Past-paper walk-through

Market Disequilibrium and Changes in Equilibrium ▪ 2.7

eXercise

Questions in this set

- 2024 Set 1 Q1
- 2022 Set 2 Q1
- 2022 Set 2 Q2
- 2017 Q1
- 2016 Q1

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 1

2024 Set 1 ▪ Q1

1. Soja Farm is a typical profit-maximizing firm that produces and sells soybeans in a constant-cost, perfectly competitive market that is in long-run equilibrium. The market equilibrium price of soybeans is \$14 per bushel.

   (a) Draw correctly labeled side-by-side graphs for the soybean market and for Soja Farm, and show each of the following.

   (i) The market equilibrium price and quantity, labeled \$14 and Q_M, respectively
   (ii) Soja Farm's profit-maximizing price and quantity, labeled P_F and Q_F, respectively
   (iii) Soja Farm's average total cost curve consistent with a long-run equilibrium, labeled ATC

   (b) If Soja Farm is the only firm in the market that chooses to increase its price of soybeans to \$15 per bushel, will Soja Farm's total revenue increase by \$1, remain the same, or decrease to \$0 ? Explain.

   (c) Soybeans are used as an input in the production of tofu. Tofu now becomes a more popular food option among consumers. On your graphs in part (a), show the short-run effect of the increased popularity of tofu on each of the following.

   (i) The new market equilibrium price and quantity of soybeans, labeled P_2 and Q_2, respectively
   (ii) Soja Farm's new profit-maximizing quantity, labeled Q*

Question 1

(d) Given the increase in popularity of tofu in part (c), what will happen to the number of firms in the soybean market in the long run? Explain.

(e) Suppose a 25% increase in the market price of quinoa causes a 5% decrease in the quantity demanded of quinoa and a 10% increase in the quantity demanded for tofu.

(i) Is the demand for quinoa elastic, inelastic, or unit elastic? Explain using numbers.
(ii) Calculate the cross-price elasticity of demand between quinoa and tofu. Show your work.

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 1

(a) Mark scheme

- Draw side-by-side graphs (4 points, 1 each): (1) Market graph: downward-sloping demand D_1 and upward-sloping supply S, with the equilibrium labeled at price $14 and quantity Q_M. (2) Firm graph: Soja Farm (a price-taking, perfectly competitive firm) has a horizontal demand/marginal-revenue curve d_1 = MR_1 drawn at the market price, labeled P_F (=14, the height carried over from the market graph). (3) A rising marginal cost (MC) curve is added to the firm graph, crossing $d_1 = MR_1$ at the profit-maximizing quantity Q_F (where $MR = MC$). (4) An average total cost (ATC) curve is added, drawn tangent to the firm's demand curve exactly at Q_F (zero long-run economic profit),

Solution 1

with the MC curve passing through the minimum point of ATC. Each of the four elements earns its own point; grade holistically against these four labeled features.

Solution 1

(b)

Mark scheme

- Soja Farm's total revenue would decrease to $0(notmerelyfallby1)$. Because Soja Farm is one price-taking firm among many in a perfectly competitive market, it faces a perfectly elastic (horizontal) demand curve at the market price of $14.Ifitaloneraisesitspriceto15$, all of its customers would simply buy soybeans from the many other sellers still charging the market price of $14, soSojaFarmwouldsellzerounitsandearn0$ in revenue.

Solution 1

(c)

Mark scheme

- Two points, one per graph: (i) On the market graph, demand shifts rightward from D_1 to D_2 (tofu's rising popularity raises demand for its input, soybeans), producing a new, higher equilibrium price labeled P_2 and a new, higher equilibrium quantity labeled Q_2 (both to the right/above the original 14/Q_M point). (ii) On the firm's graph, the higher market price shifts the firm's horizontal demand/MR curve upward to $d_2 = MR_2$ at P_2, and the new profit-maximizing quantity is labeled Q^*, found where $MR_2 = MC$ (to the right of the original Q_F).

Solution 1

(d)

Mark scheme

- The number of firms in the soybean market will increase in the long run. At the new higher price P_2, existing firms like Soja Farm earn positive (above-normal) economic profits (price exceeds ATC at Q^*). These economic profits attract new firms to enter the soybean market, which is characteristic of long-run adjustment in a perfectly competitive industry.

Solution 1

(e)(i)

Mark scheme

- Demand for quinoa is inelastic. Explanation (either is sufficient): the price elasticity of demand for quinoa has an absolute value of $|\%\Delta Q\_d \ / \ \%\Delta P| = 5\% \ / \ 25\% = 0.2$, which is less than 1, so demand is inelastic; equivalently, the 5% decrease in quantity demanded of quinoa is smaller (proportionally) than the 25% increase in the price of quinoa, meaning quantity demanded responds less than proportionally to the price change.

