Tuesday, November 22, 2011
11:20 AM

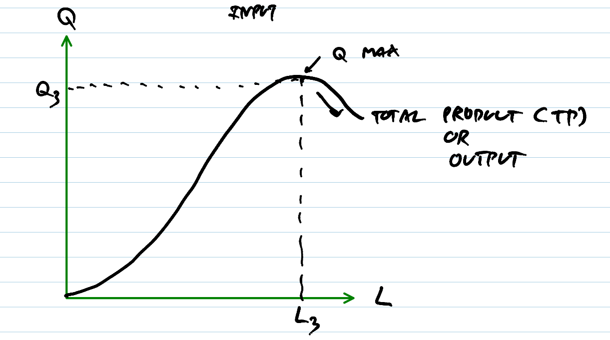
EE211: Nov 22, 2011

- PRODUCTION IN THE SHORT-RUN

SR PRODUCTION FUNCTION:

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

OUTPUT, VARIABLE INPUT, INPUTS, FIXED INPUT

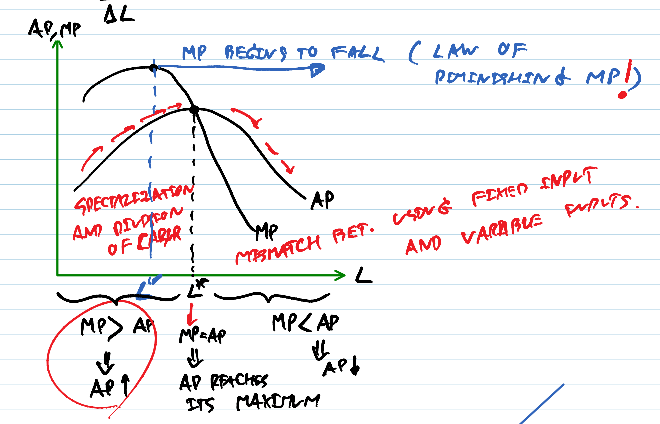


- AS L RISES, Q ALSO RISES UP TO A CERTAIN LEVEL.. BEYOND L_3, Q STARTS TO FALL.

→ TP

→ $AP = \frac{TP}{L}$ or $\frac{Q}{L}$ (LABOR PRODUCTIVITY)

