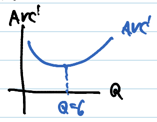
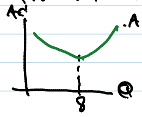
Tuesday, November 19, 2013
7:47 AM

- AFC IS FALLING AS Q RISES (SPREADING EFFECT)

- AVC IS U-SHAPED. AVC REACHES ITS BOTTOM WHEN Q = 6



- AC OR UNIT-COST CURVE IS ALSO U-SHAPED. AC HITS ITS BOTTOM WHEN Q = 8.



.. NOTICE THAT AVC HITS ITS BOTTOM FIRST AND AC HITS ITS BOTTOM LATER.

- VERTICAL GAP BETWEEN AC AND AVC = AFC.

NOTICE THAT THE FACT THAT THE GAP IS NARROWER AS Q RISES TELLS US ABOUT NATURE OF AFC.
(SPREADING EFFECT)

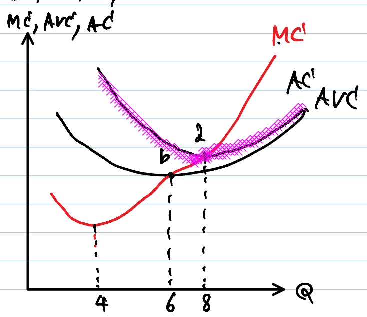
- MC IS U-SHAPED TOO. MC REACHES ITS BOTTOM AT Q = 4 (MC = 16).

- MC CUTS AT THE BOTTOM OF AVC AND AC:

(POINT b)
AT Q = 6 : MC INTERSECTS W/ AVC ⇒ MC = AVC.
(20) (20)

(POINT a)
AT Q = 8 : MC INTERSECTS W/ AC ⇒ MC = AC
(27) (27)

- WHY MC HAS TO CUT AT THE BOTTOM OF THE TWO CURVES?



LOOK AT MC & AC FIRST...

- WHEN Q < 8, MC < AC. SO AC WILL FALL. :)
- AT Q = 8, MC = AC. SO AC HITS ITS BOTTOM.
- WHEN Q > 8, MC > AC. SO AC WILL RISE. :(

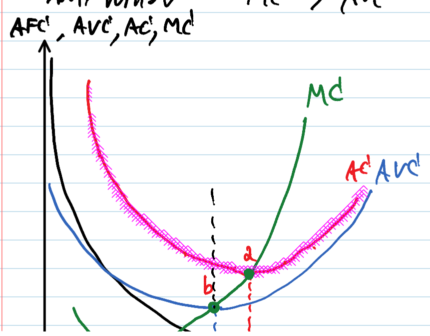
[LOOK AT THE TABLE TO CONFIRM THIS.]

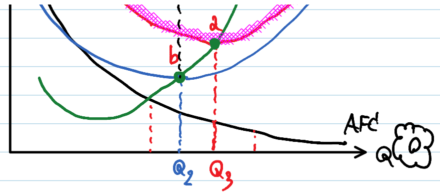
NEXT, LOOK AT MC & AVC...

RECALL $\boxed{AVC = \frac{VC}{Q}}$ $\boxed{MC = \frac{\Delta VC}{\Delta Q}}$

WHEN MC < AVC, AVC ↓ (WHEN Q < 6)

AND WHEN MC > AVC, AVC ↑ (WHEN Q > 6)





Q: In the short-run production, why does the manager face with U-shaped average cost curve?

A: When $Q < Q_2$: $\underset{\downarrow}{AFC} + \underset{\downarrow}{AVC} = \underset{\downarrow}{AC}$

Reason

① Spreading effect: $\frac{FC}{Q}$ or $AFC \downarrow$

&

② Benefits of specialization: $MP > AP \rightarrow AP \uparrow \rightarrow AVC \downarrow$
(output per worker) (variable cost / unit)

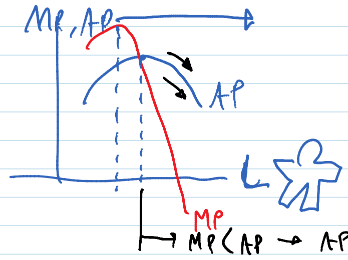
[Recall that $\boxed{AVC = \frac{w}{AP}}$]

When $Q_2 < Q < Q_3$: $\underset{\downarrow}{AFC} + \underset{\uparrow}{AVC} = \underset{\downarrow}{AC}$

As the fall in AFC "dominates" the rise in AVC, AC still continues to fall.

In other words: spreading effect ($\downarrow AFC$) is stronger than diminishing return effect ($\uparrow AVC$).

As $MP < AP \rightarrow AP \downarrow \rightarrow AVC \uparrow$!!!



