Past-paper walk-through

Externalities ▪ 6.2

eXercise

Questions in this set

- 2024 Set 1 Q2
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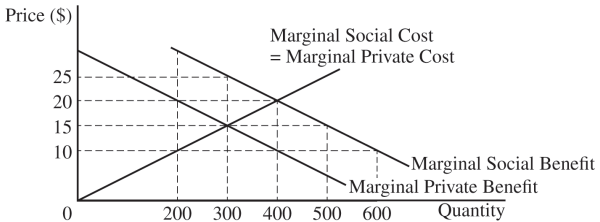
Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- // separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = "or words to that effect" – the wording need not match.

Question 2

2024 Set 1 ▪ Q2

2. Good X is produced and sold in a perfectly competitive market. The provided graph shows the market for Good X.



(a) Identify the market equilibrium price and quantity.

(b) Calculate the deadweight loss at the market equilibrium. Show your work.

Question 2

(c) Suppose the government wants to eliminate the deadweight loss in the market for Good X.

(i) Which of the following will achieve the government's objective: a per-unit tax on consumers or a per-unit subsidy to consumers? Explain.

(ii) What is the dollar value of the per-unit tax or per-unit subsidy identified in part (c)(i) ?

(d) Suppose instead the government imposes a price ceiling of $10. Will the price ceiling achieve the socially optimal quantity of Good X? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

Solution 2

(a)

Mark scheme

- The market equilibrium price is \$15, and the market equilibrium quantity is 300 units (read directly off the given supply-and-demand graph/data as the point where quantity supplied equals quantity demanded).

Solution 2

(b)

Mark scheme

- Deadweight loss = \$500. Work: \$DWL = \tfrac{1}{2} \times (\$25 - \$15) \times (400 - 300) = \tfrac{1}{2} \times \$10 \times 100 = \$500\$. This is the triangle between the demand and supply curves from the market quantity (300) to the socially optimal quantity (400), using the demand price (\$25) and supply price (\$15) at the margin.

Solution 2

(c)(i) Mark scheme

- The government should grant a per-unit subsidy to consumers (not a per-unit tax) to eliminate the deadweight loss and achieve the socially optimal quantity of Good X. Explanation (any one is sufficient): a per-unit subsidy to consumers internalizes the external benefit and increases consumers' incentive/ability to buy, raising quantity to the socially optimal level (400); a subsidy equal to the marginal external benefit lowers the effective price paid by consumers, increasing consumption to 400; a subsidy equal to the gap between marginal social benefit and marginal private benefit increases the quantity exchanged to the socially optimal quantity (400). (This implies Good X generates a positive externality, so a tax would move the market further from the optimum, not closer.)

Solution 2

(c)(ii)

Mark scheme

- The dollar value of the per-unit subsidy is \$10 — equal to the vertical gap between the marginal social benefit (demand) curve and the marginal private benefit at the socially optimal quantity of 400 units.

Solution 2

(d)

Mark scheme

- No, the price ceiling of \$10 will not achieve the socially optimal quantity of Good X. Explanation: a binding price ceiling causes the quantity actually exchanged in the market to be limited by the (lower) quantity supplied at that price, which is 200 units — less than the socially optimal quantity of 400 units. So the price ceiling creates a shortage and under-provides the good relative to the social optimum.

