

14.01 Principles of Microeconomics, Fall 2007

Chia-Hui Chen  
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Lecture 15

## Short Run and Long Run Supply

### Outline

1. Chap 8: *Profit Maximization*
2. Chap 8: *Short Run Supply*
3. Chap 8: *Producer Surplus*
4. Chap 8: *Long Run Competitive Equilibrium*

### 1 Profit Maximization

For perfect competition in a product market, we make some assumptions:

- Price taking: either individual firms or consumers cannot affect the price.
- Product homogeneity: product of all firms are perfect substitutes.
- Free entry and exit: no special cost to enter or exit the market.

Firms choose the level of output to maximize their profits. Profit equals total revenue minus total cost, namely

$$\pi(q) = R(q) - C(q) = P(q)q - C(q).$$

To maximize the profit, the following condition must hold:

$$\frac{d\pi(q)}{dq} = \frac{dR}{dq} - \frac{dC}{dq} = MR(q) - MC(q) = 0,$$

and thus

$$MR(q) = MC(q).$$

Since

$$R(q) = Pq,$$

we have

$$MR(q) = \frac{dR(q)}{dq} = P,$$

and

$$MR = AR,$$

thus

$$MC(q) = P = MR = AR$$

is the maximization condition. Note that the condition is not sufficient. In Figure 1), if the price is  $P_2$ ,  $q_2$  and  $q_3$  both satisfy the condition, but only  $q_3$  maximizes the profit.

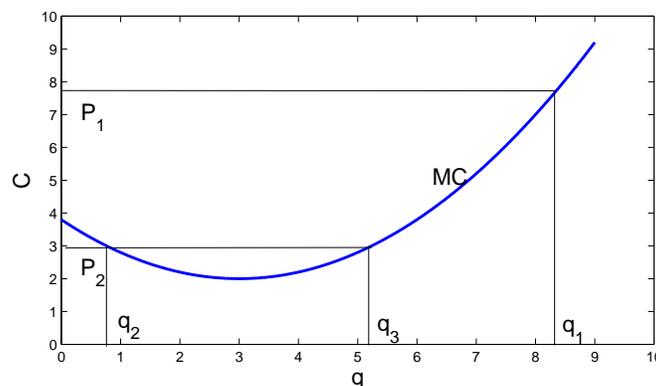


Figure 1: Profit Maximization.

## 2 Short Run Supply

Assume the firm has production costs shown in Figure 2, let us discuss its behavior under different prices.

- When  $P = P_1$ , the firm is making profits, so it will continue to produce;
- When  $P = P_2$ , the firm has losses but still continues to produce, because if it shuts down, the profit is  $-FC$ , and if continuing to produce, the profit is  $R - TVC - FC > -FC$ .
- Since  $R < SVC$ , when  $P = P_3$ , the profit if the firm shuts down,  $-FC$ , is more than the profit if it continues,  $R - TVC - FC$ , so it will shut down.

When the firm produces, it chooses the output level where  $MC(q) = P$ . Therefore, the firm's supply curve when it produces is just the part of  $MC$  above  $TVC$ . When  $P < AVC$ , the firm shuts down and  $q = 0$ .

We can derive market supply from an individual firm's supply (see Figure 3). Define elasticity of market supply as follows:

$$E_S = \frac{dQ/Q}{dP/P}$$

Figure 4 and 5 stand for inelastic and elastic supply curves, respectively.

