

**Instructions**

- (1) Please read the instruction carefully.
- (2) Please read each question carefully and answer the questions straightforwardly. Always provide economic reasons at least a paragraph for your analysis, or a graph when necessary, even when the question does not indicate so.
- (3) Handing and submitting assignments are only available via BE Moodle.

**Answering the questions and preparing answer sheets**

- (1) Answers are to be handwritten, in either digital or analog form, in a blank canvas or any clean paper. Make sure that your handwriting is clearly visible and readable.
- (2) There is no need to rewrite the question. Just indicate the question number clearly for each of the answer, such as 1.a).
- (3) When done, for the digital case, collage all the pages into a single PDF file. For those who write on sheets of paper, take photo of all pages then convert all of them into a single PDF file as well.
- (4) Name your PDF file as StudentID\_YourNickname, such as 640123456\_Bo.

**Submitting your answers**

- (1) Make sure your file does not exceed 10MB. This is the maximum file size for BE Moodle upload.
- (2) Login to BE Moodle, head into the course, then the assignment topic.
- (3) Choose your file to submit. Done. There will be timestamp for your upload date and time, so please make sure to not submit later than that.

Pimpitcha Harnatichart

6404640812

1. Consider a long-run production in which there are only two inputs labor and capital, and the input prices for labor and capital are wage ( $w$ ) and interest rate ( $r$ ), respectively. Suppose that at the equilibrium levels of labor and capital ( $L^*, K^*$ ), the marginal product of labor ( $MP_L$ ) and marginal product of capital ( $MP_K$ ) are 6 and 8, respectively.

**1.a)** Calculate the marginal rate of technical substitution (MRTS), and state the cost-minimization conditions of this firm, given that the required output is fixed at  $Q_0$ . If the market wage rate ( $w$ ) is \$3, what is the interest rate at the equilibrium?

**1.b)** Suppose now that the wage rate ( $w$ ) increases to \$4, *ceteris paribus*. Draw a diagram to illustrate the changes in the cost-minimizing combination of inputs.

2. Suppose that in the long-run production of wine, a firm uses two inputs: workers ( $L$ ) and machines ( $K$ ). At the required output of 3,000 bottles of wine, the firm's least-cost input combination is 200 units of  $L$  and 50 units of  $K$ , and the per-unit input prices for  $L$  and  $K$  are \$10 and \$20, respectively. Suppose further that at this least-cost combination of inputs, the marginal product of the 50<sup>th</sup> machine ( $MP_K$ ) is 8 bottles of wine.

**2.a)** Draw a diagram to illustrate this firm's cost-minimization decision, where  $L$  is on the x-axis and  $K$  is on the y-axis. Also, explain the firm's cost-minimization conditions.

**2.b)** At the equilibrium in part a., what is the marginal product ( $MP_L$ ) of the 200<sup>th</sup> workers?

**2.c)** Suppose that the input price for  $L$  increases to \$15 per unit, while the input price for  $K$  and the required amount of output are the same. Draw another diagram to illustrate the change in the least-cost input combination.

**2.d)** Explain the difference between short-run and long-run production.

①  $q = f(k, L)$  in long run  $\rightarrow$  no fixed factor

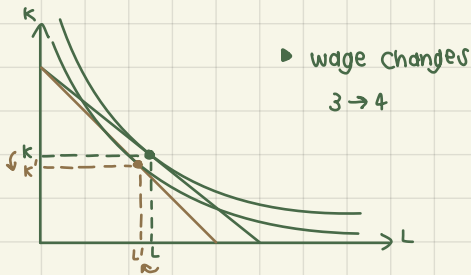
$$MP_L = 6 \quad \text{and} \quad MP_K = 8$$

$$a) \text{MRTS} = \frac{MP_L}{MP_K} = \frac{6}{8} = 0.75 \#$$

- The firms have to sacrifice 0.75 units of capital ( $k$ ) and get 1 unit of labor back in order to keep same level of output,
- Cost-minimization is  $\text{MRTS} = \text{MRMS}$

$$\frac{MP_L}{MP_K} = \frac{w}{r} \rightarrow \frac{6}{8} = \frac{3}{r} \quad ; \quad r = 4 \#$$

b) The change of cost-minimizing combination of inputs:



