

Principles of Microeconomics

National Taiwan University

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Homework 3

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In this sheet the problem sets are answered sequentially.

1. (a) **A: Economies of Scale.**

Observe the graph. The LR AC is decreasing at point A as output increases.

(b) **B: Constant Returns to Scale(CRTS).**

Observe the graph. The LR AC isn't changing at point B as output increases.

(c) **C: Diseconomies of Scale.**

Observe the graph. The LR AC is increasing at point C as output increases.

2. (a) **Producer Surplus(PS)**

Def. The difference between the "money actually gained"(the market price) and the "*min* willingness-to-sell"(the supply curve). Graphically, the PS is the area below the market price line and above the supply curve.

(b) In this exercise the PS is simply represented by the area of triangle between the market price line $p^* = 70$ and the supply curve, with an equilibrium quantity $q^* = 50$. Thus, we can compute the PS:

$$PS = \frac{1}{2}[50 \times (70 - 30)] = 1000$$

3. **(B) Short-run average total cost curves lie above the long-run average cost curves because in the long run firms have more flexibility to change input combinations.**

Expl.: Consider that in the long run, all factors of production are variable. Thus, while facing the different levels of factories(output), firms can ALWAYS choose the optimal combination of those factors to produce at the the efficient scale, which is the point achieving *min* ATC. Consequently, the LR AC curve is the envelope curve of the SR AC curves.

4. **(A) In the long run, a firm should exit when price is less than average total cost.**

Expl.: When the price is less than average total cost, firms are no longer making positive economic profits in the market. This statement can be verified by the following equation:

Given $\{p, ATC \mid p < ATC\}$,

$$profit \pi = TR - TC = p \times q - ATC \times q = (p - ATC)q < 0$$

5. **(B)** The total producer surplus in the entire market is given by the **sum of all the individual sellers' producer surplus**.

Expl.: We can add up individual sellers' producer surplus to obtain the total producer surplus in the market. Likewise, calculate the area between the market price line and market supply curve.

6. (a) **Short-run Equilibrium Price**

Given:

$$\begin{cases} Q_D = 70000 - 5000p \\ Q_S = 32500 + 2500p \end{cases} \Rightarrow p^* = 5, q^* = 45000 \quad (1)$$

So, the SR Equilibrium(market) price now: $p^* = 5$.

- (b) **Whether Satisfies Long-run Equilibrium?**

No. Because the SR Equilibrium price is still higher than the Fair Bao Shop's $ATC(p^* = 5 > 4 = ATC)$, this shop will entry the market to share this lucrative business. That is, if economic profits are positive($p^* > ATC$), then firms' entries occur until economic profits diminish to 0($p^* = ATC$).

So, we realize that the market hasn't achieved equilibrium yet.

- (c) **How Many Firms?**

From (b), we know the market price should be equal to ATC in the long run: Given the single firm's efficient scale cond. $\{q = 500, ATC = 4\}$,

$$\begin{cases} p^* = ATC = 4 \\ q^* = Q_D = 70000 - 5000 \times 4 = 50000 \end{cases} \quad (2)$$

\Rightarrow Numbers of firms $= 50000 \div 500 = 100$