

Solution to Selected Questions: CHAPTER 8
PROFIT MAXIMIZATION AND COMPETITIVE SUPPLY

Q14. A certain brand of vacuum cleaners can be purchased from several local stores as well as from several catalogue or website sources.

- a. If all sellers charge the same price for the vacuum cleaner, will they all earn zero economic profit in the long run?**

Yes, all earn zero economic profit in the long run. If economic profit were greater than zero for, say, online sources, then firms would enter the online industry and eventually drive economic profit for online sources to zero. If economic profit were negative for catalogue sellers, some catalogue firms would exit the industry until economic profit returned to zero. So all must earn zero economic profit in the long run. Anything else will generate entry or exit until economic profit returns to zero.

- b. If all sellers charge the same price and one local seller owns the building in which he does business, paying no rent, is this seller earning a positive economic profit?**

No this seller would still earn zero economic profit. If he pays no rent then the accounting cost of using the building is zero, but there is still an opportunity cost, which represents the value of the best alternative use of the building.

- c. Does the seller who pays no rent have an incentive to lower the price he charges for the vacuum cleaner?**

No, he has no incentive to charge a lower price because he can sell as many units as he wants at the current market price.

Lowering his price will only reduce his economic profit. Since all firms sell the identical good, they will all charge the same price for that good.

E4. Suppose you are the manager of a watchmaking firm operating in a competitive market. Your cost of production is given by $C = 200 + 2q^2$, where q is the level of output and C is total cost. (The marginal cost of production is $4q$; the fixed cost is \$200.)

- a. If the price of watches is \$100, how many watches should you produce to maximize profit?**

Profits are maximized where price equals marginal cost. Therefore,

$$100 = 4q, \text{ or } q = 25.$$

- b. What will the profit level be?**

Profit is equal to total revenue minus total cost: $\pi = Pq - (200 + 2q^2)$. Thus,

$$\pi = (100)(25) - (200 + 2(25)^2) = \$1050.$$

c. At what minimum price will the firm produce a positive output?

A firm will produce in the short run if its revenues are greater than its total variable costs. The firm's short-run supply curve is its MC curve above minimum AVC. Here, $AVC = \frac{VC}{q} = \frac{2q^2}{q} = 2q$. Also, $MC = 4q$. So, MC is greater than AVC for any quantity greater than 0. This means that the firm produces in the short run as long as price is positive.

11. Suppose that a competitive firm has a total cost function $C(q) = 450 + 15q + 2q^2$ and a marginal cost function $MC(q) = 15 + 4q$. If the market price is $P = \$115$ per unit, find the level of output produced by the firm. Find the level of profit and the level of producer surplus.

The firm should produce where price is equal to marginal cost so that $115 = 15 + 4q$, and therefore $q = 25$. Profit is $\pi = 115(25) - [450 + 15(25) + 2(25)^2] = \800 .

Producer surplus is profit plus fixed cost, so $PS = 800 + 450 = \$1250$. Producer surplus can also be found graphically by calculating the area below price and above the marginal cost (supply) curve: $PS = (1/2)(25)(115 - 15) = \1250 .

14. A sales tax of \$1 per unit of output is placed on a particular firm whose product sells for \$5 in a competitive industry with many firms.

a. How will this tax affect the cost curves for the firm?

With a tax of \$1 per unit, all the firm's cost curves (except those based solely on fixed costs) shift up. Total cost becomes $TC + tq$, or $TC + q$ since the tax rate is $t = 1$. Average cost is now $AC + 1$, and marginal cost becomes $MC + 1$.

b. What will happen to the firm's price, output, and profit?

Because the firm is a price-taker in a competitive market, the imposition of the tax on only one firm does not change the market price. Since the firm's short-run supply curve is its marginal cost curve (above average variable cost), and the marginal cost curve has shifted up (and to the left), the firm supplies less to the market at every price. Profits are lower at every quantity.

c. Will there be entry or exit in the industry?

If the tax is placed on a single firm, that firm will go out of business. In the long run, price in the market will be below the minimum average cost of this firm.