②  $q = (K_0 L)$  in long run, required output of 3000 bottles of wine,

a)  $Q' = 3000$

$$TC = L \cdot W + K \cdot r$$

$$= 200(10) + 50(20)$$

$$= 3000$$

Find the intercept

$$\text{At } K=0 \rightarrow 10L = 3000 \rightarrow L=300$$

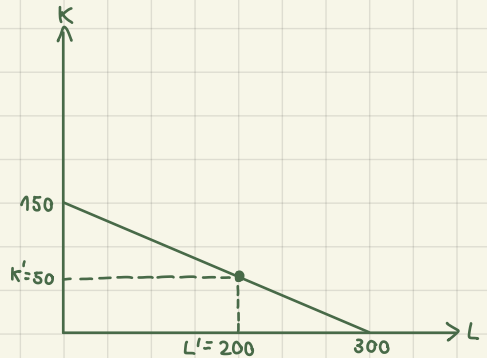
$$\text{At } L=0 \rightarrow 20K = 3000 \rightarrow K=150$$

► Cost minimization;  $MRTS = MRMS$   
condition

$$\frac{\Delta K}{\Delta L} = \frac{W}{r}$$

$$\left| \frac{-150}{300} \right| = \frac{10}{20} = \frac{1}{2}$$

∴ Give 1 K, gain 2 L



∴ The optimal choice in order to minimize the cost and keep output level

→ Firm sacrifice 1 capital (K) and get 2 labor (L)

$$q(K', L') = q(50, 200) \#$$

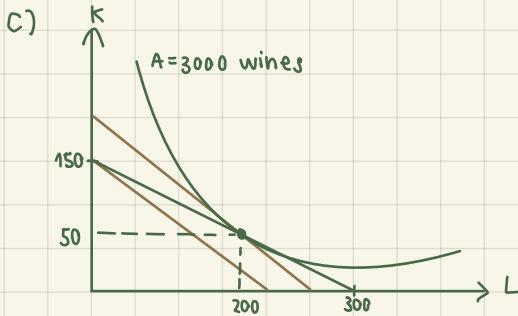
b)  $MP_L$  of 200<sup>th</sup> labor = ?

$$\rightarrow \frac{MP_L}{MP_K} = \frac{W}{r}$$

$$MP_L = \frac{W}{r} (MP_K)$$

$$MP_L = \frac{10}{20} (8)$$

$$= 10 \#$$



The production becomes more capital-intensive #

Input for  $L$  increases

$$10 \rightarrow 15$$

$$3000 = 15L + 20K$$

$$\text{when } L=0 : 3000 = 20K ; K=150$$

$$K=0 : 3000 = 15L ; L=200$$

∴ when  $w \uparrow$ , in order to keep the same level of output,

← Using less labor but more capital.

d) In short run production, at least 1 factor is fixed as firms take time to expand ( $K$ )

In long run production, all FOP are variable and can be adjusted.