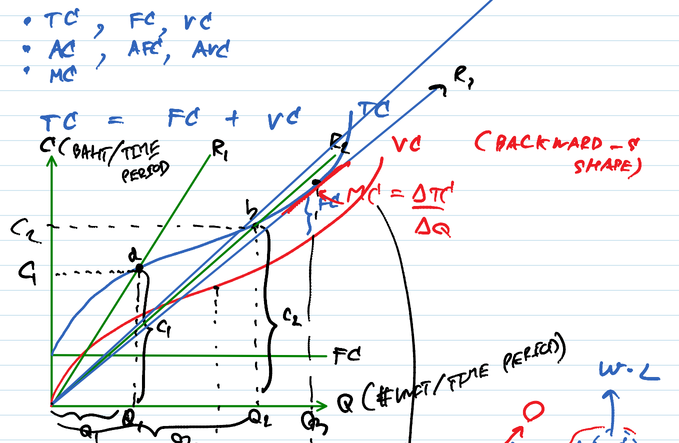
→ $MP = \frac{\Delta Q}{\Delta L}$



COST OF PRODUCTION IN THE SHORT-RUN

- TC, FC, VC
- AC, AFC, AVC
- MC

TC = FC + VC



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

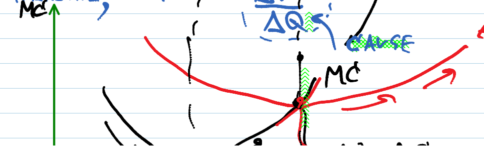
$\Delta FC = 0$

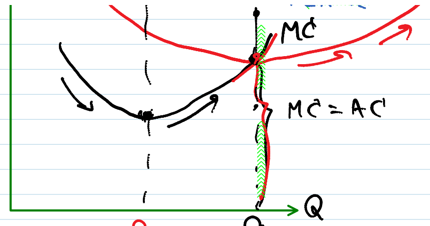
ΔVC → W·L

THEREFORE, $MC = \frac{\Delta VC}{\Delta Q}$ → SLOPE OF VC CURVE

CAUSE

AC ≡ UNIT COST CURVE





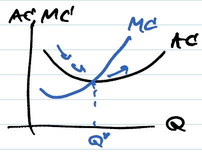
$$AC = \left(\frac{TC}{Q}\right) \quad \frac{\text{BAHT}/\cancel{\text{TIME PERIOD}}}{\text{UNIT}/\cancel{\text{TIME PERIOD}}} \Rightarrow \frac{\text{BAHT}}{\text{UNIT OF OUTPUT}}$$

MC < AC ⇓ AC ↓

MC > AC ⇓ AC ↑

EE211: Nov 23, 2011

YESTERDAY (NOV 22) : RELATIONSHIP BETWEEN MC & AC



TODAY : RELATIONSHIP BETWEEN MC & AVC

FROM $AVC = \frac{VC}{Q}$ (VARIABLE COST / OUTPUT)

$VC = AVC \cdot Q$

$$\frac{dVC}{dQ} = \frac{d(AVC \cdot Q)}{dQ} = AVC \cdot \frac{dQ}{dQ} + Q \frac{dAVC}{dQ}$$

(USE THE PRODUCT RULE)

$MC = AVC + Q \cdot$ SLOPE OF AVC

$\boxed{MC - AVC = Q \cdot \text{SLOPE OF AVC}}$

+

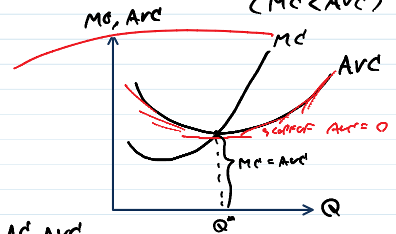
$MC = \frac{\Delta C}{\Delta Q} = \frac{\Delta(FC + VC)}{\Delta Q}$

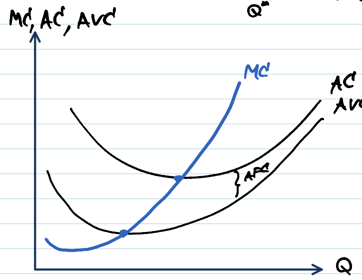
$= \frac{\Delta FC}{\Delta Q} + \frac{\Delta VC}{\Delta Q}$

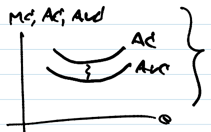
$= \frac{\Delta VC}{\Delta Q}$ (OR $\frac{dVC}{dQ}$)

- MC − AVC = 0 (MC = AVC) ⟺ SLOPE OF AVC = 0
- MC − AVC > 0 (MC > AVC) ⟺ SLOPE OF AVC MUST BE POSITIVE
- MC − AVC < 0 (MC < AVC) ⟺ SLOPE OF AVC MUST BE NEGATIVE

$\frac{\Delta C}{\Delta Q}$

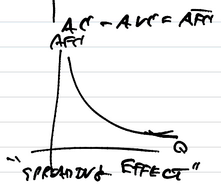




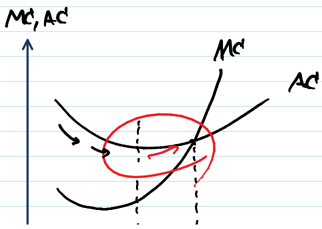


WRONG !!!

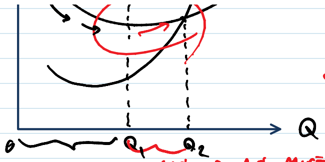
AC − AVC = AFC



WHY? LOOK AT THE NATURE OF AFC !!!



MC CROSSING BEFORE AND AFTER THE BOTTOM OF AC ARE CONCEPTUALLY



AND AFTER THE BOTTOM OF AC ARE CONCEPTUALLY WRONG!!!

MC < AC → AC MUST ↓ BUT HERE, AC IS UP!!!