Solution 1

(e)(ii)

Mark scheme

- Cross-price elasticity of demand between quinoa and tofu = (% change in quantity demanded of tofu) / (% change in price of quinoa) = 10% / 25% = 0.4. (The positive value confirms quinoa and tofu are substitutes.)

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

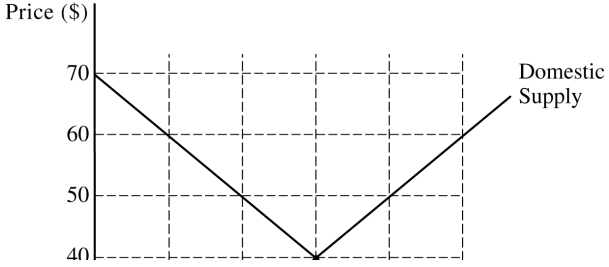
(d)

Mark scheme

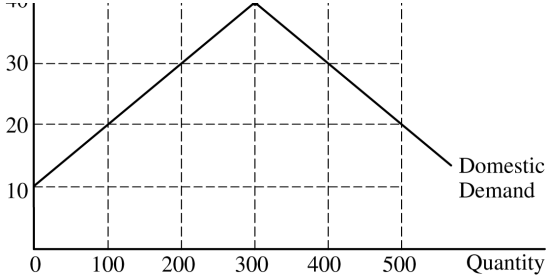
- A per-unit tax would best achieve the objective in the short run. Explanation: a per-unit tax raises the effective price consumers pay per unit of sugar, directly changing consumers' marginal incentives and reducing the quantity consumed toward the socially optimal quantity Q_S — unlike a lump-sum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

Question 2

2022 Set 2 ▪ Q2



Question 2



2. The graph provided depicts New Zealand's domestic supply and demand for wool.

   (a) Calculate the consumer surplus if New Zealand does not trade with the rest of the world. Show your work.

   (b) Instead, assume New Zealand decides to trade wool in the world market. The current world price of wool is $60 per unit, and New Zealand is a price taker in the world market.

Question 2

(i) How many units of wool will New Zealand export?
(ii) What will happen to the consumer surplus of wool consumers in New Zealand when New Zealand begins to trade with the rest of the world? Explain.
(iii) Will total economic surplus in New Zealand increase, decrease, or remain unchanged when New Zealand begins to trade wool in the world market? Explain using numbers.

(c) Now assume domestic demand in New Zealand increases. Will New Zealand's exports increase, decrease, or stay the same?

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

- Consumer Surplus $= \frac{1}{2} \times 300 \times (\$70 - \$40) = \frac{1}{2} \times 300 \times \$30 = \$9{,}000/2 = \$4{,}500$ (using the no-trade equilibrium quantity of 300 units and the choke price of \$70 minus the no-trade equilibrium price of \$40).

Solution 2

(b) Mark scheme

- (i) New Zealand will export 400 units of wool (the gap between quantity supplied and quantity demanded at the world price of \$60). (ii) Consumer surplus in New Zealand will decrease: the domestic price rises from \$40 to the world price of \$60, which decreases the domestic quantity demanded of wool — consumer surplus falls from \$4,500 before trade to \$500 after trade. (iii) Total economic surplus in New Zealand will increase by \$4,000: producer surplus increases by \$8,000 while consumer surplus decreases by \$4,000, and since the producer-surplus gain exceeds the consumer-surplus loss, total surplus rises by \$8,000 − \$4,000 = \$4,000.

Solution 2

(c)

Mark scheme

- New Zealand's exports will decrease. When domestic demand increases, domestic quantity demanded at the world price rises while domestic quantity supplied is unchanged, shrinking the gap between quantity supplied and quantity demanded — i.e. the export quantity falls.

Question 1

2017 ▪ Q1

Corn is used as food and as an input in the production of ethanol, an alternative fuel. Assume corn is produced in a perfectly competitive market.

(a) Draw correctly labeled side-by-side graphs for the corn market and a representative corn farmer. On your graphs show each of the following.

(i) The equilibrium price and quantity in the corn market, labeled P_M and Q_M, respectively

(ii) The profit-maximizing quantity of corn produced by the representative farmer earning zero economic profit, labeled Q_F

Question 1

2017 ▪ Q1

Corn is used as food and as an input in the production of ethanol, an alternative fuel. Assume corn is produced in a perfectly competitive market.

(b)(i) Assume the demand for ethanol increases. On your graphs in part (a) show what will happen to each of the following in the short run.

