Thursday, November 03, 2016 9:07 AM

COSTS OF PRODUCTION IN THE SHORT RUN

$Q = F(L, \bar{K})$

- L: VARIABLE INPUT
- $\bar{K}$: FIXED INPUT

- TOTAL COST (TC) = FIXED COST (FC) + VARIABLE COST (VC)
  - FIXED COST (FC): DOES NOT VARY W/ OUTPUT
    - EX:
      - COST OF BUILDING A FACTORY
      - COST OF BUYING MACHINES & EQUIPMENTS
      - RENTAL PAYMENT
      - INTEREST PAYMENTS ON BANK LOANS
      - ETC.
  - VARIABLE COST (VC): VARIES W/ OUTPUT
    - COST OF RAW MATERIALS
    - WAGES PAID TO WORKERS
    - UTILITY BILLS
    - ETC.

- WHEN WE DIVIDE $TC = FC + VC$ W/ q:

$$\frac{TC}{q} = \frac{FC}{q} + \frac{VC}{q}$$

- $\frac{TC}{q}$: TOTAL COST PER UNIT OF OUTPUT ⇓ AVERAGE TOTAL COST (ATC) OR AVERAGE COST (AC)
- $\frac{FC}{q}$: FIXED COST PER UNIT OF OUTPUT ⇓ AVERAGE FIXED COST (AFC)
- $\frac{VC}{q}$: VARIABLE PER UNIT OF OUTPUT ⇓ AVERAGE VARIABLE COST (AVC)

WE CALL OFFICIALLY

IN SHORT,

$$AC = AFC + AVC$$

= UNIT COST

= COST PER UNIT

(BAHT/UNIT)

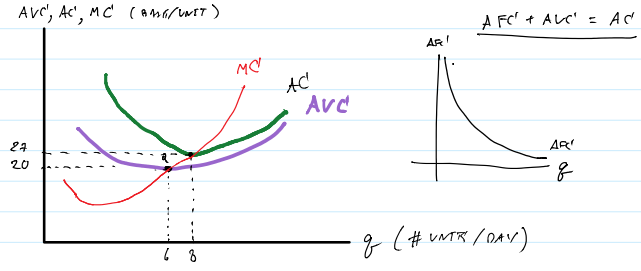
- MARGINAL COST (MC) = EXTRA COSTS FROM PRODUCING AN EXTRA UNIT OF OUTPUT.

$$MC = \frac{\Delta TC}{\Delta q} \quad \text{— (1)}$$

$$MC = \frac{\Delta TC}{\Delta q} = \frac{\Delta (FC + VC)}{\Delta q} = \frac{\Delta FC}{\Delta q} + \frac{\Delta VC}{\Delta q}$$

$$MC = \frac{\Delta VC}{\Delta q} \quad \text{— (2)}$$

- NOTICE THAT MC' CURVE CUTS FROM BELOW AT THE BOTTOM OF AVC' CURVE AND THE BOTTOM OF AC' CURVE.



- RELATIONSHIP BETWEEN AVC' AND MC'

RECALL THAT $AVC' = \frac{VC'}{q}$ Vs. $MC' = \frac{dTC'}{dq} = \frac{d(FC'+VC')}{dq} = \frac{dFC'}{dq} + \frac{dVC'}{dq}$

$MC' = \frac{dVC'}{dq}$

WHEN $q<6$, $MC' < AVC' \rightarrow AVC'$ ↓

WHEN $q=6$, $MC' = AVC'$ AT POINT a. AVC' IS AT THE BOTTOM.

WHEN $q>6$, $MC' > AVC' \rightarrow AVC'$ ↑

AP	MP
=	=
$\frac{q}{L}$	$\frac{dq}{dL}$

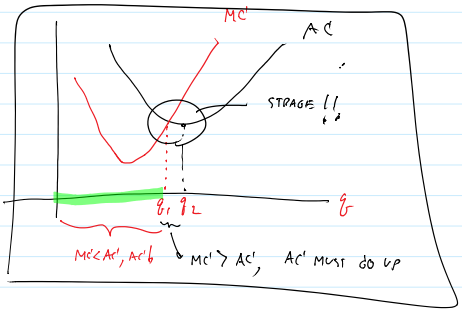
- RELATIONSHIP BETWEEN AC' AND MC'

RECALL THAT $AC' = \frac{TC'}{q}$ Vs $MC' = \frac{dTC'}{dq}$

WHEN $q<8$, AS $MC' < AC'$, THEN AC' ↓ ☺

WHEN $q=8$, $MC' = AC'$. SO AC' HITS ITS MINIMUM

WHEN $q>8$, AS $MC' > AC'$, THEN AC' ↑ ☹



Q: WHY $AVC' = \frac{VC'}{q}$ IS U-SHAPED?

A: $AVC' = \frac{VC'}{q} = \frac{w \cdot L}{q}$ [$Q = F(L, \bar{K})$

w = wage

$= w \cdot \frac{L}{q}$

$= w \frac{1}{\frac{q}{L}}$

$AVC' = w \cdot \frac{1}{AP_L}$ → GIVEN w, IF AP_L ↑ THEN AVC' OR $\frac{VC'}{q}$ ↓ ☺

I.E., IF LABOR PRODUCTIVITY INCREASES, IT WOULD HELP REDUCING VARIABLE COST PER COOKIE.

