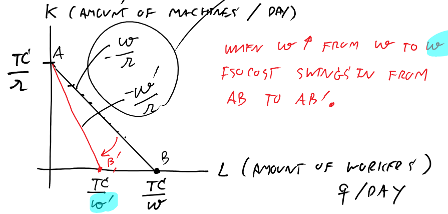
ISOCOST

GIVEN w, r, TC = TOTAL COST

$\frac{w'}{r} > \frac{w}{r}$ → LABOR BECOMES RELATIVELY MORE EXPENSIVE.



WHEN w ↑ FROM w TO w'...
ISOCOST SWINGS IN FROM AB TO AB'.

SUPPOSE HE HAS TC' BAHT

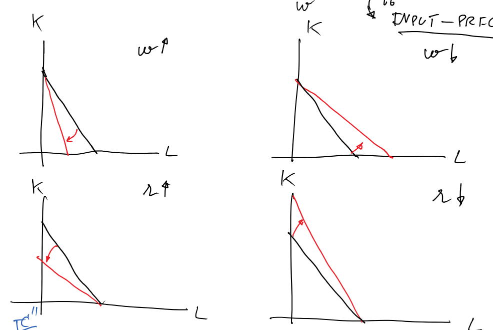
$\frac{TC'}{w}$ = MAX. AMOUNT OF WORKERS HE CAN EMPLOY

EX: $TC' = 30{,}000$ BAHT/DAY
$w = 300$ BAHT/♀/DAY
$\frac{TC'}{w} = \frac{30{,}000}{300} = 100$ ♀/DAY.

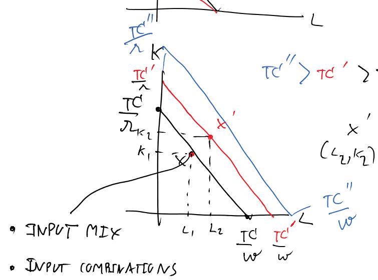
$\frac{TC'}{r}$ = MAX. AMOUNT OF MACHINE HE CAN RENT

- LINE AB IS CALLED "ISOCOST":
  A COLLECTION OF (L, K) THAT USES UP HIS TOTAL COST (OR EXPENDITURE)
- SLOPE OF ISOCOST $= -\frac{\cancel{TC'}/r}{\cancel{TC'}/w} = -\frac{w}{r}$ OR $= -\frac{P_L}{P_K}$

"INPUT-PRICE RATIO"



EFFECT OF Δw, Δr ON ISOCOST



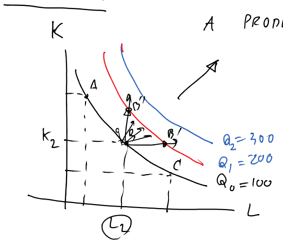
$TC'' > TC' > TC$

X' IS MORE COSTLY THAN X
(L_2, K_2) (L_1, K_1)

NOTE: SLOPES ARE ALL THE SAME: $-\frac{w}{r}$

- INPUT MIX
- INPUT COMBINATIONS

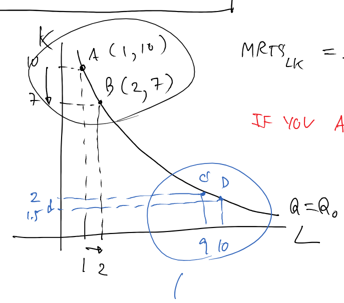
ISOQUANT: ALL COMBINATIONS OF L AND K THAT GIVE A PRODUCTION MANAGER THE SAME OUTPUT LEVEL (Q)



- THE HIGHER THE ISOQUANT, THE HIGHER THE OUTPUT LEVEL.
- SLOPE OF ISOQUANT = MARGINAL RATE OF TECHNICAL SUBSTITUTION BETWEEN L AND K ($MRTS_{LK}$) $= -\frac{\Delta K}{\Delta L}$

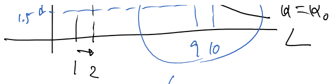
$$\boxed{MRTS_{LK} = -\frac{\Delta K}{\Delta L}\Big|_{Q=\bar{Q}}}$$

ANALOGOUS TO $\boxed{MRS_{xy} = -\frac{\Delta y}{\Delta x}\Big|_{U=\bar{U}}}$



$MRTS_{LK} = -\frac{\Delta K}{\Delta L} = -\frac{-3}{+1} = -3$

IF YOU ADD ONE MORE UNIT OF WORKERS, YOU WILL BE ABLE TO REDUCE AMOUNT OF MACHINES BY 3 UNITS AND STILL GET THE SAME AMOUNT OF OUTPUT!



