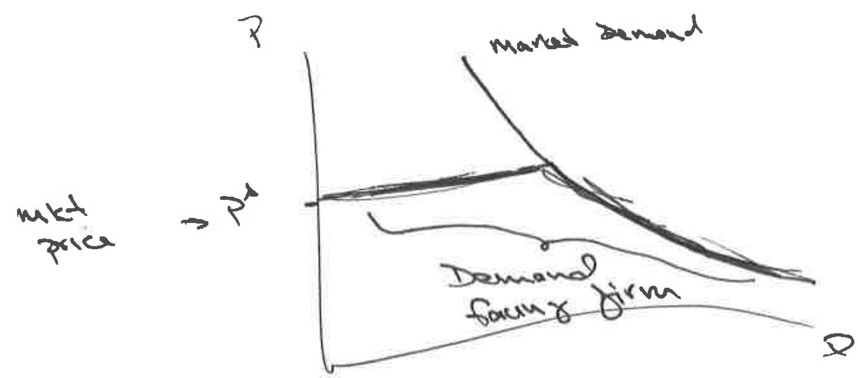
Chapter 23 - Firm Supply

The Economic Environment

→ Demand taken as given
  → demand represents a constraint on the firm
    → the firm can't sell more than people demand
    → we need to distinguish between the market demand curve (what all firms together can sell) ~~from~~ the ~~firm's~~ demand curve facing the firm

→ We'll assume markets are competitive
  → eg their are a large number of consumers and producers and so each take prices as given
  → why are firms price takers?
    → think about the demand curve each firm faces. If that firm charges more than others for the good, how many does it sell? 0
    And if it charges less than all other firms? It captures the ~~entire~~ market



The competitive firms problem

→ Since the competitive firm takes prices as given, its problem is simply to choose the quantity to produce that maximizes profits.

That is:

$$\max_{y} \; py - c(y) \quad \text{s.t. } y \geq 0$$

The FOC:

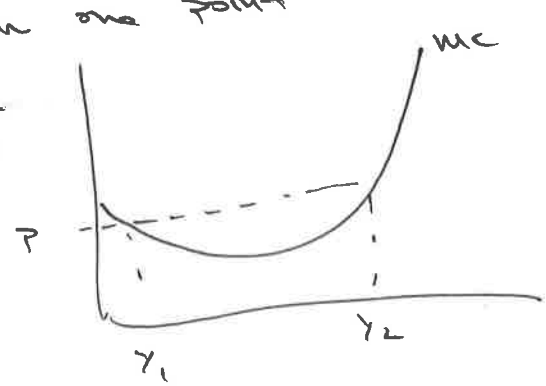
$$\frac{\partial \pi}{\partial y} = p - \underbrace{\frac{\partial c(y)}{\partial y}}_{= mc(y)} = 0$$

$$\Rightarrow \underbrace{p = mc(y)}_{\text{the optimal choice of } y \text{ satisfies this}}$$

→ 2 exceptions:

1) The MC curve could equal p at more than one point

e.g.



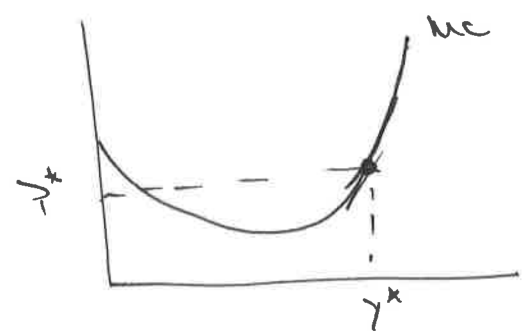
In this case, one needs to use the 2nd order condition:

$$\frac{\partial^2 \pi}{\partial^2 y} \leq 0$$

$$\Rightarrow -\frac{\partial MC(y)}{\partial y} \leq 0$$

$$\Rightarrow \underbrace{\frac{\partial MC(y)}{\partial y} \geq 0}$$

the maximum will be where price = MC and where MC is increasing



2) The MC might not equal price for any positive level of output

→ in this case, the constraint, $y \geq 0$, binds

→ so the firm "shuts down"

→ when a firm shuts down, it still has to pay fixed costs, F, but not variable costs.

→ Thus the shutdown condition is

$$\underbrace{-F > py - c_v(y) - F}$$

if this, then shut down (i.e. set $y=0$)

This condition can be rewritten as

$$0 > py - c_v(y)$$

$$\Rightarrow \quad c_v(y) > py$$

$$\Rightarrow \quad \frac{c_v(y)}{y} > p$$

$$\Rightarrow \underbrace{AVC(y) > p}$$

if $AVC(y)$ > price, then better off producing zero
→ price doesn't even cover variable costs

"We lose money on every sale, but make it up with volume."

→ so check shutdown and 2nd order conditions after find y where $p = MC(y)$

→ The solution to the problem will be the supply function: $y(p)$.