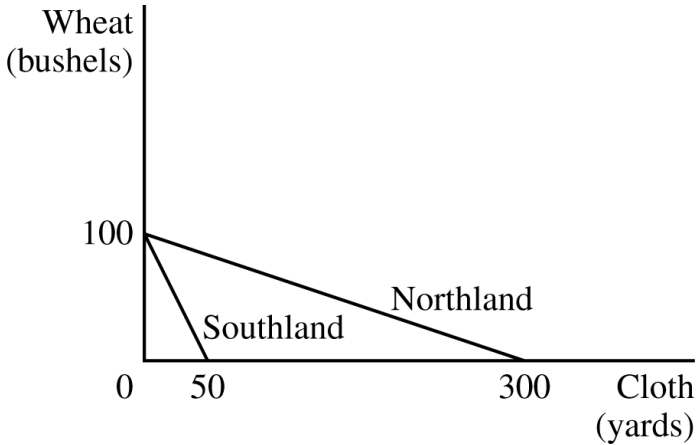
Question 2

2023 Set 1 ▪ Q2

The graph shows the production possibilities curves for Northland and Southland. [Graph titled with y-axis "Wheat (bushels)" and x-axis "Cloth (yards)". Two straight-line production possibility curves both starting from the point (0, 100) on the Wheat axis: "Southland" is the steeper line running from (0, 100) down to (50, 0); "Northland" is the flatter line running from (0, 100) down to (300, 0). Axis labels shown: 100 on the Wheat axis; 0, 50, and 300 on the Cloth axis.]

(a) Which country has a comparative advantage in producing wheat? Explain using numbers.

Question 2



Question 2

2023 Set 1 ▪ Q2

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(b) Identify a specific number of yards of cloth that could be traded for 10 bushels of wheat and would be mutually beneficial to Northland and Southland.

Question 2

2023 Set 1 ▪ Q2

The graph shows the production possibilities curves for Northland and Southland.

[Graph titled with y-axis "Wheat (bushels)" and x-axis "Cloth (yards)". Two straight-line production possibility curves both starting from the point (0, 100) on the Wheat axis: "Southland" is the steeper line running from (0, 100) down to (50, 0); "Northland" is the flatter line running from (0, 100) down to (300, 0). Axis labels shown: 100 on the Wheat axis; 0, 50, and 300 on the Cloth axis.]

(c) Southland's maximum possible output of wheat falls from 100 bushels to 75 bushels. Assuming no other changes, will Southland have a comparative advantage in producing cloth? Explain using numbers.

Question 2

2023 Set 1 ▪ Q2

The graph shows the production possibilities curves for Northland and Southland.

[Graph titled with y-axis "Wheat (bushels)" and x-axis "Cloth (yards)". Two straight-line production possibility curves both starting from the point (0, 100) on the Wheat axis: "Southland" is the steeper line running from (0, 100) down to (50, 0); "Northland" is the flatter line running from (0, 100) down to (300, 0). Axis labels shown: 100 on the Wheat axis; 0, 50, and 300 on the Cloth axis.]

(d)(i) Turnips are produced in a perfectly competitive market in Alderia, a third country, which does not engage in international trade. Runoff from turnip fields pollutes Alderia's rivers, hurting its residents.

Does the turnip market equilibrium result in an efficient allocation of resources? Explain using marginal analysis.

Question 2

(d)(ii) In an effort to reduce pollution, Alderia's government imposes a lump-sum tax on turnip production. What will be the impact on the turnip market equilibrium price and quantity in the short run?

Solution 2

(a)

Mark scheme

- Southland has a comparative advantage in producing wheat. Explanation using numbers: Southland's opportunity cost of producing one bushel of wheat is $1/2$ yard of cloth, which is less than Northland's opportunity cost of producing one bushel of wheat, 3 yards of cloth ($1/2 < 3$), so Southland is the lower-opportunity-cost (comparative-advantage) producer of wheat.

Solution 2

(b)

Mark scheme

- Any specific number of yards of cloth strictly between 5 and 30 (e.g., 20 yards of cloth for 10 bushels of wheat) is an acceptable, mutually beneficial trade ratio — it must lie between Southland's opportunity cost of producing 10 bushels of wheat (5 yards of cloth) and Northland's opportunity cost of producing 10 bushels of wheat (30 yards of cloth) for both countries to gain from trade.

Solution 2

(c)

Mark scheme

- No, Southland will not have a comparative advantage in producing cloth. Explanation using numbers: with wheat capacity now 75 bushels, Southland's opportunity cost of producing one yard of cloth is 1.5 bushels of wheat, which is greater than Northland's opportunity cost of producing one yard of cloth, $1/3$ bushel of wheat ($1.5 > 1/3$), so Northland remains the lower-opportunity-cost (comparative-advantage) producer of cloth.

Solution 2

(d)(i)

Mark scheme

- No, the turnip market equilibrium does not result in an efficient allocation of resources. Explanation using marginal analysis: because production generates a negative externality (pollution) not borne by producers, at the market equilibrium quantity the marginal social cost exceeds the marginal social benefit (MSC $>$ MSB) — equivalently, the negative externality in production causes marginal social cost to exceed marginal private cost (MSC $>$ MPC) at that equilibrium — so the market overproduces turnips relative to the socially efficient quantity.