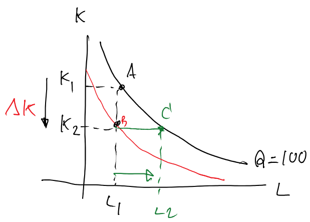
... AND STILL GET THE SAME AMOUNT OF OUTPUT!

$$MRTS_{LK} = -\frac{\Delta K}{\Delta L} = = \frac{-0.5}{+1} = -0.5$$

HERE, WHEN YOU ADD 1 MORE GUY TO THE FACTORY, TO GET THE SAME $Q = Q_0$, YOU CAN ONLY WITHDRAW 0.5 UNIT OF K.

SO, $MRTS_{LK}$ IS DIMINISHING FROM LEFT TO RIGHT (W/O SIGN)

ANOTHER VERSION OF MRTS ⇒ MRTS = ?



MOVEMENT FROM A → B ⇒ LOSS OF OUTPUT :(10 · -5 = -50

LOSS OF OUTPUT = $MP_K \cdot \Delta K$

MOVEMENT FROM B → C ⇒ GAIN IN OUTPUT

GAIN IN OUTPUT = $MP_L \cdot \Delta L = +50$ (2 · 25)

A → B	+	B → C	=	A → C
-50		+50		(0) → $\Delta Q = 0$.

$$MP_K \cdot \Delta K + MP_L \cdot \Delta L = \Delta Q = 0$$

$$\boxed{MRTS = \frac{\Delta K}{\Delta L} = -\frac{MP_L}{MP_K}}$$

MP_L — MARGINAL PRODUCT OF LABOR

MP_K — MARGINAL PRODUCT OF KAPITAL

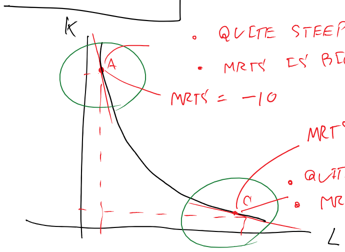
WHERE $\boxed{MP_L = \frac{\Delta Q}{\Delta L}}$ $MP_K = \frac{\Delta Q}{\Delta K}$

(W/O THE SIGN) $MRTS_{AT\ A} > MRTS_{AT\ B}$

Ex: 10 > 1

$MRS = \frac{\Delta Y}{\Delta X}$

$MRS = -\frac{MU_X}{MU_Y}$



AT A   YOU HAVE A RELATIVELY LARGER AMOUNT OF MACHINE COMPARED TO AMOUNT OF WORKER. → HIGH K, LOW L

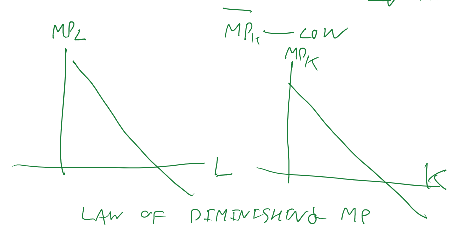
↓

LABOR WILL BE MORE PRODUCTIVE THAN CAPITAL !!!

AT C   YOU GOT THE OPPOSITE OF SITUATION A.