Result from diminishing MP!

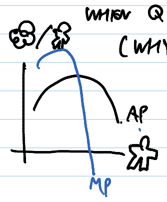
So far,

Production	Costs in SR
TP	TC, FC, VC
AP	AC, AFC, AVC
MP	MC
(3 curves)	(7 curves)

* Law of diminishing MP: MP falls when Q rises (why?)

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

MP : MP FALLS WHEN Q RISES (WHY?)



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

$\boxed{MC = \frac{\bar{w}}{MP}}$

GIVEN w, WHEN MP↑, MC↓, WHEN MP↓, MC↑

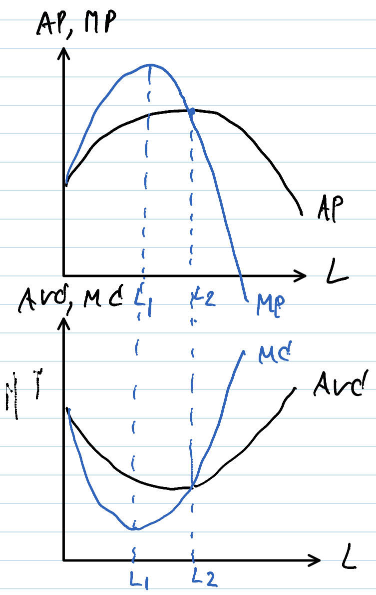
PROOF: $MC = \frac{\Delta VC}{\Delta Q}$

$= \frac{\Delta(w \cdot L)}{\Delta Q}$

$= w \cdot \frac{\Delta L}{\Delta Q}$

$= w \cdot \frac{1}{\frac{\Delta Q}{\Delta L}}$

$MC = w \cdot \frac{1}{MP}$ #



PRODUCTION & COSTS

$AVC = \frac{\bar{w}}{AP}$

$MC = \frac{\bar{w}}{MP}$

- MP > AP, AP ↑ | MP < AP, AP ↓
- MC < AVC, AVC ↓ | MC > AVC, AVC ↑

"NATURE OF COSTS IS A REFLECTION OF THE NATURE OF PRODUCTION IN THE SHORT RUN"

SWANS REFLECTING ELEPHANTS (DALI, 1937)

PRODUCTION IN THE LONG RUN

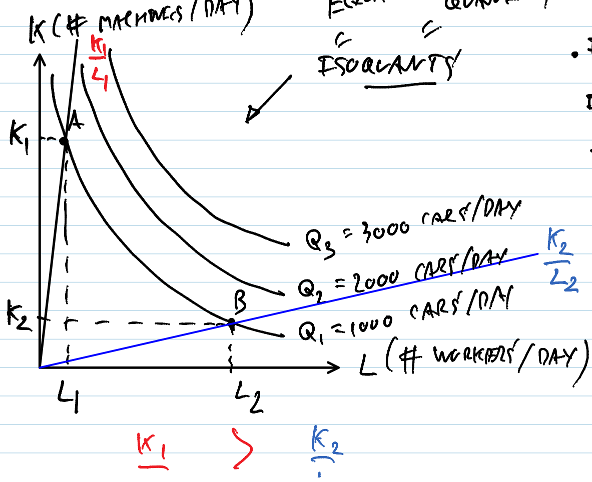
$Q = F(L, K)$

NOW, BOTH LABOUR (L) AND CAPITAL (K) ARE "VARIABLE INPUTS"

TOOLS USED WHEN LOOKING AT PRODUCTION IN THE LR:

- ISOQUANT
- ISO COST

EQUAL QUANTITY = ISOQUANTS



- INPUT MIX (L_1, K_1) AND INPUT MIX (L_2, K_2) GIVE THE SAME AMOUNT OF OUTPUT (= 1000 CARS/DAY)

ISOQUANT: A SET OF INPUT COMBINATIONS THAT GIVES THE SAME AMOUNT OF OUTPUT.

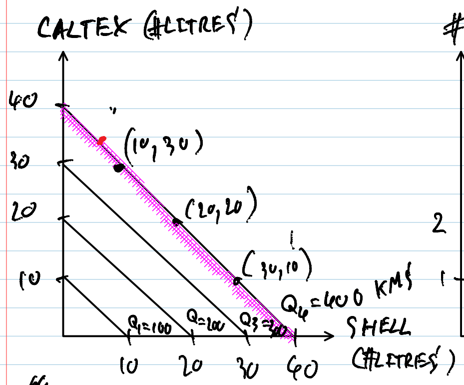
L_1 L_2

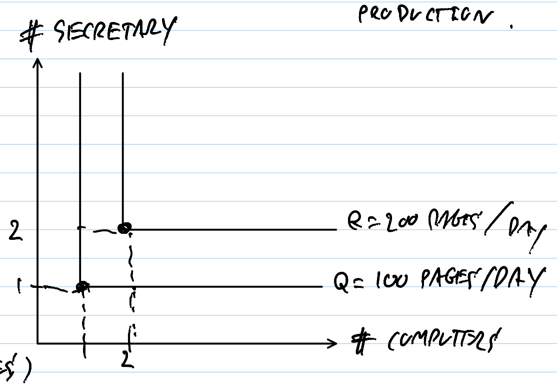
THE SAME AMOUNT OF OUTPUT.