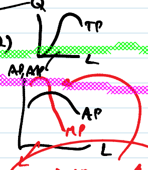
WRAP UP...

PRODUCTION & COST

TP (OR Q)

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

$MP = \frac{\Delta Q}{\Delta L}$



WHEN MP > AP → AP↑

MC < AC → AC↓

- $TC = FC + VC$
- $\frac{TC}{Q} = \frac{FC}{Q} + \frac{VC}{Q}$
- $AC = AFC + AVC$
- $\frac{\Delta TC}{\Delta Q} = MC$

⇒ RELATIONSHIP BET. MC & AC

⇒ RELATIONSHIP BET. MC & AVC

⇒ AFC: "SPREADING EFFECT" (READ KRUGMAN & WELLS)

FOLLOWS

LAW OF DIMINISHING MARGINAL RETURNS (PRODUCTS) !!! ...

∴ IN THE SR, WHEN USING VARIABLE INPUTS (WORKER) W/ FIXED INPUTS, MP WILL EVENTUALLY FALL!

LET'S MAKE A BRIDGE BET. PRODUCTION & COST...

RELATIONSHIP BETWEEN MP AND MC

BEGIN WITH $MC = \frac{\Delta C}{\Delta Q} = \frac{\Delta(FC + VC)}{\Delta Q}$

$$\frac{\Delta C}{\Delta Q} = \left(\frac{\Delta FC}{\Delta Q} + \frac{\Delta VC}{\Delta Q}\right)$$

$$MC = \frac{\Delta C}{\Delta Q} = \frac{\Delta VC}{\Delta Q}$$

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

$$= \bar{w} \cdot \frac{\Delta L}{\Delta Q} \qquad \left(\frac{\Delta Q}{\Delta L} = MP\right)$$

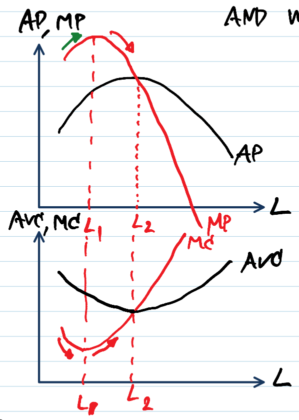
$$= \bar{w} \cdot \frac{1}{MP}$$

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

INTERPRETATION?

∴ GIVEN $\bar{w}$, WHEN MP ↑, MC ↓

AND WHEN MP ↓, MC ↑.



PRODUCTION & COST

- MC IS A MIRROR IMAGE OF MP.
- AVC IS A MIRROR IMAGE OF AP

RELATIONSHIP BETWEEN AP AND AVC

TO BEGIN WITH

$$AVC = \frac{VC}{Q} = \frac{w \cdot L}{Q} = w \cdot \frac{L}{Q} = w \cdot \frac{1}{AP}$$

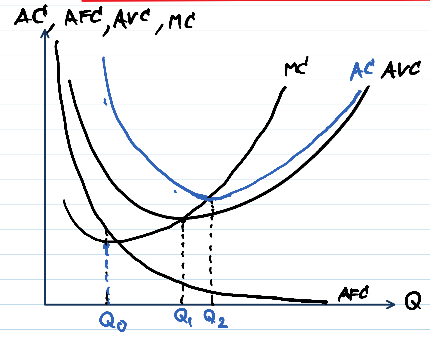
$$AVC = \frac{VC}{Q} = \frac{w \cdot L}{Q} = w \cdot \frac{L}{Q} = w \cdot \frac{1}{AP}$$

THEREFORE, $\boxed{AVC = \bar{w} \cdot \frac{1}{AP}}$ $\left(\because \frac{Q}{L} = AP\right)$

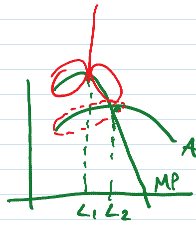
WHEN AP ↑, AVC ↓
AND WHEN AP ↓, AVC ↑

EE211: Nov 24-25, 2011

Q: WHY AVERAGE COST IS U-SHAPED?