Solution 2

(d)(ii)

Mark scheme

- A lump-sum tax will not change the market equilibrium price and quantity in the short run, because a lump-sum tax raises fixed cost only and does not affect marginal cost, so the (marginal-cost-based) supply curve does not shift.

Question 1

2023 Set 2 ▪ Q1

Anderson Company is a typical firm that manufactures Good G in a constant-cost, perfectly competitive market. Anderson Company is currently earning positive economic profit.

(a) What must be true about the relationship between accounting profit and economic profit if Anderson Company currently incurs both explicit and implicit costs in production?

Question 1

2023 Set 2 ▪ Q1

Anderson Company is a typical firm that manufactures Good G in a constant-cost, perfectly competitive market. Anderson Company is currently earning positive economic profit.

(b) Draw correctly labeled side-by-side graphs for the market and Anderson Company and show each of the following.

(i) The market equilibrium price and quantity, labeled P_M and Q_M, respectively (ii) The profit-maximizing price and quantity for Anderson Company, labeled P_F and Q_F, respectively (iii) The area representing Anderson Company's positive economic profit, shaded completely

Question 1

2023 Set 2 ▪ Q1

Anderson Company is a typical firm that manufactures Good G in a constant-cost, perfectly competitive market. Anderson Company is currently earning positive economic profit.

(c) On your graphs in part (b), show what will happen to each of the following if the market for Good G adjusts to long-run equilibrium.

(i) The market equilibrium price and quantity, labeled P_2 and Q_2, respectively (ii) Anderson Company's profit-maximizing price and quantity, labeled $P*$ and $Q*$, respectively

Question 1

2023 Set 2 ▪ Q1

Anderson Company is a typical firm that manufactures Good G in a constant-cost, perfectly competitive market. Anderson Company is currently earning positive economic profit.

(d)(i) Assume the production of Good G creates benefits for third parties. Given this situation, will the market equilibrium quantity be greater than, less than, or equal to the allocatively efficient quantity? Explain.

(d)(ii) The government takes an action that corrects the externality in the market for Good G. As a result of the government's action, does total economic surplus increase, decrease, or stay the same? Explain.

Solution 1

(a)

Mark scheme

- Anderson Company's accounting profit must be greater than its economic profit. Accounting profit = total revenue − explicit costs, while economic profit = total revenue − (explicit costs + implicit costs). Because implicit costs are positive, subtracting them further reduces the total, so economic profit is lower than accounting profit.

Solution 1

(b) Mark scheme

- Draw correctly labeled side-by-side graphs for the market and for Anderson Company. Market graph: downward-sloping demand (D) and upward-sloping supply (S), with their intersection labeled market equilibrium price P_M and quantity Q_M [1 point]. Firm graph: a horizontal demand/marginal-revenue curve (d = MR) extended from P_M, with the firm's price labeled P_F ($= P_M$) [1 point]. Add a rising marginal cost (MC) curve intersecting d = MR at the profit-maximizing quantity, labeled Q_F, where MR = MC [1 point]. Add an average total cost (ATC) curve that sits below the d = MR curve at Q_F, with the MC curve passing through the minimum point of ATC [1 point]. Shade completely the rectangle bounded above by P_F (d = MR) and below by ATC at

Solution 1

Q_F to represent Anderson Company's positive economic profit [1 point]. Total: 5 points for the five required graph elements.

Solution 1

(c) Mark scheme

- On the graphs from part (b), show the long-run adjustment: (i) On the market graph, draw a rightward shift of the supply curve (S to S_2), producing a lower market equilibrium price, labeled P_2, and a greater market equilibrium quantity, labeled Q_2 [1 point]. (ii) On the firm's graph, show the new lower price P^* extended from the new market equilibrium price P_2 (giving the firm a new demand/MR curve $d_2 = MR_2$), and a lower profit-maximizing quantity, labeled Q^*, at the new equilibrium where $P^* = MR_2 = MC =$ minimum ATC (zero economic profit in the long run) [1 point]. Total: 2 points.