The market price and quantity of corn, labeled P^* and Q^*

(b)(ii) The area of the profit or loss earned by the representative corn farmer, shaded completely

Question 1

2017 ▪ Q1

Corn is used as food and as an input in the production of ethanol, an alternative fuel. Assume corn is produced in a perfectly competitive market.

(c) Relative to your answer in part (b), state what will happen to the market equilibrium price and quantity of corn in the long run. Explain.

Question 1

2017 ▪ Q1

Corn is used as food and as an input in the production of ethanol, an alternative fuel. Assume corn is produced in a perfectly competitive market.

(d) Soybeans are produced in a perfectly competitive market. Assume farmers can grow either corn or soybeans on the same land. What happens to the price of soybeans in the next planting season if the price of corn increases? Explain.

Question 1

2017 ▪ Q1

Corn is used as food and as an input in the production of ethanol, an alternative fuel. Assume corn is produced in a perfectly competitive market.

(e)(i) Assume instead that the government sets a binding price ceiling in the corn market. Draw a new correctly labeled graph for the corn market and show each of the following.

The binding price ceiling, labeled P_c

(e)(ii) The quantity purchased by consumers in the corn market, labeled Q_p

Solution 1

(a) Mark scheme

- Draw side-by-side graphs. Corn MARKET graph: downward-sloping demand D_1 and upward-sloping supply S intersecting at equilibrium price P_M and quantity Q_M (both labeled on the axes with dashed lines to the intersection). FIRM graph: a horizontal demand/marginal-revenue curve $d_1 = MR_1$ drawn at the market price P_M; the firm's profit-maximizing quantity Q_F is where $MC = MR_1$; the firm's ATC and MC curves are drawn with MC passing through the minimum point of ATC, and $P_M = ATC = MC$ at Q_F (the representative farmer earns zero economic profit). Points earned for: (1) correctly labeled corn-market graph with P_M, Q_M (downward demand, upward supply); (2) horizontal demand curve on the

Solution 1

firm graph extended from P_M; (3) Q_F identified at $MC = MR_1$; (4) ATC/MC shown with MC passing through minimum ATC and $P = ATC = MC$ at Q_F.

Solution 1

(b)(i)

Mark scheme

- An increase in ethanol demand raises the demand for corn, shifting the market demand curve rightward from D_1 to D_2. This raises the market equilibrium price and quantity of corn in the short run, labeled P^* and Q^* (both greater than P_M and Q_M).

Solution 1

(b)(ii)

Mark scheme

- On the firm's graph, with price now at P^* (above ATC) and the firm producing where $MC = MR_2 = d_2$ at quantity Q_{F2}, the profit earned is the rectangle bounded above by P^* and below by ATC, over the output range from 0 to Q_{F2}. This rectangle must be shown completely shaded to earn the point.

Solution 1

(c)

Mark scheme

- In the long run the market quantity of corn will increase and the market price will decrease (moving back down). Because the representative farmer is earning positive economic profit in the short run (part b), new farmers are attracted into the corn market; their entry shifts the market supply curve rightward, which increases quantity and decreases price until economic profit returns to zero.

Solution 1

(d)

Mark scheme

- The price of soybeans will increase in the next planting season. Since farmers can grow either corn or soybeans on the same land, a higher price of corn makes growing corn relatively more profitable, so farmers substitute land away from soybeans and into corn. This decreases the supply of soybeans, raising the equilibrium price of soybeans.

Solution 1

(e)(i)

Mark scheme

- Draw a new, correctly labeled graph of the corn market (same upward-sloping supply and downward-sloping demand) showing a binding price ceiling P_C set below the market equilibrium price.

Solution 1

(e)(ii)

Mark scheme

- The quantity purchased by consumers, Q_P, is the quantity at which the price ceiling P_C intersects the supply curve – i.e. the quantity that sellers are willing to supply at the ceiling price, which is the actual (constrained) quantity transacted in the market.

Question 1

2016 ▪ Q1

MICROECONOMICS
Section II
Total Time—60 minutes
Reading Period—10 minutes
Writing Period—50 minutes

Directions: You are advised to spend the first 10 minutes reading all of the questions and planning your answers. You will then have 50 minutes to answer all three of the following questions. You may begin writing your responses before the reading period is over. It is suggested that you spend approximately half your time on the first question and divide the remaining time equally between the next two questions. Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. Use a pen with black or dark blue ink.

1. The markets for bananas, muffins, and coffee are interrelated, and each market is perfectly competitive.

Question 1

(a) In the market for bananas, the equilibrium price is $1.00 per pound, and the equilibrium quantity is 1,000 pounds per week. Suppose the government imposes a price floor on bananas at $1.20 per pound, causing the quantity supplied to increase to 1,500 pounds per week.

(i) Would the price floor result in a shortage, a surplus, or neither? Explain.