3. Consider a perfectly competitive market, in which the current equilibrium price is 150 baht per unit.

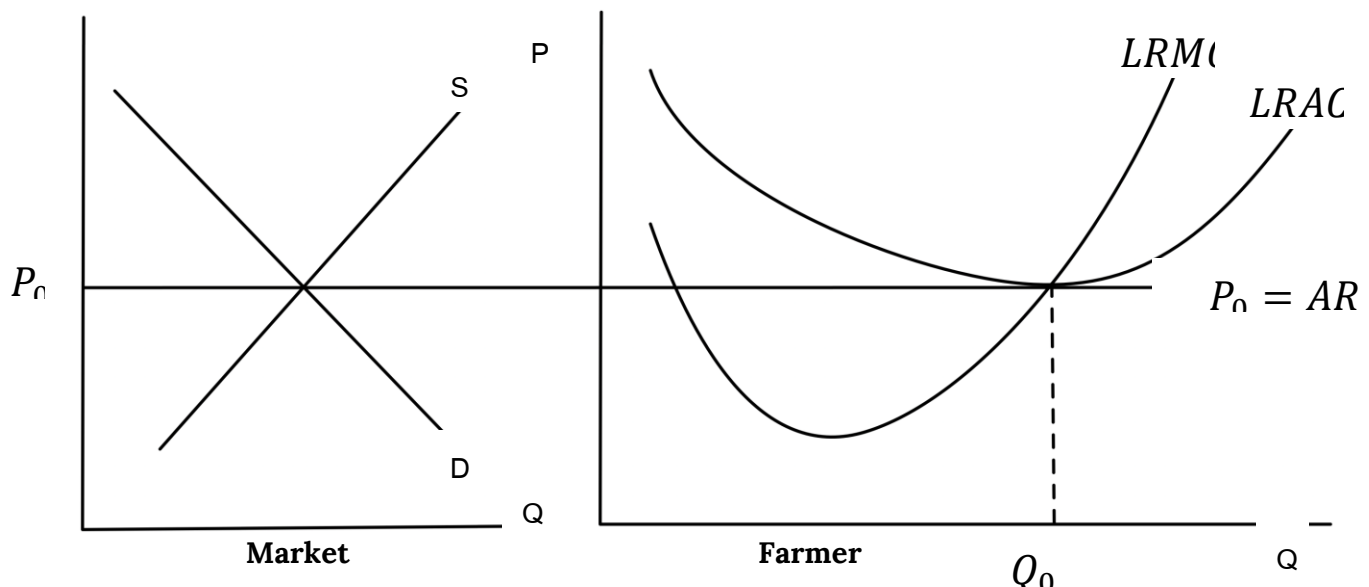
3.a) Suppose that a firm in this market sells 20 units of its output. State the profit-maximizing condition of this firm, and draw a diagram to illustrate how the equilibrium quantity is determined.

3.b) At this equilibrium quantity of 20 units, suppose that the firm's average total cost is 180 baht, and its average fixed cost is 60 baht. Calculate this firm's average variable cost, total revenue, total cost, and profit.

3.c) From part b., should this firm stay in the market in the short run? Justify your answer.

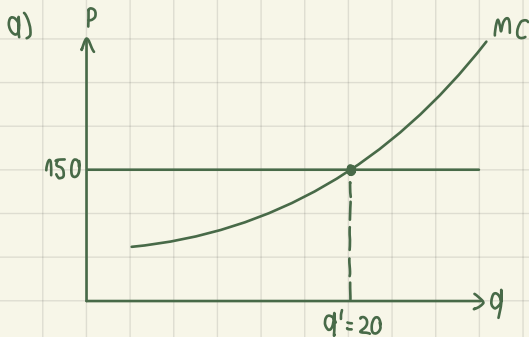
3.d) Suppose now that the market demand decreases, and the market price decreases to 120 baht per unit. Draw two diagrams to illustrate: (i) the change in the equilibrium price and quantity in the market, (ii) how the change in the market price affects the firm equilibrium quantity and profit. Would your answer from part c. change?

4. A Thai rice farmer is in a long run equilibrium in a perfect competition and produces at the quantity  $Q_0$  as shown in the graph below.



4.a) The government grants a lump sum subsidy to every farmer. How will this change the LRAC? Explain why LRMC does not change.