Solution 1

(d)(i)

Mark scheme

- The market equilibrium quantity will be less than the allocatively efficient quantity. Because production of Good G creates benefits for third parties (a positive production externality), the marginal social cost (MSC) is less than the marginal private cost (MPC) at the market equilibrium. Since the market only reflects MPC (not MSC), it under-produces relative to the allocatively efficient output level where price equals MSC.

Solution 1

(d)(ii)

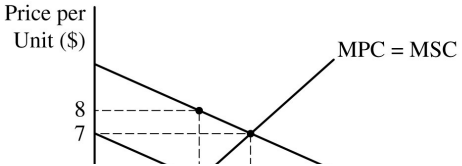
Mark scheme

- Total economic surplus will increase. Accept an explanation using ONE of the following: the quantity produced will increase toward the allocatively efficient quantity; the deadweight loss will decrease to $0; the marginal private cost will rise to equal the marginal social cost, internalizing the externality (e.g., via a per-unit subsidy).

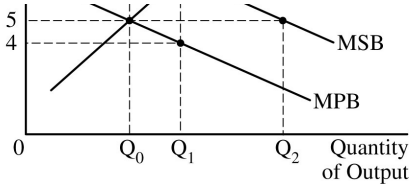
Question 2

2022 Set 1 ▪ Q2

2. Bueno is a firm that produces and sells guava, a type of fruit. The market for guava is perfectly competitive. The marginal private benefit (MPB), marginal private cost (MPC), marginal social benefit (MSB), and marginal social cost (MSC) curves are illustrated in the graph provided.



Question 2



(a) Identify the kind of market failure represented by this graph.

(b) Using numbers from the graph, identify the marginal external benefit.

(c) Assume the guava market is in short-run equilibrium and Bueno hires workers in a perfectly competitive labor market at a wage of \$20 per hour. The marginal product of the last worker hired was 6 units of guava per hour.

(i) Calculate the change in Bueno's profit per hour from the last worker hired. Show your work.
(ii) Suppose that the government decides to provide a per-unit subsidy to consumers who buy guava. How would the per-unit subsidy affect Bueno's marginal revenue product curve? Explain.

Question 2

(d) Instead of hiring workers in a perfectly competitive labor market, assume Bueno hires workers in a monopsony labor market. Will the number of workers hired increase, decrease, or stay the same? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

Solution 2

(a)

Mark scheme

- A positive consumption externality (positive externality in consumption): the marginal social benefit of guava exceeds the marginal private benefit (demand) curve, meaning third parties benefit from others' consumption.

Solution 2

(b)

Mark scheme

- The marginal external benefit is \$3 – the vertical (dollar) gap between the marginal-social-benefit curve and the private demand (marginal-private-benefit) curve at the relevant quantity, as read from the graph.

Solution 2

(c)(i)

Mark scheme

- Change in profit per hour $= MRP - MFC = (\$5 \times 6) - \$20 = \$30 - \$20 = \$10$. Marginal revenue product $MRP =$ marginal product $\times$ price $= 6 \times \$5 = \$30$; marginal factor cost $MFC =$ wage $= \$20$ since the labor market is perfectly competitive. Hiring the last worker raised profit per hour by $10.

Solution 2

(c)(ii)

Mark scheme

- Bueno's MRP curve would shift up (to the right). The per-unit subsidy to consumers increases demand for guava, raising the price received/paid for guava; since $MRP = MP \times P$, a higher guava price raises MRP for each worker, shifting the MRP curve upward.

Solution 2

(d)

Mark scheme

- The number of workers hired will decrease. A monopsony faces an upward-sloping labor-supply curve, so its marginal factor cost *MFC* lies above (and is steeper than) the supply/wage curve – *MFC* rises as the firm hires more workers (it must raise the wage paid to ALL workers, not just the marginal one), whereas *MFC* (=wage) is constant in a perfectly competitive labor market. Since firms hire where $MFC = MRP$, the monopsony's higher *MFC* at any quantity means it hires fewer workers than a perfectly competitive firm would.