(ii) Calculate the price elasticity of supply if the price increases from $1 to $1.20. Show your work.

(iii) Between $1 and $1.20, is the supply elastic, unit elastic, or inelastic? Explain.

(b) Bananas are an input for muffins.

(i) Draw a correctly labeled graph of the market for muffins indicating the equilibrium price and quantity, labeled P_0 and Q_0, respectively.

(ii) On the graph drawn in part (b)(i), show the impact of an increase in the price of bananas on the muffin market, labeling the new equilibrium price and quantity P_1 and Q_1, respectively.

(iii) On the same graph, completely shade the area that represents the **change** in the consumer surplus caused by the increase in the price of bananas.

Question 1

(c) In the market for coffee, the equilibrium price is $3.00 per cup and the equilibrium quantity is 100 cups per week. The cross-price elasticity of coffee with respect to muffins is −2.

(i) Are coffee and muffins normal goods, inferior goods, complementary goods, or substitute goods?

(ii) Assume the supply of coffee is perfectly elastic. Using the equilibrium price and quantity given above, draw a correctly labeled graph for the coffee market, and show the impact of an increase in the price of muffins on the coffee market.

(iii) Given the original quantity of 100 cups of coffee per week, if the increase in the price of muffins is 10%, calculate the new equilibrium quantity in the coffee market. Show your work.

Solution 1

(a)(i)

Mark scheme

- Surplus. At the price floor of $1.20 (above the 1.00$ equilibrium), the price floor is binding/effective, so quantity supplied (1,500 lb/week) exceeds quantity demanded — this excess of Qs over Qd is a surplus, not a shortage.

Solution 1

(a)(ii)

Mark scheme

- Price elasticity of supply 2.2–2.5 (either the midpoint or point method earns the point). Midpoint formula: $\%\Delta Q = (1500-1000)/1250 = 0.4 = 40\%$; $\%\Delta P = (1.20-1.00)/1.10$ $0.182 = 18.2\%$; $E = 40\%/18.2\%$ 2.2. (Equivalently with the point method using the original base: $\%\Delta Q = 500/1000 = 50\%$, $\%\Delta P = 0.20/1.00 = 20\%$, $E = 50\%/20\% = 2.5$.) Any correctly-worked elasticity value from a valid formula (2, 2.2, or 2.5) earns the point.

Solution 1

(a)(iii)

Mark scheme

- Elastic. Since the price elasticity of supply calculated above is greater than 1 (the percentage change in quantity supplied exceeds the percentage change in price), supply over this range is elastic.

Solution 1

(b)(i)

Mark scheme

- A correctly labeled graph of the muffin market: Price on the vertical axis, Quantity on the horizontal axis, an upward-sloping supply curve S and a downward-sloping demand curve D intersecting at the initial equilibrium, with the equilibrium price and quantity labeled P0 and Q0 respectively (dashed lines dropping to the axes).

Solution 1

(b)(ii)

Mark scheme

- Because bananas are an input to muffins, the rise in the price of bananas raises muffin producers' costs, shifting the muffin supply curve LEFT from S to S1. The new intersection with demand D occurs at a higher price and lower quantity, labeled P1 ($>$ P0) and Q1 ($<$ Q0).

Solution 1

(b)(iii)

Mark scheme

- The area representing the decrease in consumer surplus is the trapezoid bounded above by the new price line P1, below by the original price line P0, on the left by the price (vertical) axis, and on the right by the (unchanged) demand curve D between the points (Q1, P1) and (Q0, P0) — i.e., the whole shaded band between P0 and P1 under the demand curve, out to Q0/Q1, must be completely shaded.

Solution 1

(c)(i)

Mark scheme

- Complementary goods. The cross-price elasticity of coffee with respect to muffins is negative ($-2 < 0$): a rise in the price of muffins decreases the quantity demanded of coffee, which is the defining property of complements.

Solution 1

(c)(ii)

Mark scheme

- Correctly labeled coffee-market graph: Price on the vertical axis, Quantity on the horizontal axis,
  a perfectly elastic (horizontal) supply curve S drawn at $P = 3$, $and a downward-sloping demand curve D with initial equilibrium quantity 100 cups/week. Because coffee and mu$
  while the equilibrium quantity falls (to 80 cups/week, from part (c)(iii)).

Solution 1

(c)(iii)

Mark scheme

- $\%\Delta Q = \%\Delta P(\text{muffins}) \times \text{cross-price elasticity} = 10\% \times (-2) = -20\%$. New equilibrium quantity $= 100 - (0.20 \times 100) = 100 \times (1 - 0.20) = 80$ cups per week. (Using the midpoint formula to back out the same $-20\%/80$ result is also acceptable.)