⑤ Perfectly competitive  $\rightarrow$  150 Bqht / unit



$\therefore$  profit maximization condition :  $MC = MR$

b)  $q'=20$  ,  $ATC=180$  ,  $AFC=60$

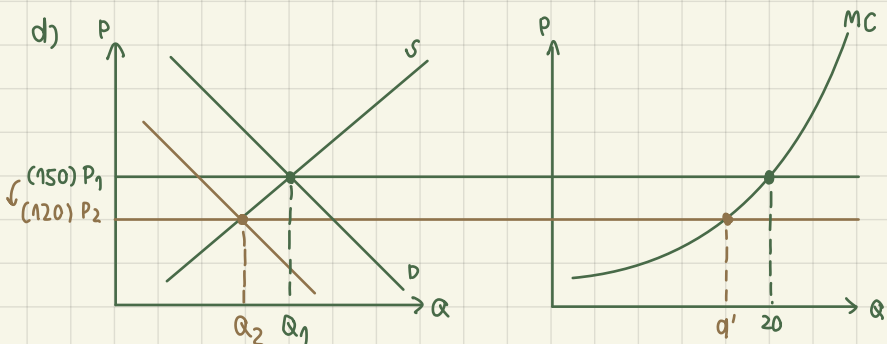
$$\rightarrow AVC = ATC - AFC = 180 - 60 = 120 \text{ ₪}$$

$$\rightarrow TR = P \cdot q = 150(20) = 3000 \text{ ₪}$$

$$\rightarrow TC = ATC(q) = 180(20) = 3600 \text{ ₪}$$

$$\rightarrow \text{Profit} = TR - TC = 3000 - 3600 = -600 \text{ ₪}$$

c) Yes, this firm should stay in the short run market because this firm is in the least loss situation ( $P > AVC$ ). The different between  $P$  and  $AVC$  can use for paying the fixed cost because of fixed factors cannot be adjusted in short run.

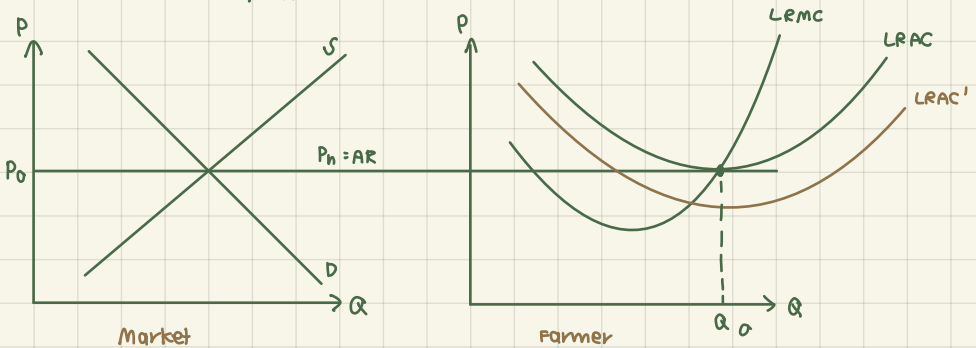


$\rightarrow$  If price market goes down from  $150 \rightarrow 120$ , the eqbm quantity and profit will decrease, so,  $P = AVC$  produce at  $q'$  or stop are different.

④ d) Subsidy  $\rightarrow$  TC decrease. LRAC decrease

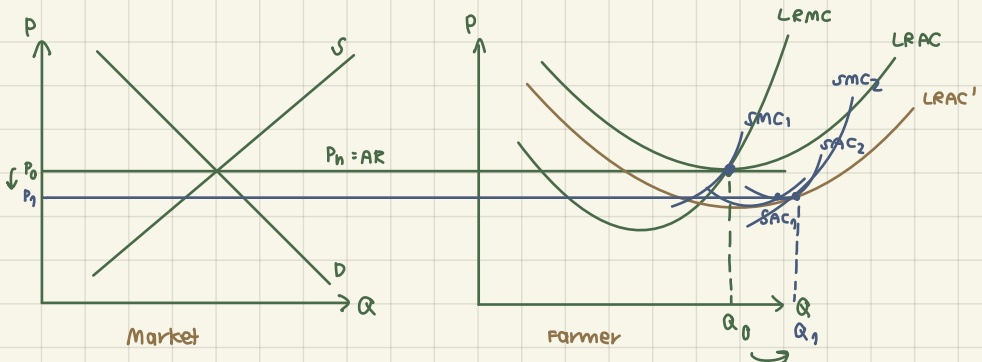
LRMS doesn't change because of a price taker in the perfect competition is farmer  $q$  then the competitive price and Eqbm quantity remain constant.

b) It cannot change because the profit maximization is when  $P = LMC$   $q$  both  $P$  and  $LMC$  don't change. The optimal quantity to maximize profit will be the same.