$$\frac{K_1}{L_1} > \frac{K_2}{L_2}$$

AT A: RELATIVELY LARGER AMOUNT OF CAPITAL (K) IS USED COMPARE TO L ⇒ CAPITAL-INTENSIVE TECHNIQUE OF PRODUCTION,

AT B: RELATIVELY LARGER AMOUNT OF LABOR (L) IS USED COMPARE TO K ⇒ LABOUR INTENSIVE TECHNIQUE OF PRODUCTION.





"TWO INPUTS ARE PERFECT SUBSTITUTES"

STRAIGHT LINE ISOQUANTS

"TWO INPUTS ARE PERFECT COMPLEMENTS"

L-SHAPED ISOQUANTS

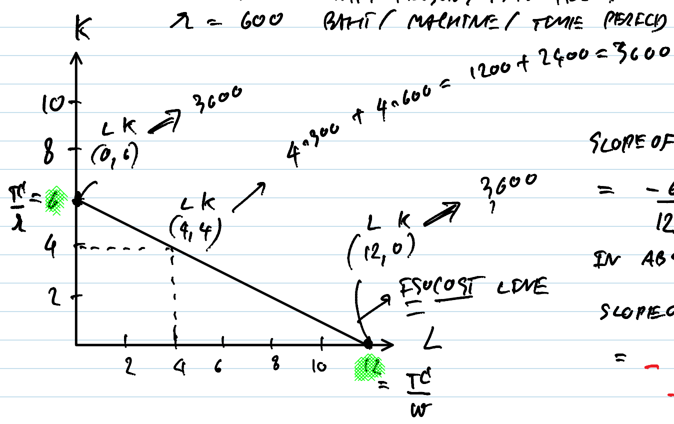
ISOCOST: A SET OF INPUT COMBINATION THAT COSTS THE SAME AMOUNT OF TOTAL COSTS.

- CONSIDER 2 VARIABLE INPUTS: L & K
- PRICE OF LABOR = w (wage)
- PRICE OF CAPITAL = r (rental rate of machine)
- CEO GIVES TC BAHT TO A PRODUCTION MANAGER

EX $TC = 3600$ BAHT / TIME PERIOD

$w = 300$ BAHT / PERSON / TIME PERIOD

$r = 600$ BAHT / MACHINE / TIME PERIOD



SLOPE OF ISOCOST

$$= \frac{-6}{12} = -\frac{1}{2}$$

IN ABSTRACT FORM, SLOPE OF ISOCOST

$$= -\frac{\cancel{TC}/r}{\cancel{TC}/w}$$

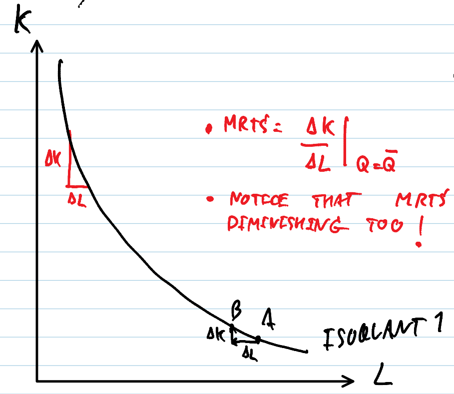
$$= -\frac{w}{r} \text{ OR } \frac{P_L}{P_K}$$

INPUT PRICE RATIO OR RELATIVE PRICE OF LABOR & CAPITAL

Ex $\frac{w}{r} = \frac{1}{2} \Rightarrow r = 2w$.

SO FAR, ISOQUANT & ISO COST LINES.