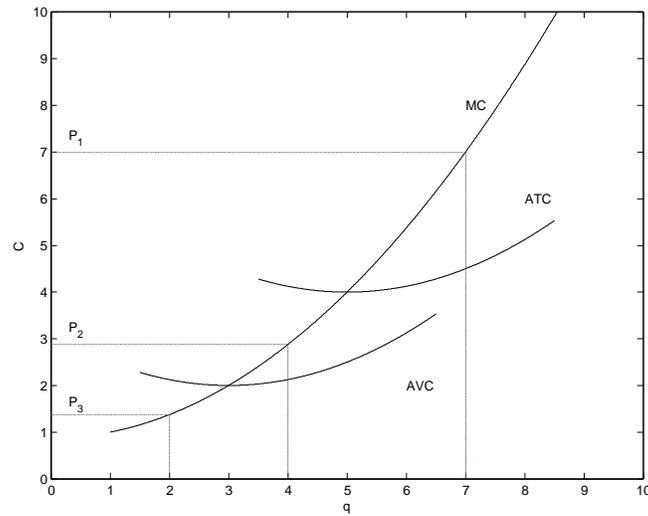


Figure 2: Individual Firm's Supply in Short Run.

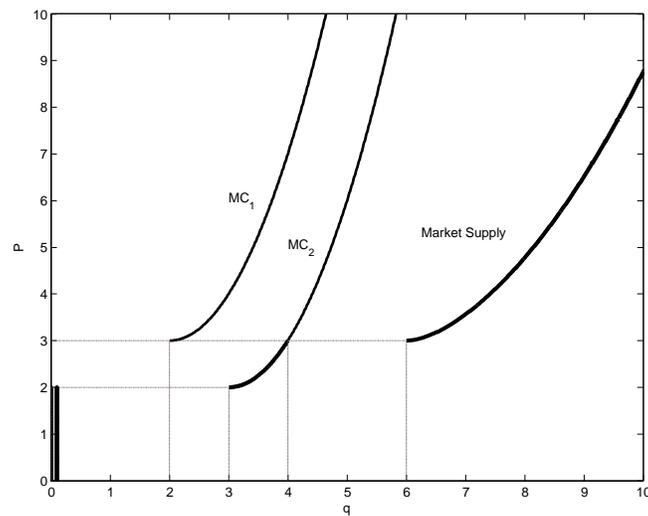


Figure 3: Market Supply in Short Run.

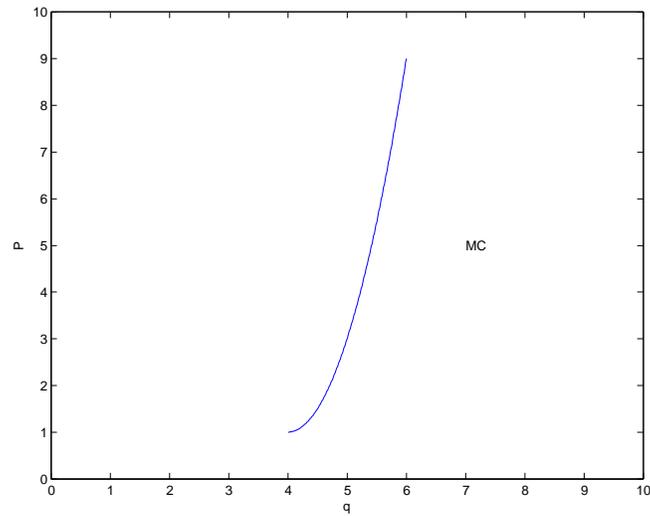


Figure 4: Inelastic Market Supply Curve.

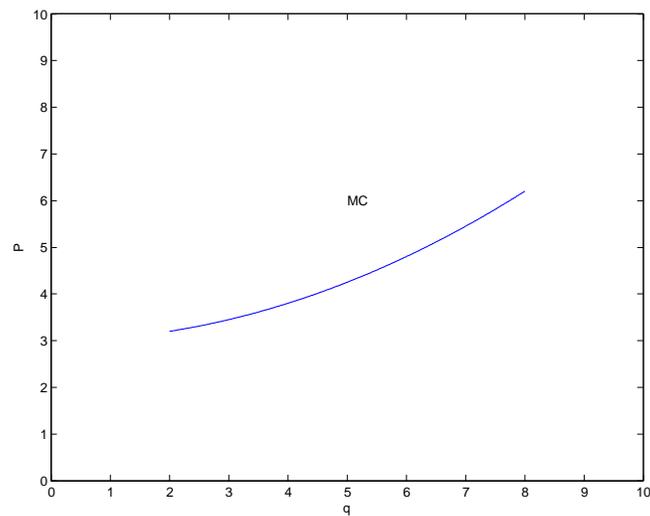


Figure 5: Elastic Market Supply Curve.