Question 1

2022 Set 2 ▪ Q1

Sugar is produced in a perfectly competitive market using inputs from perfectly competitive factor markets. Frank Sugar Co. is a representative firm in the sugar market.

(a) Assume Frank Sugar Co. is earning zero economic profit. Draw correctly labeled side-by-side graphs for the sugar market and Frank Sugar Co. and show each of the following.

(i) The market equilibrium price and quantity, labeled P_M and Q_M, respectively (ii) The profit-maximizing price and quantity for Frank Sugar Co., labeled P_F and Q_F, respectively

Question 1

2022 Set 2 ▪ Q1

Sugar is produced in a perfectly competitive market using inputs from perfectly competitive factor markets. Frank Sugar Co. is a representative firm in the sugar market.

(b)(i) Assume the demand for sugar increases and sugar is produced in a constant-cost industry.

On your graph in part (a), show the short-run effect of the increased demand for sugar on the market price, labeled P_2, and the quantity sold by Frank Sugar Co., labeled Q_N.

(b)(ii) Compared to the equilibrium identified in part (a)(ii), what will happen to the short-run profit earned by Frank Sugar Co. as a result of the increased demand for sugar?

(b)(iii) When the market adjusts to long-run equilibrium, how will the market price of sugar in the long run compare to P_2 ? Explain.

Question 1

2022 Set 2 ▪ Q1

Sugar is produced in a perfectly competitive market using inputs from perfectly competitive factor markets. Frank Sugar Co. is a representative firm in the sugar market.

(c) Instead, assume sugar consumption has a negative impact on public health over time and the negative impact of sugar on health is underestimated by consumers. Draw a correctly labeled graph of the market, with the marginal social benefit (MSB), marginal private benefit (MPB), marginal social cost (MSC), and marginal private cost (MPC) curves, and show each of the following.
(i) The market equilibrium quantity, labeled Q_M (ii) The socially optimal quantity, labeled Q_S

Question 1

2022 Set 2 ▪ Q1

Sugar is produced in a perfectly competitive market using inputs from perfectly competitive factor markets. Frank Sugar Co. is a representative firm in the sugar market.

(d) Assume the government decides to intervene in the market to affect consumers' incentives and to address the negative impact of sugar consumption on public health. Which of the following policies would best achieve that objective in the short run: a lump-sum tax, a per-unit tax, a lump-sum subsidy, or a per-unit subsidy? Explain.

Solution 1

(a) Mark scheme

- Draw two side-by-side graphs. Market graph: upward-sloping supply (S) and downward-sloping demand (D) curves crossing at the equilibrium price P_M and quantity Q_M (1 pt — correctly labeled axes/curves/P_M/Q_M). Firm graph: a horizontal line at $P_F = P_M$ labeled d = MR, representing the price-taking firm's demand/marginal-revenue curve (1 pt). An upward-sloping MC curve crossing d = MR at quantity Q_F, the profit-maximizing output where MR = MC (1 pt). A U-shaped ATC curve drawn tangent to (just touching) the d = MR line at Q_F, with the MC curve passing through ATC's minimum point — this shows P_F = ATC, i.e. the firm earns zero economic profit (1 pt).

Solution 1

(b)(i)

Mark scheme

- On the market graph, shift the demand curve rightward from D to D , raising the equilibrium price from P_M to a higher price labeled P_2 (equilibrium quantity rises from Q_M to Q_2). On the firm's graph, shift the horizontal d = MR line upward to the new price P_2 (labeled d = MR); the firm's profit-maximizing quantity, where MR = MC, rises from Q_F to a higher quantity labeled Q_N.

Solution 1

(b)(ii)

Mark scheme

- The short-run profit earned by Frank Sugar Co. will increase. At the new price P_2, price exceeds ATC at Q_N (whereas at P_F price equaled ATC, i.e. zero economic profit), so the firm now earns positive economic profit.

Solution 1

(b)(iii)

Mark scheme

- The long-run market price will be lower than P_2 (it will fall back to P_M). Explanation: the positive economic profit earned at P_2 attracts new firms to enter the sugar market; entry increases market supply, shifting the supply curve rightward and driving the market price back down until it reaches P_M, where firms again earn zero economic profit.

