Microeconomics, Module 11: “Monopoly” (Chapter 10)

Illustrative Test Questions

(The attached PDF file has better formatting.)

Question 11.1: Profit Maximization: Monopoly

Which of the following is true in the long-run for a *monopolist* that maximizes profits?

A. Marginal revenue equals marginal cost
B. Price equals marginal revenue
C. Price equals marginal cost
D. Price equals average cost
E. Average cost is minimized

Answer 11.1: A

The equimarginal principle says that marginal revenue equals marginal cost for all firms, both competitive firms and monopolists. The other choices are true for competitive firms but not for monopolists.

Question 11.2: Profit Maximization: Competition

All but which of the following are true in the long-run for a *competitive firm* that maximizes profits?

A. Marginal revenue equals marginal cost
B. Price equals marginal revenue
C. Price equals marginal cost
D. Price equals average variable cost
E. Average cost is minimized

Answer 11.2: D

For all firms, marginal revenue equals marginal cost (Statement A). In a competitive market, the demand curve facing the firm is horizontal, so price equals marginal revenue (Statement B). Combining these two equations says that price equals marginal cost (Statement C).

Statement D should say that “price equals average total cost,” not average variable cost. In the short run, if price does not equal average total cost, the firms make either positive or negative economic profits. If they make positive economic profits, other firms enter the market and bid down the market price; if they make negative economic profits, some firms exit the market until the market price falls to the competitive level. If firms did not produce at minimum average cost, other firms would enter and take their market share by pricing lower.

Question: In the long-run, aren’t all costs variable?

Answer: This question is heuristic; it emphasizes that the variable vs fixed cost distinction does not affect long-run pricing.

~ Variable costs mean costs that vary with the number of units produced.
~ Fixed costs mean costs that don’t vary with the number of units produced.

In the long-run, the firm can exit the market, so even fixed costs depend on making units. But they costs are fixed once the firm builds its plant or sets up its operations. On the final exam, you may get a problem with a cost curve having both fixed and variable costs. The implications for short run vs long-run pricing differ.

Question 11.3: Monopoly and Demand Elasticity

A monopolist sells at price P*, where the price elasticity of demand is η^*. If $|\eta^*| > 1$, then

A. The monopolist earns positive economic profits.
B. The monopolist's marginal revenue is positive.
C. The monopolist should increase output until demand becomes inelastic.
D. The monopolist should decrease output until demand becomes inelastic.
E. The monopolist can take advantage of economies of scale.

Answer 11.3: B

The marginal revenue is the change in total revenue for a small increase in the quantity produced. If the percentage change in quantity is greater than the percentage change in price, as implied by an elasticity whose absolute value is greater than one, the product $Q \times P$ increases as Q increases, so marginal revenue is positive.

Question 11.4: Monopoly and Demand Elasticity

A monopolist sells at price P*, where the price elasticity of demand is η^*. If $|\eta^*| < 1$, then

A. The monopolist earns positive economic profits.
B. The monopolist's marginal revenue is positive.
C. The monopolist should increase output until demand becomes elastic.
D. The monopolist should decrease output until demand becomes elastic.
E. The monopolist can take advantage of economies of scale.

Answer 11.4: D

If the firm raises price and decreases output, the percentage increase in price exceeds the percentage decrease in quantity, and the firm's total revenue increases. Since the firm has reduced output, its costs decrease, so its net profit increases.

Question 11.5: Linear Demand Curves and Elasticities

Let η be the price elasticity of demand for a linear demand curve. As P increases to its maximum value at which some goods are bought,

A. $\eta \rightarrow -\infty$
B. $\eta \rightarrow -1$
C. $\eta \rightarrow 0$
D. $\eta \rightarrow +1$
E. $\eta \rightarrow +\infty$

Answer 11.5: A

The elasticity $\eta = \partial Q/\partial P \times (P/Q)$. If the demand curve is linear, $\partial Q/\partial P$ is a constant. As P increases to its maximum value at which some goods are bought, $Q \rightarrow 0$, and $\eta \rightarrow -\infty$.