- when  $LRAC \downarrow$   $q$   $SAC$  at  $Q_0$  provide average cost  $C$ .
- when  $P > C$ , there is "excess profit"

c) In long  $q$ , the farmer will be attracted by excess profit, the supply will increase.



- supply increase  $q$  price decrease
- To maximize profit  $q$  the optimal quantity will increase.

---

**4.b) (10 Points)** Will the lump sum subsidy change the quantity the farmer wants to produce to maximize his profit? Show in the graph that the farmer now earns an Excess Profit. Explain.

**4.c) (10 Points)** Demonstrate how this Excess Profit will affect the market price in the Long Run that allows new entry to the market.

**5.** House and Land (HL) is the monopolist in a luxury housing market. It is a very efficient firm in which workers can construct houses with constant marginal cost and average cost. The demand and cost functions for HL are given as follows. (P is in million-baht unit).

$$P = 60 - 0.6Q$$

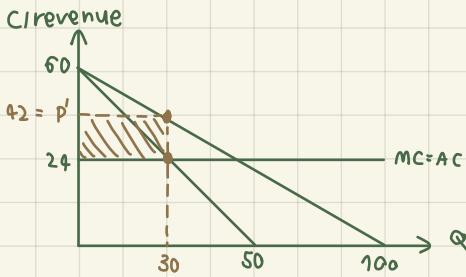
$$MC = AC = 24$$

**5.a)** Derive the marginal revenue function. Draw a diagram to illustrate the demand, marginal revenue, marginal cost, and average cost curves.

**5.b)** State the profit-maximizing condition for HL, and determine the optimal units of houses. Also, indicate the profit in the diagram, and explain how this profit can be derived.

**5.c)** The government tries to encourage more people to have access to luxury houses, so they launch a policy forcing HL to sell their houses at the ideal price. Draw another diagram to indicate the ideal price and determine the corresponding quantity at this price. Illustrate the social welfare before and after the intervention in the diagram and discuss.

⑤ a)  $D = \text{linear} \rightarrow MR$  is 2 times steeper



$$MR = P = 60 - 0,12Q$$

b) profit maximizing condition

$$MR = MC$$

$$60 - 0,12Q = 24$$

$$Q' = 30 \text{ units}$$

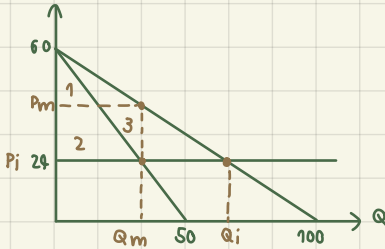
$$P = 60 - 0,12(30)$$

$$= 42$$

$$\% \text{ Profit} = (P - C)Q$$

$$= (42 - 24) 30 = 540 \text{ MB \#}$$

c) C/revenue



►  $P = MC$  (Ideal Price)