Solution 1

(c)

Mark scheme

- Draw a graph with an upward-sloping marginal private cost curve (MPC) and a downward-sloping marginal private benefit curve (MPB); their intersection gives the market equilibrium quantity Q_M (1 pt). Add a marginal social benefit curve (MSB) drawn below/to the left of MPB (since consumers underestimate sugar's harm to health, so MSB $<$ MPB at each quantity), label the upward-sloping cost curve MPC $=$ MSC (no production externality), and mark the socially optimal quantity Q_S at the intersection of MSB and MSC, with $Q_S < Q_M$ (1 pt).

Solution 1

(d)

Mark scheme

- A per-unit tax would best achieve the objective in the short run. Explanation: a per-unit tax raises the effective price consumers pay per unit of sugar, directly changing consumers' marginal incentives and reducing the quantity consumed toward the socially optimal quantity Q_S — unlike a lump-sum tax (which does not change the per-unit price/marginal incentive) or a subsidy (which would increase, not decrease, consumption).

Question 2

2021 Set 2 ▪ Q2

Copper is produced in a perfectly competitive market with an upward-sloping supply curve and a downward-sloping demand curve. Assume the production of copper results in liquid waste, which seeps into local rivers. The contaminated river water causes human illnesses and crop failures downstream. The marginal external cost from producing copper is constant across all quantities of copper produced.

(a)(i) Draw a correctly labeled graph of the copper market with the marginal social benefit (MSB), marginal private benefit (MPB), marginal social cost (MSC), and marginal private cost (MPC) curves, and show each of the following.

The market equilibrium quantity, labeled Q_M

(a)(ii) Draw a correctly labeled graph of the copper market with the marginal social benefit (MSB), marginal private benefit (MPB), marginal social cost (MSC), and marginal private cost (MPC) curves, and show each of the following.

Question 2

The socially efficient quantity, labeled Q_S

Question 2

2021 Set 2 ▪ Q2

Copper is produced in a perfectly competitive market with an upward-sloping supply curve and a downward-sloping demand curve. Assume the production of copper results in liquid waste, which seeps into local rivers. The contaminated river water causes human illnesses and crop failures downstream. The marginal external cost from producing copper is constant across all quantities of copper produced.

(b) Suppose the demand for copper decreases. On your graph in part (a), show the deadweight loss at the new market equilibrium, shaded completely.

Question 2

2021 Set 2 ▪ Q2

Copper is produced in a perfectly competitive market with an upward-sloping supply curve and a downward-sloping demand curve. Assume the production of copper results in liquid waste, which seeps into local rivers. The contaminated river water causes human illnesses and crop failures downstream. The marginal external cost from producing copper is constant across all quantities of copper produced.

(c)(i) Suppose the government is considering levying a tax on copper.
What per-unit tax level would achieve the socially optimal quantity?

(c)(ii) Explain why a lump-sum tax on producers will not achieve the socially optimal quantity in the short run.

Solution 2

(a)(i)

Mark scheme

- Draw an upward-sloping marginal private cost (MPC) curve and a downward-sloping marginal private benefit (MPB) curve. Label the market equilibrium quantity, where MPC = MPB, as Q_M on the horizontal axis.

Solution 2

(a)(ii)

Mark scheme

- Add a marginal social cost (MSC) curve drawn above the MPC curve at every output level (reflecting a negative production externality, e.g. pollution from copper mining/production). Label the socially efficient quantity Q_S, where MSC = MPB (= MSB), lying to the left of Q_M (i.e., $Q_S < Q_M$).

Solution 2

(b)

Mark scheme

- Shift the demand curve (MPB = MSB) leftward to MPB' = MSB'. The new market equilibrium quantity Q'_M (where MPC = MPB') and the new socially efficient quantity Q'_S (where MSC = MPB') both fall, with $Q'_S < Q'_M$. Shade the deadweight loss as the fully-enclosed triangle bounded by the MSC curve and the MPB' (=MSB') curve over the output range between Q'_S and Q'_M.

Solution 2

(c)(i)

Mark scheme

- The per-unit tax that achieves the socially optimal quantity equals the marginal external cost at that quantity: tax = MSC − MPC (the vertical gap between MSC and MPC, evaluated at the socially efficient quantity Q_S).