$\boxed{AC = AFC + AVC}$



OBSERVATION #1: FROM Q=0 TO Q=Q_1, AC ↓

AFC (↓) + AVC (↓) = AC (↓)

"SPREADING EFFECT" OF THE FALL IN AFC

"DIMINISHING RETURN EFFECT" OF RISING IN AVC HAS NOT YET OPERATED.

AVC & AP

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

AS MP > AP

OBSERVATION #2: FROM Q=Q_1 TO Q=Q_2, AC ↓

AFC (↓) + AVC (↑) = AC ↓

SPREADING EFFECT > DIMINISHING RETURN EFFECT

∵ AP ↓ ← MP < AP.

BACKWARD REASONING

(LAW OF DIMINISHING RETURN STARTS TO OPERATE

i.e., SPREADING EFFECT OF THE FALL IN AFC IS STRONGER THAN DIMINISHING RETURN EFFECT OF THE RISE IN AVC. THEREFORE, AC IS STILL FALLING.

OBSERVATION #3: FROM Q = Q_2 ONWARDS, AC ↑

AFC (↓) + AVC (↑) = AC (↑)

THAT MEANS "DIMINISHING RETURN EFFECT "DOMINATES" SPREADING EFFECT."

SO, FROM OBSERVATION #1, #2, #3, WE UNDERSTAND WHY AC IS U-SHAPED.

THAT IS, HOW TP, AP, MP BEHAVE WHEN WE CHANGE LABOUR (L)

GIVEN THE KNOWLEDGE ON NATURE OF PRODUCTION AND BEHAVIOR OF COST CURVES, WE ARE READY TO DISCUSS "PROFIT MAXIMIZATION"

OBJECTIVE OF THE FIRM: MAXIMIZE PROFITS (π)
(ASSUMED BY ECONOMISTS)

PROFIT (π) = TOTAL REVENUE (TR) − TOTAL COSTS (TC)

INCLUDE BOTH EXPLICIT COSTS AND IMPLICIT COSTS

$= P \cdot Q$ (BAHT/PERIOD OF TIME)

P: BAHT/UNIT; Q: UNIT/PERIOD OF TIME

$\pi(Q) = TR(Q) - TC(Q)$

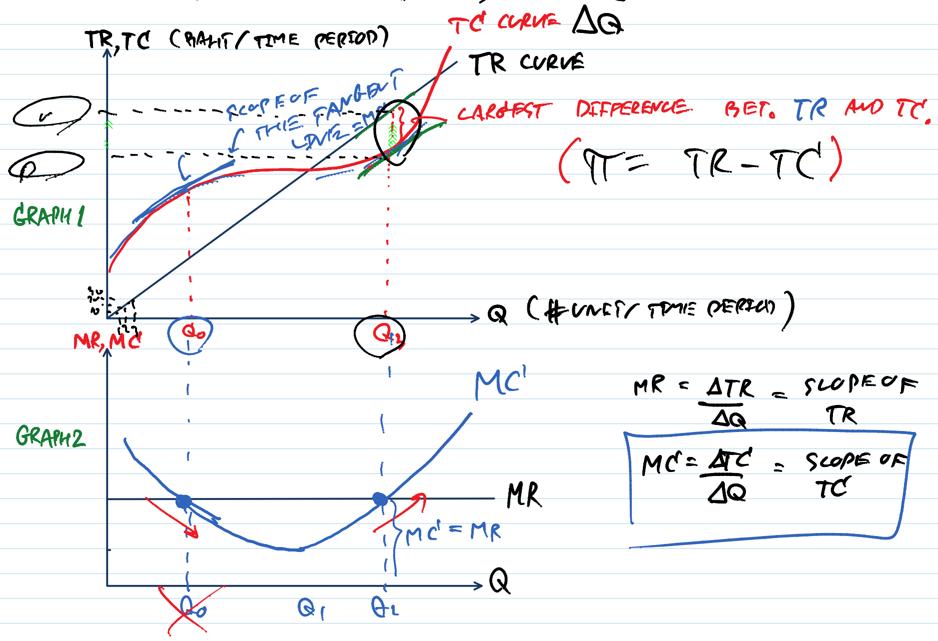
QUESTION: HOW MUCH TO PRODUCE SO AS TO MAXIMIZE THE FIRM'S PROFIT?