→ but we might also want the inverse supply function, which gives price as a function of quantity. This is directly given from the FOC: $p = MC(y)$

Example: let $c(y) = y^2$

$$\pi = py - y^2$$

$$\frac{\partial \pi}{\partial y} = p - 2y = 0$$

$$\Rightarrow 2y = p$$

$$y = p/2$$

check 2nd order condition:

$$\frac{\partial MC(y)}{\partial y} = 2 \geq 0 \quad \checkmark$$

check shutdown

$$c_v(y) = y^2$$

$$AVC(y) = \frac{y^2}{y} = y$$

Shutdown if $AVC(y) > p$

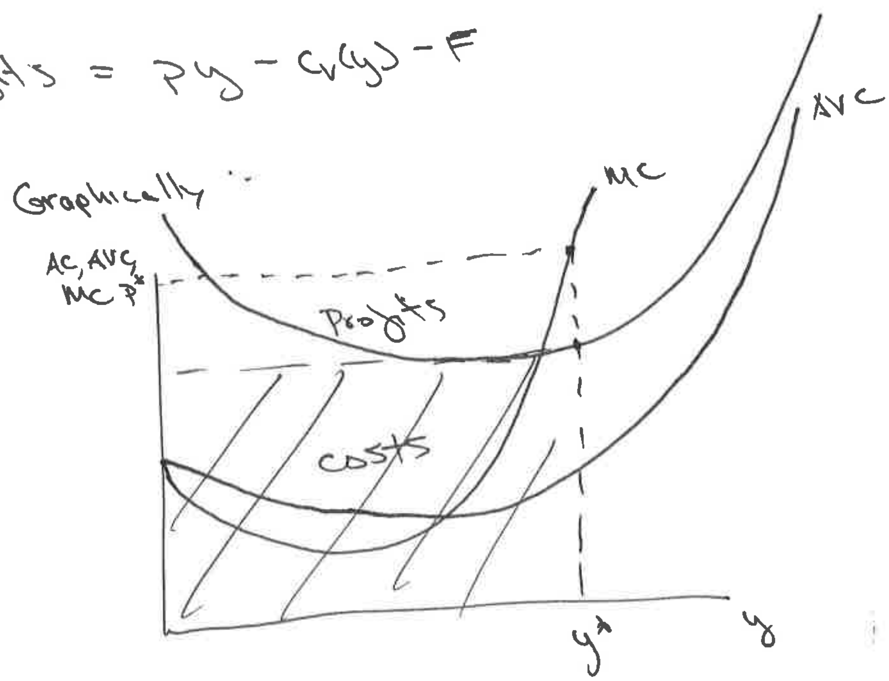
$$y > p$$

$$p/2 > p \quad \rightarrow \text{not shutdown for any } \underline{p > 0}$$

Profits and Producer Surplus

$$\text{Profits} = py - c_v(y) - F$$

Graphically:



$$\text{Revenue} = p \times y$$

$$\text{costs} = c(y) = AC(y) \times y$$

$$\text{profits} = \text{Rev} - \text{costs}$$
$$= py - c(y)$$

Producer surplus is related to profits

→ PS = revenue − variable costs

$$= py - c_v(y)$$

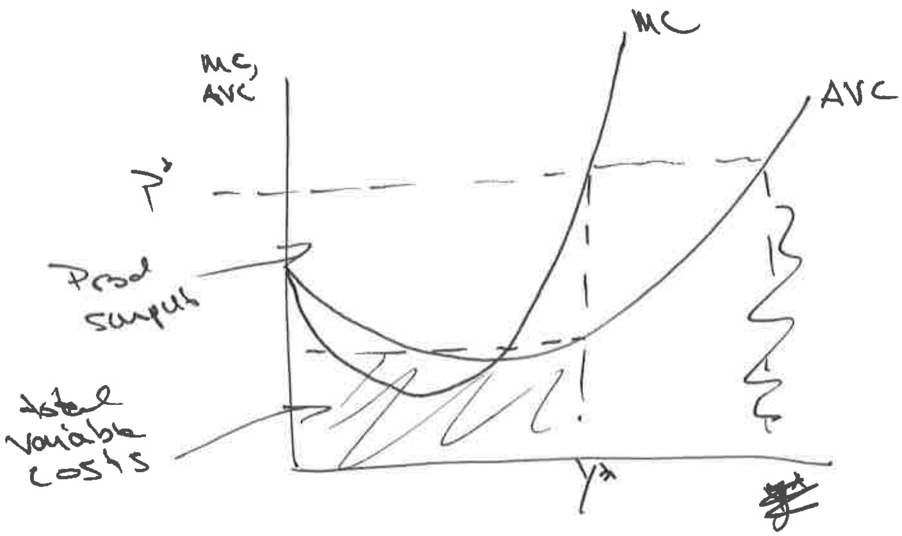
→ exclude fixed costs b/c pay ~~those~~ w/ $y=0$ or not → so they are excluded from the surplus from producing

