

Microeconomics

Monopoly

May 23, 2024

Monopoly

When a firm operates under a monopoly, it maximizes the following function:

$$\max_Q \pi_m = TR(Q) - TC(Q) = p(Q)Q - TC(Q) \rightarrow MR(Q) - MC(Q) = 0$$

$$MR(Q) = MC(Q)$$

Exercise 1

In a market where a single monopolistic firm operates characterized by the following total cost function:

$$TC(Q) = 100Q$$

the demand is given by:

$$Q_d = 400 - 2p$$

Calculate:

1. The equilibrium characterizing the market in the case where the firm is a price-setter (operates as a monopoly)
2. The equilibrium characterizing the market in the case where the firm is a price-taker (operates in perfect competition)
3. The net loss to the monopoly

Solution

1. Calculate $p(Q)$, the inverse function of market demand, as follows:

$$Q_d = 400 - 2p \rightarrow 2p = 400 - Q \rightarrow p = 200 - \frac{1}{2}Q$$

Therefore, we marginalize costs and revenues and set them equal:

$$\frac{\partial TR(Q)}{\partial Q} = \frac{\partial (200Q - \frac{1}{2}Q^2)}{\partial Q} = 200 - Q$$

$$\frac{\partial TC(Q)}{\partial Q} = \frac{\partial (100Q)}{\partial Q} = 100$$

$$MR(Q) = MC(Q) \rightarrow 200 - Q = 100 \rightarrow Q_m = 100$$

To find the price, substitute everything into the demand function:

$$p = 200 - \frac{1}{2}Q = 200 - \frac{1}{2}100 \rightarrow p_m = 150$$

$$Eq_{mon} = \{Q_m = 100, p_m = 150\}$$

2. Now suppose the monopolist for any reason cannot or chooses not to influence the market, becoming a price-taker and thus operating according to the rules of perfect competition:

$$p = MC(Q) \rightarrow 200 - \frac{1}{2}Q = 100 \rightarrow \frac{1}{2}Q = 100 \rightarrow Q_{cp} = 200$$

$$p = 200 - \frac{1}{2}200 = 200 - 100 \rightarrow p_{cp} = 100$$

$$Eq_{cp} = \{Q_{cp} = 200, p_{cp} = 100\}$$

As expected, the equilibrium of the monopolistic firm has a lower quantity and a higher price compared to that of a price-taker. A monopoly produces less and sells at higher prices than a firm operating in perfect competition.

3. Now calculate the difference between monopoly profit and perfect competition profit:

$$\pi_m = TR(Q_m) - TC(Q_m) = p_m Q_m - TC(Q_m) = 150 \cdot 100 - 100 \cdot 100 = 15000 - 10000 = 5000$$

$$\pi_{cp} = TR(Q_{cp}) - TC(Q_{cp}) = p_{cp}Q_{cp} - TC(Q_{cp}) = 100 \cdot 200 - 100 \cdot 200 = 20000 - 20000 = 0$$

$$\pi_{cp} - \pi_m = 0 - 5000 = -5000$$