Question: What does this have to do with a linear demand curve? For any demand curve, as $Q \rightarrow 0$, $P/Q \rightarrow \infty$ so $\eta \rightarrow \infty$.

Answer: For some curves, $\eta = \partial Q/\partial P \rightarrow 0$ as $Q \rightarrow 0$, so even though $P/Q \rightarrow \infty$, η stays finite.

Illustration: Let the demand curve be $PQ = k$, where k is a constant. $Q = k/P$, so $\partial Q/\partial P = -k/P^2$ and $\partial Q/\partial P \times P/Q = -k/P^2 \times P/Q = -1$.

Question 11.6: Linear Demand Curves and Elasticities

Let η be the price elasticity of demand for a linear demand curve. As $P \rightarrow 0$,

A. $\eta \rightarrow -\infty$
B. $\eta \rightarrow -1$
C. $\eta \rightarrow 0$
D. $\eta \rightarrow +1$
E. $\eta \rightarrow +\infty$

Answer 11.6: C

The elasticity $\eta = \partial Q/\partial P \times (P/Q)$. Since the demand curve is linear, $\partial Q/\partial P$ is a constant. As $P \rightarrow 0$, $Q \rightarrow$ a positive value, and $\eta \rightarrow 0$.

Question 11.7: Supply Curves for Monopolists

A monopolist's supply curve

A. Is the part of its marginal cost curve that lies above its minimum average costs.
B. Is the part of its marginal cost curve that lies above its minimum average variable costs.
C. Does not exist.
D. Coincides with its marginal revenue curve.
E. Is the part of its marginal revenue curve that lies above its minimum average costs.

Answer 11.7: C

A supply curve gives the quantity produced at each price. But the monopolist's quantity depends on the demand curve, so it has no supply curve.

Question: This sounds like semantics. How do a monopolist and a competitive firm differ? They both price to maximize profits, which (by the equimarginal principle) is the point at which marginal cost equals marginal revenue. Why does the competitive firm have a supply curve but the monopolist does not?

Answer: The supply curve relates quantity supplied to price; the equimarginal principle relates quantity supplied to marginal revenue. For the competitive firm, marginal revenue equals price (since it faces a horizontal demand curve), so the equimarginal principle along with the marginal cost curve relates quantity supplied to price. For the competitive firm, the marginal cost curve is the supply curve.

For the monopolist, the marginal revenue depends on the demand curve. Even if we know that price equals $100 at a quantity Q, we don't know the marginal revenue at the quantity Q, since it depends on the entire demand curve from quantity 0 to quantity Q.

Question: Suppose we know the entire demand curve from quantity 0 to quantity Q. Does this give us the information to infer the monopolist's supply as a function of the market price?

Answer: We must also know the marginal cost curves of all other firms supplying in this market, as well as the pricing behavior of each other firm. Even if we know that exactly two firms of the same size operate in a market (a duopoly), we don't know the equilibrium unless we know the pricing philosophy of each firm. As we cover in a later module, the equilibrium quantity and price differ for a Bertrand duopoly vs a Cournot

duolopy. We can't possibly know the pricing philosophy of each other firm, so don't speak of the supply curve of a monopolist.

Question: If the firm is a monopoly, there are no other firms in the market; what do you mean by the pricing philosophy of other firms?

Answer: By monopoly, we mean any firm with market power, even if it is not the only firm.

Question 11.8: Dead Weight Loss of Monopoly

Which of the following can not eliminate the dead weight loss due to monopoly?

A. An excise subsidy
B. A sales subsidy
C. An effective price ceiling
D. Rate of return regulation
E. First degree price discrimination

Answer 11.8: D

Not all these items are in the required reading for this course; the final exam won't test anything not in the required reading. All these topics are covered in the CAS transition exam. For the CAS exam, know the following:

Statements A and B: The legal form of a sales subsidy differs from that of an excise subsidy. Consumers receive the sales subsidy; producers receive the excise subsidy. But the economic incidence of a sales subsidy is identical to that of an excise subsidy.

Question: How does the sales subsidy eliminate the dead weight loss?