$MRTS = -\frac{MP_L}{MP_K}$ MP_L — HIGH, MP_K — LOW → HIGH

RECALL THAT



LAW OF DIMINISHING MP

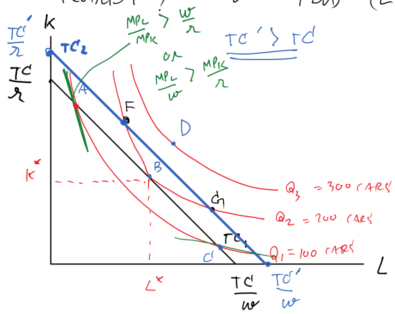
• COST MINIMIZATION PROBLEM

MINIMIZE TOTAL COST (TC) = $w \cdot L + r \cdot K$

SUBJECT TO $Q = \bar{Q}$ (A GIVEN OUTPUT LEVEL THE CEO ASKED THE PRODUCTION MANAGER

MINIMIZE TOTAL COST (TC) = $w \cdot L + r \cdot K$
SUBJECT TO $Q = \bar{Q}$ (A GIVEN OUTPUT LEVEL THE CEO ASKED THE PRODUCTION MANAGER TO DO)

PROBLEM ? → FIND (L^*, K^*) → MINIMIZE TC



① POINT B IS "LEAST-COST COMBINATION": THE INPUT MIX THAT MINIMIZES TOTAL COST OF OUTPUT.

② AT B: SLOPE OF ISOQUANT = SLOPE OF ISOCOST

$$MRTS_{LK} = -\frac{w}{r}$$

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

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

OR

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

CONSUMER

$$\frac{MU_x}{P_x} = \frac{MU_y}{P_y}$$

$\frac{MP_L}{w}$ = ADDITIONAL OUTPUT YOU RECEIVE WHEN YOU SPEND LAST BAHT ON HIRING WORKER.

$\frac{MP_K}{r}$ = ADDITIONAL OUTPUT YOU RECEIVE WHEN YOU SPEND LAST BAHT ON RENTING MACHINE (≈ CAPITAL)

SO IF $\frac{MP_L}{w} > \frac{MP_K}{r}$, THE MANAGER SHOULD BUY/USE MORE OF L AND LESS K.

IF $\frac{MP_L}{w} < \frac{MP_K}{r}$, THE MANAGER SHOULD BUY/USE MORE OF K AND LESS OF L.

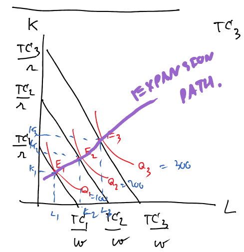
⇒ THEN YOU WILL GET MORE OUTPUT ☺

$\boxed{\frac{MP_L}{w} = \frac{MP_K}{r}}$ IS CALLED "COST-MINIMIZATION RULE"

"TO MINIMIZE COST OF PRODUCING A GIVEN AMOUNT OF OUTPUT, A SMART MANAGER MUST SPEND SUCH THAT, AFTER MONEY TO BUY L & K IS SPENT UP, MARGINAL PRODUCT OF LABOR FROM LAST BAHT SPENT ON L = MARGINAL PRODUCT OF KAPITAL FROM LAST BAHT SPENT ON K.

EXPANSION PATH

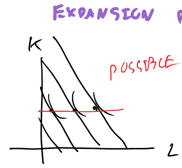
$TC_3 > TC_2 > TC_1$



$E_1(L_1, K_1)$
$E_2(L_2, K_2)$
$E_3(L_3, K_3)$
} THEY ARE ALL LEAST COST COMBINATIONS.

i.e., TO PRODUCE Q = 100, USE E_1
" ——— " Q = 200, USE E_2
" ——— " Q = 300, USE E_3

EXPANSION PATH : A COLLECTION OF ALL INPUT MIXES THAT MINIMIZE TOTAL COST OF PRODUCING A GIVEN AMOUNT OF OUTPUT



RETURNS TO SCALE (RTS)

- CONSTANT RTS : DOUBLING ALL INPUTS, NAMELY, L AND K GIVES YOU DOUBLE OUTPUTS.
- INCREASING RTS : " ——————— " MORE THAN DOUBLE OUTPUTS
- DECREASING RTS : " ——————— " LESS THAN DOUBLE OUTPUTS

Ex: 1 ♀ + 1 FRYING PAN → 10 OMLETS / HR.
2 ♀ + 2 FRYING PANS → 20 " ——— "

→ CRS

IN OTHER WORDS,

↑L BY x% + ↑K BY x% } → OUTPUT INCREASES BY x% → CRS
→ " ——————— " > x% → IRS
" ——————— " < x% → DRS.