ANSWER: WE BEGIN WITH...

- TOTAL REVENUE (TR) = $P \times Q$ (BAHT/TIME PERIOD)
- AVERAGE REVENUE (AR) = $\frac{TR}{Q}$ $\frac{(\text{BAHT}/\cancel{\text{TIME PERIOD}})}{(\text{UNIT}/\cancel{\text{TIME PERIOD}})}$ BAHT/UNIT

EX: TR = 10,000 BAHT/DAY
Q = 500 UNIT/DAY
AR = $\frac{10000}{500} = 20$ BAHT/UNIT.

- MARGINAL REVENUE (MR) = $\frac{\Delta TR}{\Delta Q}$



$MR = \frac{\Delta TR}{\Delta Q}$ = SLOPE OF TR

$\boxed{MC = \frac{\Delta TC}{\Delta Q} = \text{SLOPE OF } TC}$

- AS A LARGEST DIFFERENCE BETWEEN TR AND TC OCCURS WHEN MR INTERSECT W/ MC (SEE GRAPH 2 ABOVE), SO...

∴ TO MAXIMIZE PROFIT, THE FIRM SHOULD PRODUCE AT Q WHERE MARGINAL COST = MARGINAL REVENUE.

- AND TO MAXIMIZE PROFIT, NOTE THAT THE FIRM MUST CHOOSE THE LEVEL OF OUTPUT

} THIS REQUIREMENT IS TO "RULE OUT" AT Q_0

(AND) TO MAXIMIZE PROFIT, NOTE THAT THE FIRM MUST CHOOSE THE LEVEL OF OUTPUT ON RISING PART OF MC !!!

{ THAT IS TO "RULE OUT" PRODUCING AT Q_0 WHERE π IS MINIMIZED, INSTEAD.

ABOVE IS BY "VISUAL INSPECTION" (GRAPHICAL ANALYSIS).

A BIT OF MATHEMATICS :

TO MAXIMIZE PROFIT, THE PROFIT FUNCTION IS :

$$\max_{q} \pi(q) = TR(q) - TC(q)$$

CHOICE VARIABLE

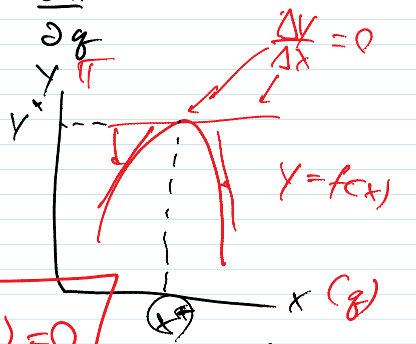
$$\boxed{\frac{d\pi(q^*)}{dq} = \frac{dTR(q^*)}{dq} - \frac{dTC(q^*)}{dq} = 0}$$

WE TAKE THE 1ST DERIVATIVE BY DIFFERENTIATING PROFIT WITH RESPECT TO q

THIS CONDITION IS SO CALLED "FIRST ORDER CONDITION" (FOC)

Δ, d, ∂

$\dfrac{\partial \pi}{\partial q}$



TO FIND A MAXIMUM POINT

$$\boxed{\frac{d\pi(q^*)}{dq} = MR(q^*) - MC(q^*) = 0}$$

TO MAXIMIZE π, THE FIRM SHOULD CHOOSE LEVEL OF OUTPUT WHERE $MR(q^*) = MC(q^*)$.