IF AP_L ↓, THEN AVC' OR $\frac{VC'}{q}$ ↑ ☹

$AC' = AFC' + AVC'$

WHEN $MP_L > AP_L \rightarrow AP_L$ ↑ $\rightarrow AVC'$ ↓.

WHEN $MP < AP_L \rightarrow AP_L$ ↓ $\rightarrow AVC'$ ↑.

WHEN $MP < AP_L \rightarrow AP_L \downarrow \rightarrow AVC \uparrow$.

EX: $L_1 = 10$ WORKERS, $Q_1 = 1000$ COOKIES; $FC = 1000$ BAHT/DAY, $w = 300$ BAHT/WORKER/DAY.

$AFC_1 = \frac{FC}{Q_1} = \frac{1000}{1000} = 1$ BAHT/🍪

$AVC_1 = \frac{VC}{Q} = \frac{w \cdot L}{Q} = \frac{300 \cdot 10}{1000} = 3$ BAHT/🍪

AT $Q = 1000$ ==,

1 BAHT → $\frac{FC}{Q}$ (25%)

3 BAHT → $\frac{VC}{Q}$ (75%)

w/ $L = 10$, $AP_L = \frac{Q_1}{L} = \frac{1000}{10} = 100$ 🍪/ฯ

NEXT $L_2 = 11$ WORKERS, $Q_2 = 1200$ COOKIES

$AVC_2 = \frac{w \cdot L_2}{Q_2} = \frac{300 \cdot 11}{1200} = \frac{3300}{1200} = 2.75$ BAHT/🍪

w/ $L = 11$, $AP_L = \frac{Q_2}{L_2} = \frac{1200}{11} = 109.09$ 🍪/ฯ

SUMMARY

$$AVC = \frac{w}{AP_L}$$

NEXT, RELATIONSHIP BETWEEN MP AND MC ...

$MP_L = \frac{dQ}{dL}$ AND $MC = \frac{dTC}{dQ}$

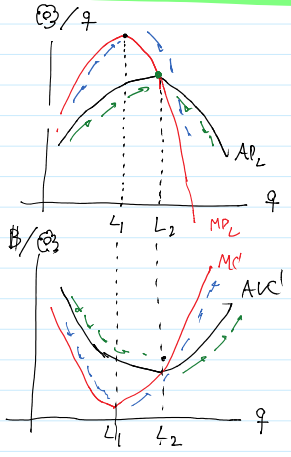
$$MC = \frac{dTC}{dQ} = \frac{d(FC + VC)}{dQ} = \frac{dFC}{dQ} + \frac{dVC}{dQ} = \frac{dVC}{dQ} = \frac{d(w \cdot L)}{dQ} = w\frac{dL}{dQ} = w \cdot \frac{1}{\frac{dQ}{dL}}$$

$$MC = w \cdot \frac{1}{MP_L}$$

GIVEN w, WHEN MP_L IS RISING, MC WILL BE FALLING

WHEN MP_L IS FALLING, MC WILL BE RISING.

GRAPH ...



$Q = AP \cdot L$

$Q_1 = AP_L \cdot L_1$, $Q_2 = AP_2 \cdot L_2$

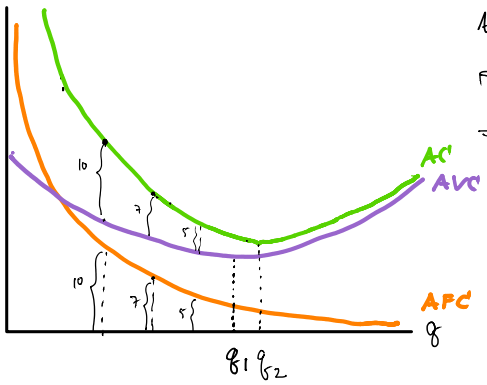
$AVC = \frac{w}{AP_L}$ $MC = \frac{w}{MP_L}$

- AVC IS A MIRROR IMAGE OF AP_L #
- MC IS A MIRROR IMAGE OF MP_L #

$AP = \frac{Q}{L}$

Monday, November 07, 2016 1:01 PM

AFC, AVC, AC, MC



Q: WHY AC IS U-SHAPED?

A: $AFC + AVC = AC$

FROM $0 \to q_1$: $AFC \downarrow + AVC \downarrow = AC \downarrow$

$\Rightarrow$ COST PER UNIT IS CHEAPER WHEN PRODUCING MORE. (WHY?)

THANKS TO ① SPREADING EFFECT: $\uparrow Q \to \downarrow \frac{FC}{Q}$!

② DIMINISHING RETURN EFFECT DOES NOT OPERATE YET.

NOW $MP_L > AP_L \to AP_L \uparrow \to AVC \downarrow$!

(BENEFIT OF SPECIALIZATION)

B/C $MP < AP \to AP \downarrow \to AVC \uparrow$!

LAW OF DIMINISHING MP IS OPERATING NOW.

FROM $q_1 \to q_2$: $AFC \downarrow + AVC \uparrow = AC \downarrow$

AS SPREADING EFFECT { DOMINATES / OUTWEIGHS } DIMINISHING RETURN EFFECT,

SO, AC IS STILL FALLING

FROM q_2 ONWARDS: $AFC \downarrow + AVC \uparrow = AC \uparrow$

NOW DIMINISHING RETURN EFFECT > SPREADING EFFECT.

SO, AC ↑.