Answer: The subsidy may induce the monopolist to produce the competitive quantity. Suppose the market demand curve is linear at $Q = 120 - P$ and the marginal cost curve is flat at $MC = 40$. The equilibrium quantity in a competitive market is $Q = 120 - 40 = 80$.

If a single firm has a monopoly, its total revenue curve is $TR = 120Q - Q^2$ and its marginal revenue is $MR = 120 - 2Q$. Equating marginal cost to marginal revenue gives $40 = 120 - 2Q \Rightarrow 2Q = 80 \Rightarrow Q = 40$. The monopolistic price is $120 - 40 = 80$. Too little of the good is produced, and the dead weight loss is large.

If the government gives each consumer an 80 subsidy, the new demand curve is $Q = 120 - (P - 80) = 200 - P$. The new marginal revenue curve is $MR = 200 - 2Q$. Equating marginal revenue with marginal cost gives $200 - 2Q = 40 \Rightarrow Q = 80$. The monopolist produces the competitive quantity, and the dead weight loss is zero.

Question: Does this mean the dead weight loss is zero? The government is paying an extra 80 for each item purchased, and the monopolist gets 120 instead of 40. Taxpayers money is used to fund the monopolist. This is worse than the simple monopoly.

Answer: Landsburg gives two types of answers:

- We do not judge the proper allocation of wealth in the society. Perhaps the society wants to reward monopolists for their ingenuity. The dead weight loss is the loss to society, not the proper division of wealth within the society.
- The government can impose a tax on the right to be the monopolist producing this product. If the tax is $80 \times 80 = 6{,}400$, the tax just covers the cost of the subsidy. The consumers get a higher quantity and the monopolist earns a normal profit.

Question 11.9: Natural Monopolies

Natural monopolies typically occur when

A. Fixed costs and marginal costs are both high.
B. Fixed costs are high and marginal costs are low.
C. Fixed costs are low and marginal costs are high.
D. Fixed costs and marginal costs are both low.
E. Fixed costs are low and marginal costs are highly variable.

Answer 11.9: B

Consider a municipal utility, such as phone service (before cell phones) or electricity service. The fixed costs are laying the phone lines or electricity lines through the city. This requires digging up the streets to lay lines underground, which is a large cost. Once these lines have been laid, adding an additional consumer requires connecting another home to the street lines, which is a small cost.

Consider a software maker like Microsoft. The fixed costs are research and development for a new software product, which are high. The marginal cost is the cost of a CD, which is small.

Question 11.10: Dead Weight Loss and Monopoly

The area showing dead weight loss in a monopoly diagram underestimates the actual cost of monopoly when the source of monopoly power is

A. Economies of scale
B. Patents
C. Ownership of an essential resource
D. A legal barrier to entry
E. Cartel pricing

Answer 11.10: D

A legal barrier to entry is obtained and supported by lobbying, which does not produce goods and is a dead weight loss. The standard monopoly diagrams of dead weight loss do not include the expenses of lobbying politicians to secure legal barriers to entry.

Exercise 11.11: Coffee Bean Monopoly

Sumatran coffee beans are produced by a profit-maximizing monopoly. The marginal cost to produce Sumatran coffee beans is constant at $4 per pound. The price elasticity of demand is constant at –1.4.

A. What is the price charged for S coffee beans?
B. If poor weather conditions cause the marginal cost of production to rise by $1 per pound, what happens to the price of S coffee beans?
C. If a competing variety of coffee beans makes demand for S coffee beans more elastic, what happens to the price of S coffee beans? Explain this result.

Solution 11.11:

Part A: Marginal revenue = marginal cost = $P \times (1 - 1/|\eta|) \Rightarrow \$4 = P \times (1 - 1/1.4) \Rightarrow \$4 = P \times 0.286 \Rightarrow P = \$4 / 0.286 = \$13.99 \approx \$14$.

Part B: $P = \$5 / 0.286 = \$17.48 \approx \$17.50$.

Part C: If η becomes more elastic, (1 – 1/|η|) rises, and P declines. If consumers have more elastic demand, they are unwilling to pay a high price for Sumatran coffee, so the monopolist must lower its price to sell output.