Solution 2

(c)(ii)

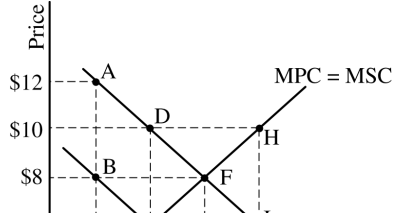
Mark scheme

- A lump-sum tax on producers will not achieve the socially optimal quantity in the short run because a lump-sum tax is a fixed cost — it raises total cost and average cost but does not change marginal cost. Since a firm's output decision depends on marginal cost (producing where MPC = MPB), quantity stays at Q_M rather than falling to Q_S.

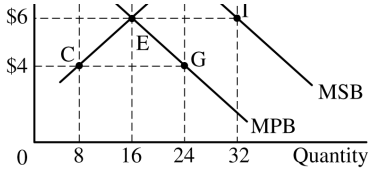
Question 2

2018 ▪ Q2

2. Modern-day word processing software gives consumers the ability to create and save documents in different file formats that can then be accessed by multiple computer operating systems. The graph below depicts a perfectly competitive market for word processing software. In the graph, MSB is the marginal social benefit, MPB is the marginal private benefit, MPC is the marginal private cost, and MSC is the marginal social cost.



Question 2



(a) Identify the type of market failure illustrated by the graph. Explain.

(b) Using the numbers on the graph, identify the market equilibrium price and quantity.

(c) Using the labeling on the graph, identify the area representing the deadweight loss at the quantity identified in part (b).

(d) Suppose the government is considering granting a subsidy to correct the market failure. What is the dollar value of the per-unit subsidy that would achieve the socially optimal quantity?

(e) Suppose the government does not grant the subsidy and instead imposes a price floor at $8.

(i) How many units will consumers and producers exchange at the price floor?

Question 2

(ii) Does the price floor correct the market failure? Explain.

Solution 2

(a)

Mark scheme

- The graph illustrates a positive externality (in production or consumption). Explanation: marginal social benefit is greater than marginal private benefit (MSB $>$ MPB) — equivalently, the market equilibrium quantity is less than the socially optimal quantity.

Solution 2

(b)

Mark scheme

- Market equilibrium price = \$6; market equilibrium quantity = 16 units.

Solution 2

(c)

Mark scheme

- The deadweight loss at the market quantity of 16 units is the triangular area labeled DEF on the graph — the region between the MSB and MSC (supply) curves, spanning from the market quantity (16 units) out to the socially optimal quantity.

Solution 2

(d)

Mark scheme

- The per-unit subsidy needed to achieve the socially optimal quantity is $4.

Solution 2

(e)(i)

Mark scheme

- At a price floor of 8, $consumersandproducerswillexchange8units(thequantitydemandedatthe8$ price floor, which is below the quantity supplied, so the shorter side of the market — quantity demanded — determines the amount actually exchanged).

Solution 2

(e)(ii)

Mark scheme

- No, the $8 price floor does not correct the market failure. Explanation (any one of): the quantity exchanged in the market (8 units) is still less than the socially optimal quantity; marginal social benefit is greater than marginal social cost (MSB $>$ MSC) at a quantity of 8 units; or the deadweight loss increased after the price floor was imposed compared to the unregulated market outcome.

Question 3

2017 ▪ Q3

The graph below shows the marginal social cost (MSC), marginal private cost (MPC), marginal social benefit (MSB), demand (D), and marginal revenue (MR) curves for a monopoly.

[Graph with vertical axis "PRICE" and horizontal axis "QUANTITY". Price axis has labeled levels, from top to bottom: P_6, P_5, P_4, P_3, P_2, (gap), P_1. Quantity axis has labeled levels, from left to right: Q_1, Q_2, Q_3, Q_4, Q_5, Q_6. Four curves are drawn: a downward-sloping demand curve labeled "D = MSB" running from high price/low quantity to low price/high quantity; a steeper downward-sloping "MR" curve below/inside the demand curve, ending near Q_4 on the quantity axis; an upward-sloping "MPC" curve starting from a low price near the origin and rising to the upper right; and an upward-sloping "MSC" curve lying above and to the left of MPC (steeper/higher at each quantity), also rising to the upper right. The curves MPC and

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MSC intersect the demand curve and each other at various points aligned with the labeled price and quantity gridlines (dashed reference lines connect intersections down to the quantity axis at Q_1 through Q_6 and across to the price axis at P_1 through P_6).]