- quantity  $\uparrow$  from  $Q_m \rightarrow Q_i$

► Before intervention

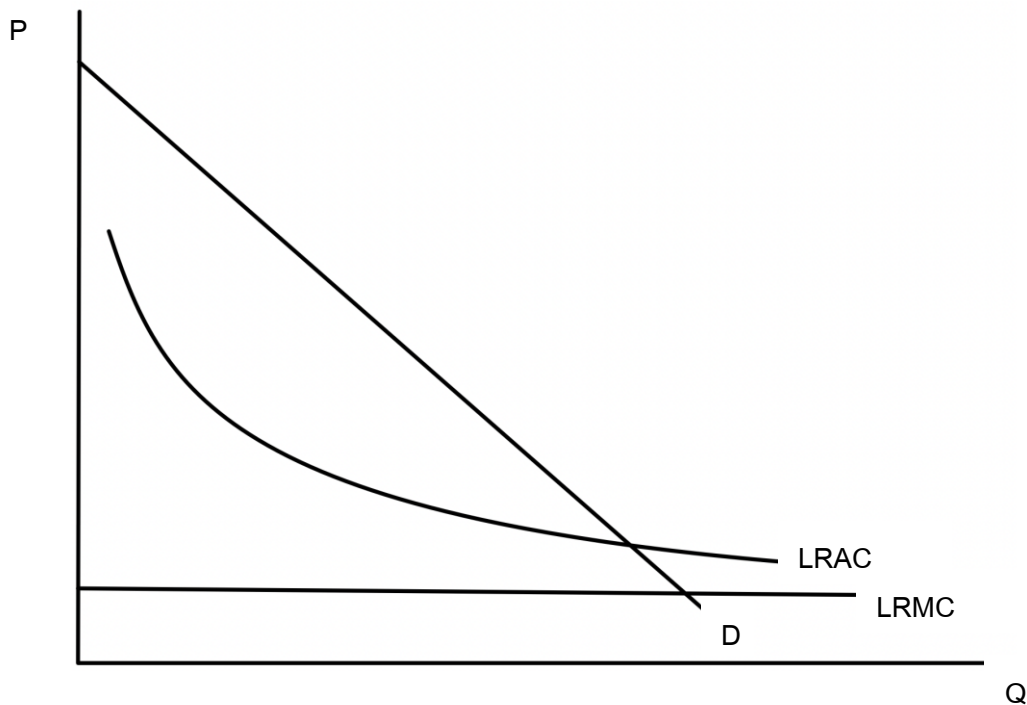
$$CS = 1, PS = 2(C\pi), DWL = 3$$

► After intervention

$$CS = 1 + 2 + 3, PS = \text{none}, DWL = \text{none}$$

∴ Intervention prevent HL from taking the advantages from consumer and remove DWL.

**6.** The producer of the upcoming vaccine for COVID-19 is a monopoly who wants to price their vaccine to maximize profit. The cost of producing the vaccine is mostly fixed cost involving the research so that the Long Run Average Cost (LRAC) keeps declining the more vaccine is produced. The Long Run Marginal Cost (LRMC) is a small constant cost at all production level.



**6.a)** If the demand of vaccine is downward sloping as usual, show the equilibrium price and quantity that will maximize the profit. State the equilibrium conditions. Identify the profit and the deadweight loss to the society.

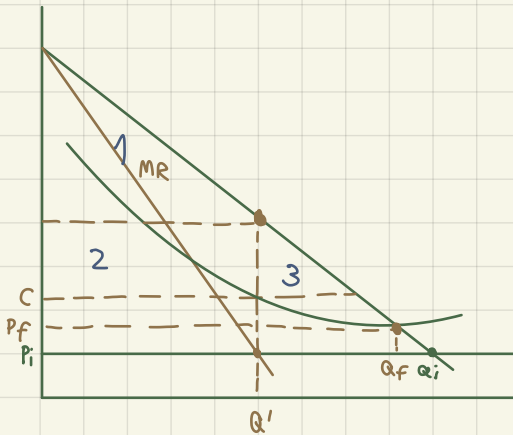
**6.b)** Assumed that monopoly price is \$50 per dose, marginal cost \$10, calculate the Lerner's index of monopoly power.

**6.c)** Determine the Ideal Price? Will the monopoly earn any profit at this Ideal Price? Explain.

**6.d)** Determine the Fair Price? Is there still deadweight loss at this Fair Price? Explain.

\*\*\*\*\*

⑥ a)



Equilibrium  $Q^*$ :  $MR = LMC$

$CS = 1$ ,  $DWL = 3$

Producer's profit = 2

b) Lerner's index

$$i = \frac{P - MC}{P} = \frac{50 - 10}{50} = 0.8$$

c) Ideal Price

$$P = mc = 10 \text{ \$}$$

at  $P_i$ , firm faces loss  $\rightarrow P < LRAC$

d) Fair Price

$$P = LRAC$$

at  $P_f$ , no DWL because firm is at normal profit