Question 11.12: Monopoly

All but which of the following are true regarding monopoly?

A. A monopoly occurs when an industry has only a single firm.
B. A monopolist, unlike a competitive firm, can affect market prices by its actions.
C. A monopolist's marginal revenue is less than the demand price.
D. A monopolist, like a competitive firm, seeks to maximize profits.
E. All of A, B, C, and D are true.

Answer 11.12: A

Two firms may exist in an industry, but if they sell in different markets, they may both be monopolists. It is hard to define an industry (or a market), and the textbook does not require that there be only one firm in the industry. Statement C is true if the demand curve is downward sloping, which is true for all demand curves. Statement D is true since all firms seek to maximize profits in economics textbooks.

Question 11.13: Price and Marginal Cost

Coffee is produced at a constant marginal cost of $1.00 a pound. Due to a shortage of cocoa beans, the marginal cost rises to $2.00 a pound.

- If coffee is produced in a competitive market, the market price will rise by ___ a pound.
- If coffee is produced by a monopolist, the market price will rise by ___ a pound.

A. less than $1.00; less than $1.00
B. exactly $1.00; less than $1.00
C. less than $1.00; exactly $1.00
D. exactly $1.00; more than $1.00
E. more than $1.00; exactly $1.00

Answer 11.13: B

In a competitive market, price equals marginal cost, so if the marginal cost rises, the price rises by the same amount. In a monopoly, the price rises by less than the rise in the marginal cost. This is not a benefit of monopoly, since if marginal cost falls, the competitive price falls by the same amount, whereas the monopoly price falls by less than the marginal cost.

Exercise 11.14: Marginal Revenue and Price Elasticity of Demand

How is marginal revenue related to the price elasticity of demand?

Solution 11.14: Marginal revenue = Price × $(1 - 1/|\eta|)$

Question 11.15: Monopoly and Elasticity

All but which of the following are true regarding monopoly and elasticity?

A. A linear demand curve is elastic when quantity is small and inelastic when quantity is large.
B. A linear demand curve is elastic when price is high and inelastic when price is low.
C. A monopolist operates where marginal revenue is positive.
D. A monopolist operates on the inelastic portion of the demand curve.
E. All of A, B, C, and D are true.

Answer 11.15: D

If demand were inelastic, the monopolist would raise the price.

- Quantity would decrease by less than the proportional increase in the price, so total revenue would increase.
- Cost decreases because the quantity decreases.
- Total profit (= total revenue minus total cost) increases.

Exercise 11.16: Diamonds

Diamonds are mined in South Africa. Suppose a civil war in South Africa closes the diamond mines, lowers the supply of diamonds, and pushes up the price of diamonds. The price rise is so great that the total revenue of diamond cutters increases. Is this evidence that the diamond industry is monopolistic?

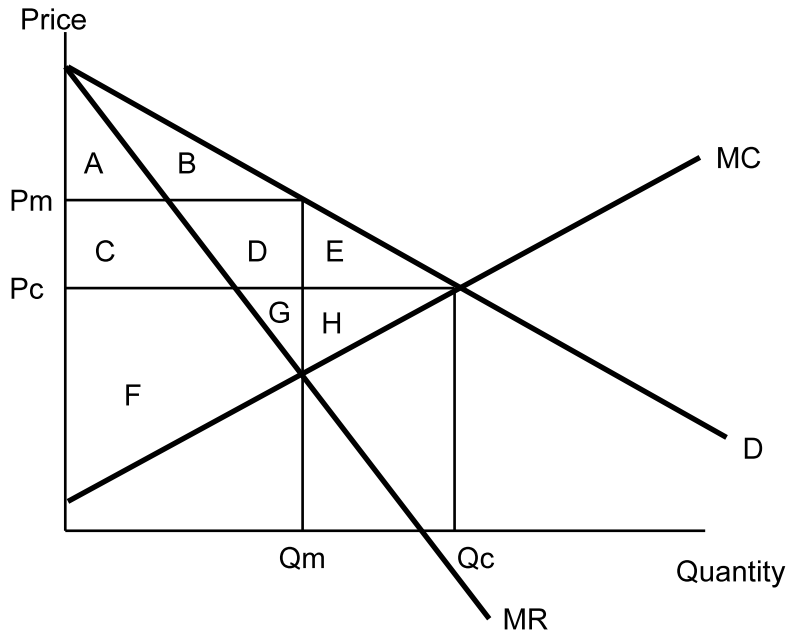
Solution 11.16: It is not evidence of a monopoly. A drop in quantity leads to a rise in total revenue, implying that marginal revenue is negative. Since a monopolist produces where marginal revenue equals marginal cost, and since marginal cost is positive, a monopolist never operates where marginal revenue is negative.