NOTE : IT IS ALSO REQUIRED THAT MC MUST BE ON RISING PART

(... "2nd ORDER CONDITION" :

WE CALL "2^{nd} ORDER CONDITION":

$$\boxed{\frac{d^2\pi}{dq^2} < 0}$$

(TO ENSURE THAT WE ARE ACTUALLY WORKING W/ MAXIMUM)

FROM THE FIRST ORDER CONDITION, YOU HAVE

$$\boxed{\frac{d\pi(q^*)}{dq} = MR(q^*) - MC(q^*) = 0}$$

FIRST ORDER NECESSARY CONDITION (FONC)

NOW YOU DIFFERENTIATE THE FOC AGAIN AND YOU WILL GET:

$$\frac{d^2\pi}{dq^2} = \cancel{\frac{dMR}{dq}}^{\,0} - \frac{dMC}{dq} < 0 .$$

$$\frac{d^2\pi}{dq^2} = -\frac{dMC}{dq} < 0$$

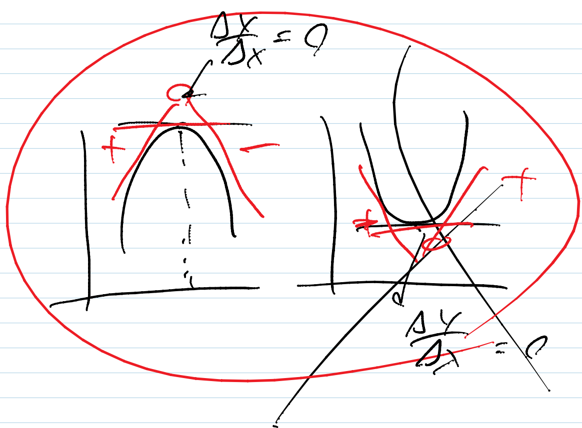
"

$$\boxed{\frac{d^2\pi}{dq^2} = \frac{dMC}{dq} > 0}$$

#

IN WORDS, SCOPE OF MC MUST BE POSITIVE.

SECOND-ORDER SUFFICIENT CONDITION (SOSC)



TP, AP, MP

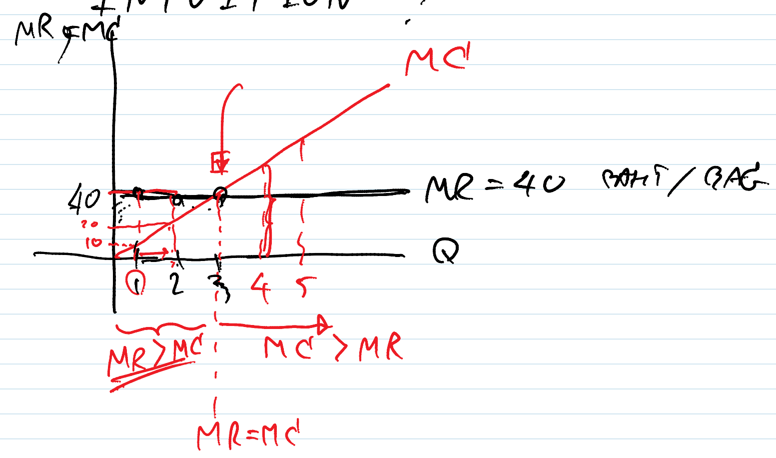
(PRODUCTION)

- TP, AP, MP (PRODUCTION)
- 7 COST CURVES (COST)
- PROFIT MAXIMIZING CONDITION : MR = MC.

INTUITION ?

~~MR = MC~~

~~MR > MC~~



MARKET STRUCTURE

HERE, WE FOCUS ONLY

EE211
1. PERFECTLY COMPETITIVE MARKET
2. MONOPOLY (A SINGLE SELLER) " MONOPOLIST "

IN EE 311
3. OLIGOPOLY (A FEW SELLERS)
4. MONOPOLISTIC COMPETITION

PERFECTLY COMPETITIVE MKT. ——————————— MONOPOLY

- LARGE NUMBER OF BUYERS AND SELLERS
- NON-DIFFERENTIATED PRODUCTS (OR HOMOGENEOUS PRODUCTS)

⇒ BUYERS AND SELLERS ARE "PRICE TAKERS"

- FREE ENTRY AND FREE EXIT
- PERFECT INFORMATION

TAKE PRICES AS GIVEN AND

MAKE A DECISION,

FOR SELLERS: OUTPUT DECISION

FOR BUYERS: PURCHASE DECISION