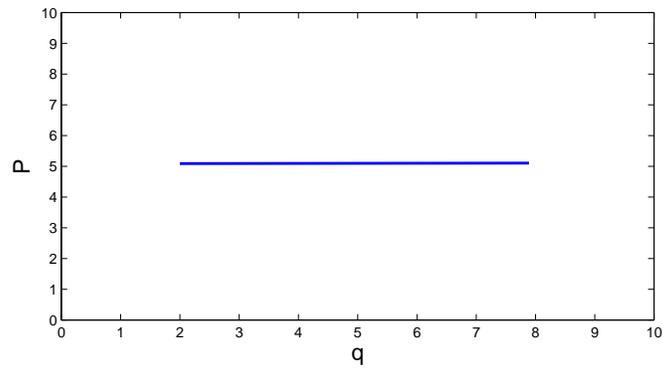


Figure 6: Perfectly Inelastic Market Supply Curve.

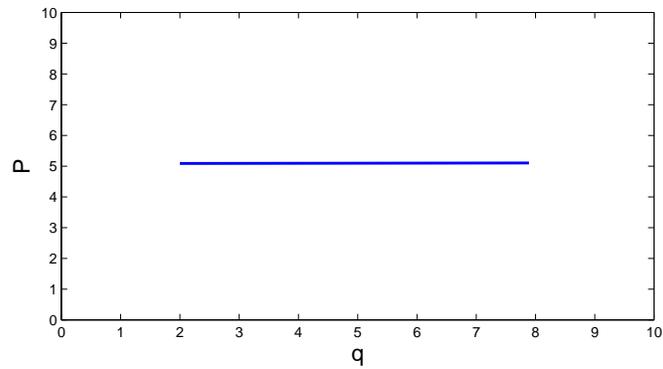


Figure 7: Perfectly Elastic Market Supply Curve.

Similarly, we have perfectly inelastic market supply (see Figure 6) and perfectly elastic market supply (see Figure 7).

Perfectly elastic market supply happens when

$$MC = \text{const.}$$

### 3 Producer Surplus

Producer Surplus is the difference between the firm's revenue and the sum of the total variable cost of producing  $q$  (see Figure 8):

$$PS = R - TVC = R - TVC - FC + FC = Profit + FC.$$

Thus, producer surplus is the sum of profit and fixed cost.

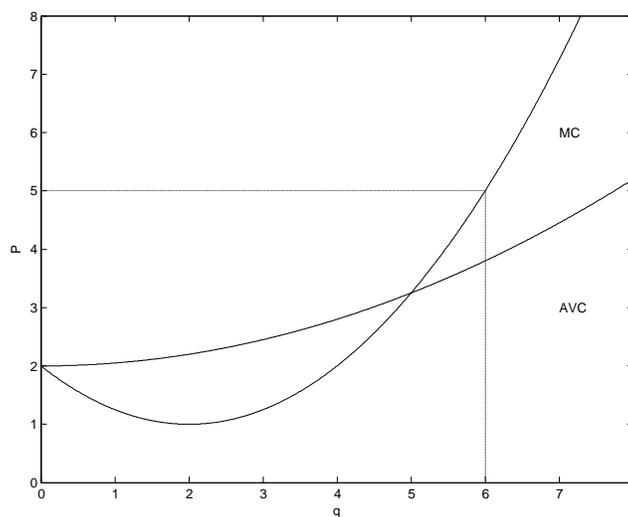


Figure 8: Producer Surplus.