(By the way, diamonds are produced by a cartel; the market is not competitive at all. But that's real life; this illustrative test question is theory.)

Exercise 11.17: Monopoly and Social Gain or Loss

Show graphically how a monopoly results in lower social gain than a competitive industry.

Solution 11.17: Suppose the industry has a monopolistic supplier and that a competitive industry would produce with the same industry-wide marginal cost curve as the monopolist's.



	Competition	*Monopoly*
Consumers' Surplus	A+B+C+D+E	A+B

Producers' Surplus	F+G+H	C+D+F+G
Social Gain	A+B+C+D+E+F+G+H	A+B+C+D+F+G
Dead Weight Loss		E+H

The competitive industry produces at Q_c, and the monopolist produces at Q_m. The monopoly creates a deadweight loss of E + H; it is more efficient to produce more than Q_m.

The monopoly decreases consumers' surplus, but increases producers' surplus (i.e., H < C+D) because otherwise the monopolist would produce a higher output.

Question 11.18: Monopoly Profits

Which of the following is true regarding monopoly profits?

A. The loss of social welfare from monopoly results from the good being produced at less than the competitive quantity.
B. The loss of social welfare from monopoly results from the good being sold at more than the competitive price.
C. One remedy for the dead weight loss of monopoly is to remove a monopolist's profits with an excise tax.
D. One remedy for the dead weight loss of monopoly is to remove a monopolist's profits with an income tax.
E. None of A, B, C, or D is true.

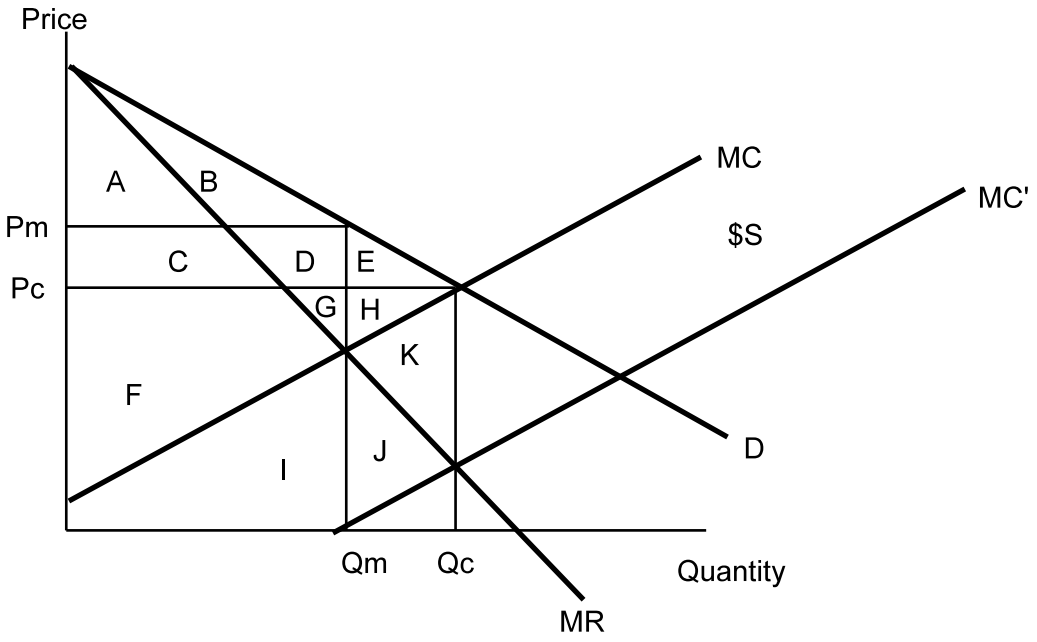
Answer 11.18: A

(The economic incidence of a tax is not the same as the legal incidence. The monopolist passes off both the excise tax and the income tax to consumers.)