NEXT, LET'S DISCUSS ABOUT SLOPE OF ISOQUANT



• $MRTS = \frac{\Delta K}{\Delta L}\Big|_{Q=\bar{Q}}$

• NOTICE THAT MRTS IS DIMINISHING TOO! (WHY?) *

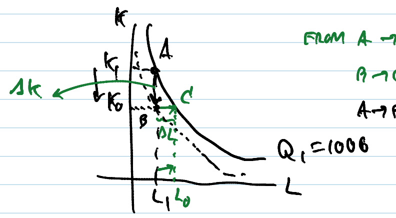
→ DIY

SLOPE OF ISOQUANT = MARGINAL RATE OF TECHNICAL SUBSTITUTION

= THE RATE AT WHICH ONE INPUTS CAN BE SUBSTITUTED W/ ANOTHER INPUT SO THAT OUTPUT REMAINS UNCHANGED.

$$\boxed{MRTS = -\frac{MP_L}{MP_K}}$$

$\left(\approx MRS = -\frac{MU_X}{MU_Y}\right)$



FROM A→B: $MP_K \cdot \Delta K$ = LOSS IN OUTPUT

A→C: $MP_L \cdot \Delta L$ = GAIN IN OUTPUT

A→B→C: $MP_K \cdot \Delta K + MP_L \cdot \Delta L = \Delta Q = 0$

$MRTS = \frac{\Delta K}{\Delta L} = -\frac{MP_L}{MP_K}$ # END OF THE PROOF

HINT: IF YOU WOULD LIKE TO EXPLAIN WHY MRTS IS DIMINISHING, LOOK AT LAW OF DIMINISHING MARGINAL PRODUCT.

$MRTS_A > MRTS_B$ OR $\underbrace{\left(\frac{MP_L}{MP_K}\right)_{AT\ A} > \left(\frac{MP_L}{MP_K}\right)_{AT\ B}}_{\text{SO WHAT?}}$.

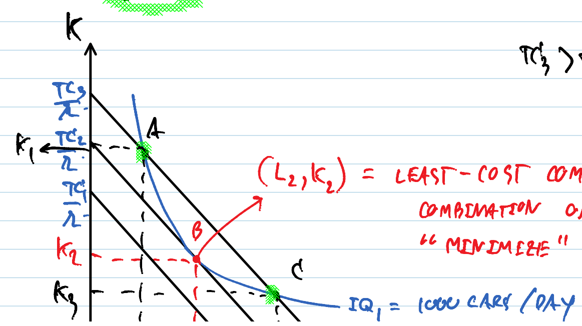
• COST MINIMIZATION PROBLEM

MIN $TC = w \cdot L + rK$

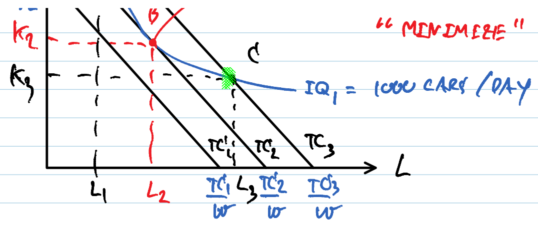
SUBJECT TO $Q = \bar{Q}$

L^*, K^* = ? ? → TC IS MINIMIZED GIVEN $Q = \bar{Q}$ (LET'S SAY 3000 CARS/DAY)

$TC_3 > TC_2 > TC_1$



(L_2, K_2) = LEAST-COST COMBINATION: COMBINATION OF INPUTS THAT "MINIMIZE" THE TOTAL COST GIVEN REQUIRED



"MINIMIZE" THE TOTAL COST" GIVEN REQUIRED AMOUNT OF OUTPUT.

AT POINT B: SLOPE OF ISOQUANT = SLOPE OF ISOCOST

$$MRTS = -\frac{w}{r}$$

$$-\frac{MP_L}{MP_K} = -\frac{w}{r}$$

$$\frac{MP_L}{MP_K} = \frac{w}{r}$$

$$\boxed{\frac{MP_L}{w} = \frac{MP_K}{r}} \qquad \approx \left[\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y}\right]$$

GOLDEN RULE OF COST MINIMIZATION:

MARGINAL PRODUCT OF LABOR PER BAHT — MARGINAL PRODUCT OF CAPITAL PER BAHT

TO MINIMIZE COSTS, THE MANAGER MUST CHOOSE AN INPUT MIX SUCH THAT LAST BAHT SPENT ON L AND LAST BAHT SPENT ON K GIVE THE SAME MARGINAL PRODUCT (MP).

SO IF $\frac{MP_L}{w} > \frac{MP_K}{r}$, HE SHOULD BUY MORE _____ AND LESS _____.

AND IF $\frac{MP_L}{w} < \frac{MP_K}{r}$, HE SHOULD ________ ____________.

EX:

$MP_L = 4$ COOKIES

$MP_K = 4$ COOKIES

$w = 2$ BAHT / WORKER

$r = 1$ BAHT / MACHINE

$$\frac{MP_L}{w} = \frac{4}{2} = 2 \quad < \quad \frac{MP_K}{r} = \frac{4}{1} = 4$$