2 ways to see producer surplus graphically:

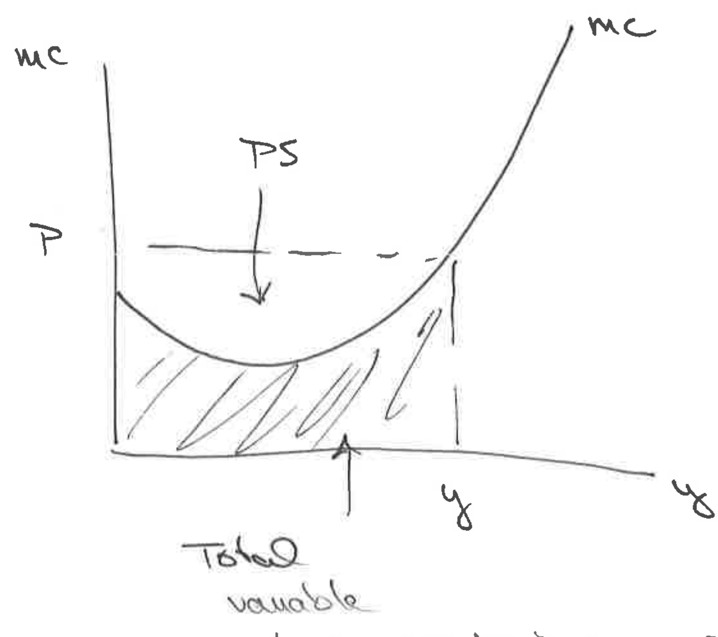
1) Diff btwn revenue and total variable costs

revenue = $p * y$

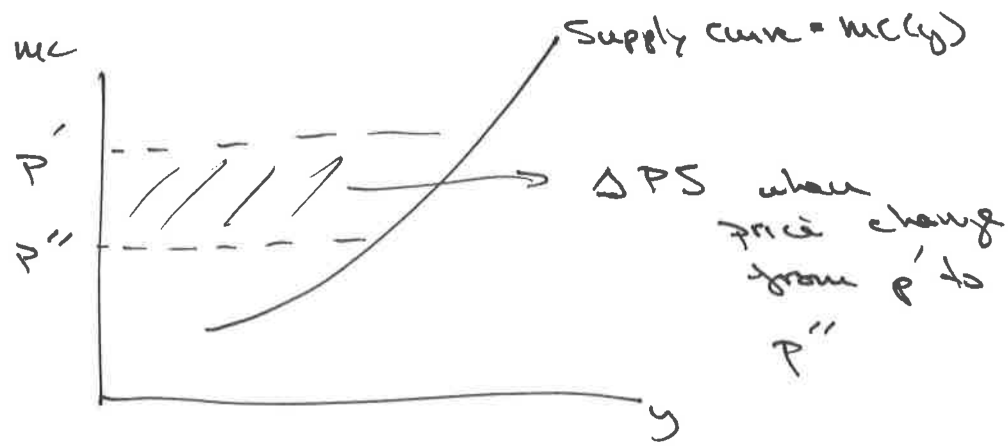
total variable cost = $AVC(y) * y$



2) Using just the MC curve:



→ This 2nd way makes it easier to see Δ in PS



Long run supply

→ In the long run, all factors are variable

$$\pi = py - \underbrace{c(y)}_{\text{long-run costs}}$$

FOC:

$$\underbrace{p = \underbrace{MC(y)}_{\text{LR marginal cost}}}_{\text{this equation yields the LR supply curve}}$$

→ Shutdown decision now based on LAC (b/c fixed costs not fixed):

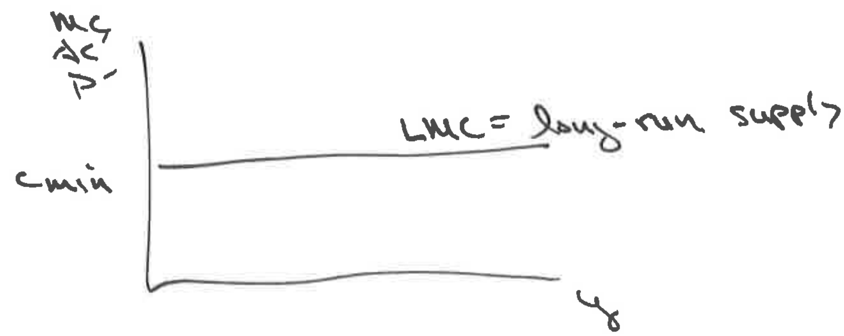
Shut down if $p < \dfrac{c(y)}{y}$

$$p < LAC(y)$$

A special case: constant LR avg. costs

→ w/ constant returns to scale, the LR MC curve = the LR AC curve

⇒



→ firm will supply any amt at $p = c_{min}$, zero if $p < c_{min}$, infinite if $p > c_{min}$

→ here we see again that the scale of production is indeterminant w/ CRS