Exercise 11.19: Monopoly Diagrams

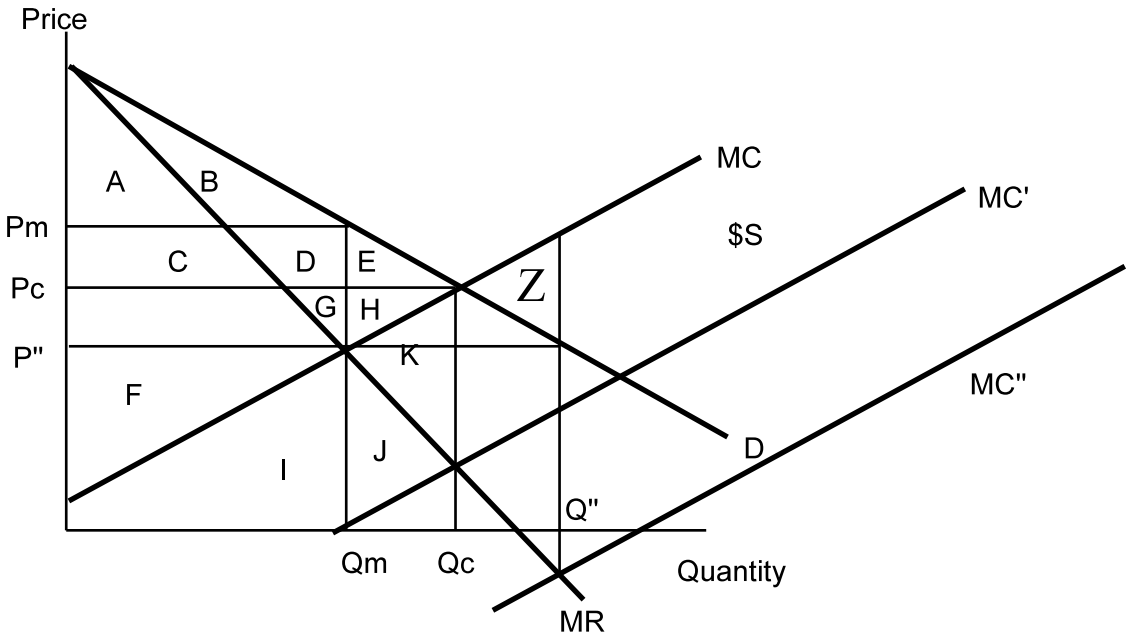
A. Show graphically how an optimal subsidy can be used to eliminate the deadweight loss resulting from a monopoly.
B. Suppose the subsidy is larger than the optimal one. Show how this can result in a deadweight loss greater than that from the unsubsidized monopoly.

(You are not responsible for the sections on monopolies and subsidies; we have included the graphs below to you more practice reading the graphs and identifying areas.)