(a)(i) Identify the monopolist's profit-maximizing quantity

(a)(ii) profit-maximizing price

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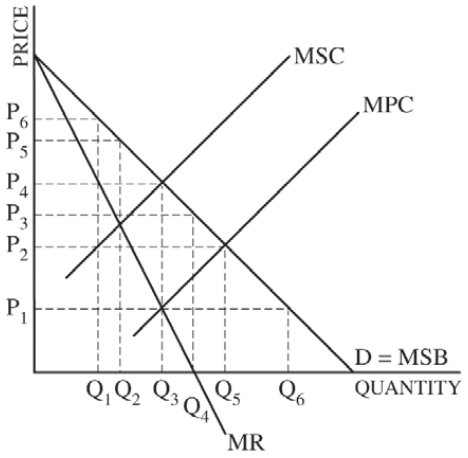

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labeled price and quantity gridlines (dashed reference lines connect intersections down to the quantity axis at Q_1 through Q_6 and across to the price axis at P_1 through P_6).]

(b) What information in the graph indicates that there is a negative externality?

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labeled price and quantity gridlines (dashed reference lines connect intersections down to the quantity axis at Q_1 through Q_6 and across to the price axis at P_1 through P_6).]

(c) Identify the socially optimal quantity.

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labeled price and quantity gridlines (dashed reference lines connect intersections down to the quantity axis at Q_1 through Q_6 and across to the price axis at P_1 through P_6).]

(d)(i) In the case in which the government imposes a per-unit tax equal to the marginal external cost, identify each of the following.

The dollar value of the tax, using the price labels from the graph

(d)(ii) The profit-maximizing quantity associated with the tax

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labeled price and quantity gridlines (dashed reference lines connect intersections down to the quantity axis at Q_1 through Q_6 and across to the price axis at P_1 through P_6).]

(e) Given the monopoly facing the negative externality, would the deadweight loss increase, decrease, or stay the same as a result of imposing the per-unit tax? Explain.

Solution 3

(a)(i)

Mark scheme

- The monopolist's profit-maximizing quantity is Q_3, found where marginal revenue equals marginal private cost, i.e. $MR = MPC$.

(a)(ii)

Mark scheme

- The monopolist's profit-maximizing price is P_4, found by going up from the profit-maximizing quantity Q_3 to the demand curve.

Solution 3

(b)

Mark scheme

- The graph shows a negative externality because the marginal social cost curve lies above (exceeds) the marginal private cost curve, i.e. $MSC > MPC$ – indicating an external cost imposed on third parties that is not borne by the producer.

Solution 3

(c)

Mark scheme

- The socially optimal quantity is Q_3, found where the demand curve (marginal social benefit) intersects the marginal social cost curve, $D = MSC$. (This happens to be the same quantity as the monopolist's own unregulated profit-maximizing output, because the underproduction caused by the monopolist's market power offsets the overproduction that the negative externality would otherwise cause.)

Solution 3

(d)(i)

Mark scheme

- The dollar value of the tax is $P_4 - P_1$, using the price labels from the graph – the vertical gap between the marginal social cost curve and the marginal private cost curve at quantity Q_3 (the marginal external cost the tax is set equal to).

Solution 3

(d)(ii)

Mark scheme

- The profit-maximizing quantity associated with the tax is Q_2, found where MR intersects the after-tax marginal cost curve (MPC plus the per-unit tax). This quantity is less than the original (and socially optimal) quantity Q_3.

Solution 3

(e)

Mark scheme

- The deadweight loss increases as a result of the tax. Before the tax, the monopolist's profit-maximizing quantity (Q_3) happened to equal the socially optimal quantity (Q_3), so there was no deadweight loss despite both market power and the externality being present. After the tax, the monopolist's profit-maximizing quantity falls to Q_2, which is less than the socially optimal quantity Q_3 – this divergence creates deadweight loss that did not exist before the tax.