$MC = AC \Rightarrow 6q + 5 = 3q + 5 + \frac{48}{q}$$

$$-3q \qquad -3q$$

$$3q = \frac{48}{q}$$

$$q^2 = 16 \Rightarrow q = 4$$

$$P = MC(q^*) = 6 \cdot q^* + 5$$

$$= 6 \cdot 4 + 5 = 29$$

$$P = 29$$

Supply = Demand

$$N \cdot q = 4N = D(p) = D(29)$$

$$= 53 - 29$$

$$= 24$$

$$4N = 24$$

$$\Rightarrow N = 6$$

4. $c(q) = 3q^2 + 5q + 27$

$\Rightarrow MC = 6q + 5, \quad AC = 3q + 5 + \frac{27}{q}$

$P_p = P_c - T$

$P_p = MC = AC$

$\Rightarrow \quad q = 3$

$P_p = 23$

} from #2

$$P_c = P_p + T = 23 + 3 = 26$$

Supply = Demand: $N \cdot q = D(P_c) = 53 - 26$

$= 27$

$N \cdot 3 = 27$

$N = 9$