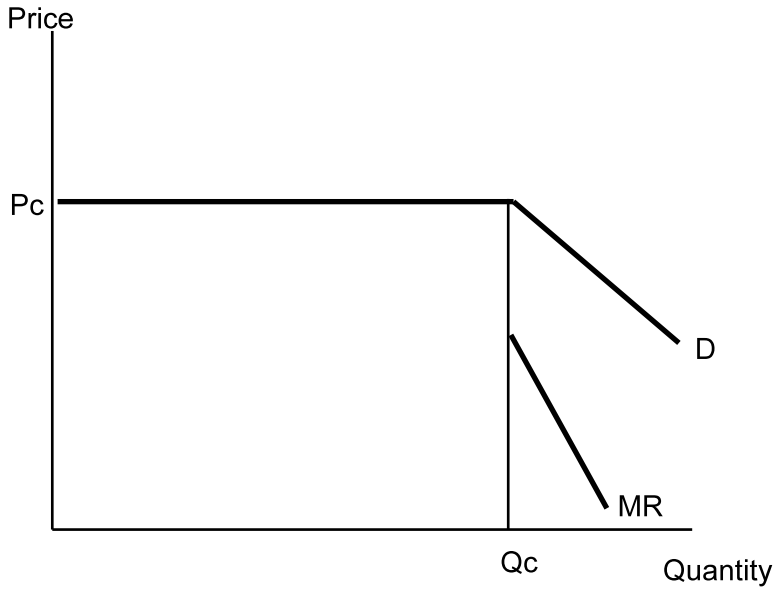
		Monopoly	
	Competition	*Unsubsidized*	*Subsidized*
Consumers' Surplus	A+B+C+D+E	A+B	A+B+C+D+E
Producers' Surplus	F+G+H	C+D+F+G	F+G+H+I+J+K
Taxpayer Cost			I+J+K
Social Gain	A+B+C+D+E+F+G+H	A+B+C+D+F+G	A+B+C+D+E+F+G+H

Now suppose the subsidy is larger than S, such that the marginal cost curve moves down to MC′′, inducing production of Q′′, which sells at a price P′′. Since production is above the competitive quantity, the deadweight loss is Z. Under the unsubsidized monopoly, the deadweight loss is E+H. If Z is bigger than E+H, the subsidy has made things worse.



Exercise 11.20: Monopoly and Price Ceilings

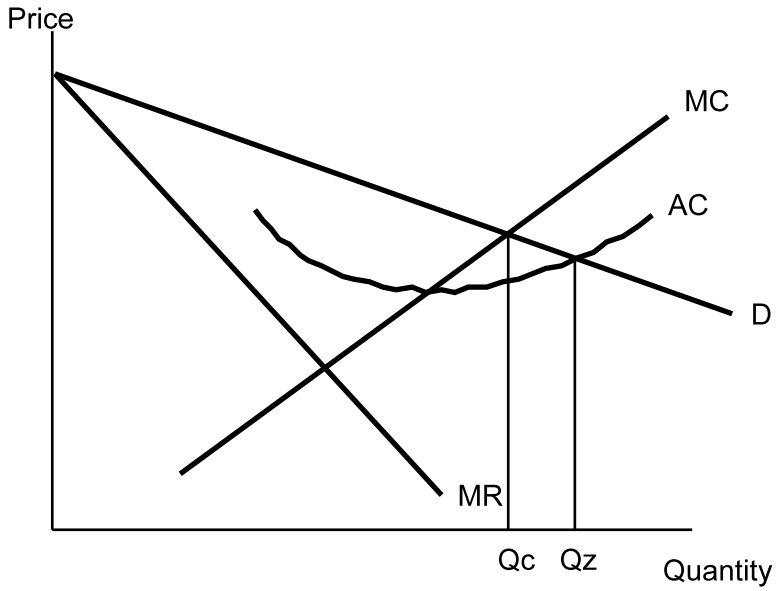
Show graphically the demand and marginal revenue curves facing a monopolist if the government imposes a price ceiling at the competitive price. (You are not responsible for price ceilings and monopolies; we have included this graph to give you practice reading and interpreting the areas.)

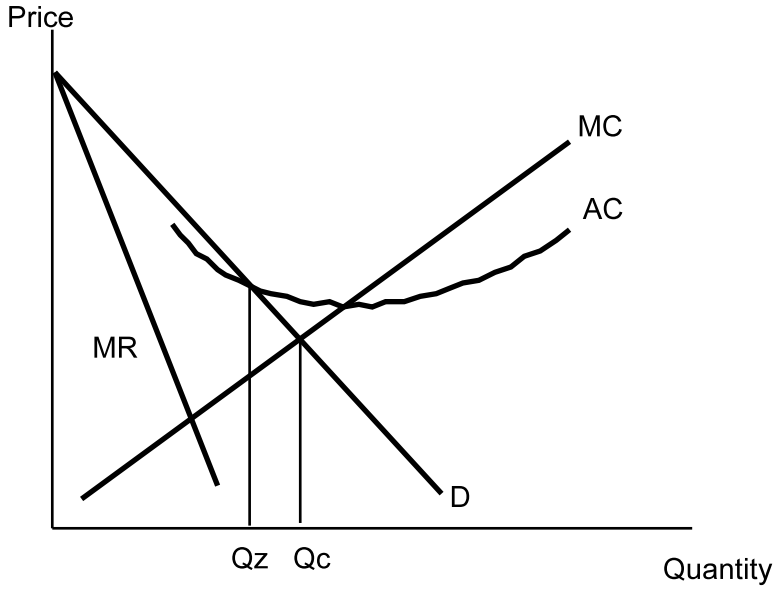


The competitive price is P_c, so the demand facing the monopolist is flat up to Q_c, the competitive output.

Exercise 11.21: Monopoly and Regulation

Show graphically how zero-profit regulation of a monopolist can lead to output that is less than the competitive output. (This topic is germane to insurance, but the final exams do not test this graph.)





Under zero-profit regulation, firm produce where price equals average cost, shown on the graphs as Q_z, which can be more or less than Q_c.

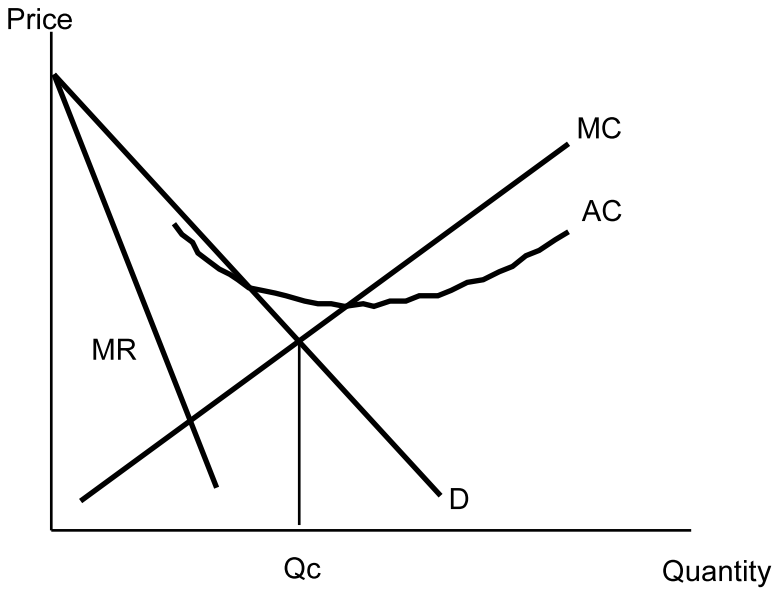
Exercise 11.22: Fair Return on Capital

Insurance rates are often regulated by allowing a fair return on capital. Is this the same as zero-profit regulation? Does this regulation give insurers the incentive to keep costs low?

Solution 11.22: Zero profit means zero *economic* profit; the firm makes just enough accounting profit to cover the cost of capital. This is the fair return on capital. This regulation does not give the insurer an incentive to keep costs low because the insurer can raise prices to cover the higher costs.

Exercise 11.23: Natural Monopoly, Profits, and Competition

Show graphically that a natural monopoly would earn negative profits if it were forced to set prices competitively.



Since the marginal cost curve intersects the average cost curve at the minimum average cost, the marginal cost curve crosses demand where price is less than average cost; if the firm prices competitively, it will earn negative profit. Under conditions of natural monopoly, a competitive industry can't survive because the firms can't cover their costs.

Exercise 11.24: Natural Monopoly and Competition

The text says that it's unfair to compare the social gain from a natural monopoly with that under competition. Why is this so?

Solution 11.24: The comparison is unfair because the natural monopoly could not exist under competitive conditions. The competitive industry is purely hypothetical.

Exercise 11.25: Patent Protection

What two items must be considered to set the optimal length of a patent?

Solution 11.25:

- the losses from monopoly production
- the gains from promoting invention