ECO.MIC12 Consumer and Producer Surplus and the Incidence of Indirect Taxes

Total Marks

AQA 7136 · Calculators not allowed · about 90 minutes

Name: _____ Date: ____ / ____ / _____

Answer all questions. Full sentences are required for questions worth 4 marks or more. Allowed time: 90 minutes. No calculator is needed; round whole-number prices and quantities are used.

1 Multiple choice, market context: which statement defines consumer surplus in a competitive market for a single good?

- ☐ The area above the demand curve and below the market price, measuring the extra benefit consumers receive
- ☐ The area below the supply curve and above the market price, measuring producer receipts
- ☐ The vertical distance between demand and supply at a given quantity
- ☐ The total revenue received by firms at the equilibrium price

(Total for Question 1 is 1 mark)

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2 Define consumer surplus in the context of a competitive market for a product sold at a single equilibrium price.

(Total for Question 2 is 1 mark)

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3 Define producer surplus in the context of a competitive market for a product sold at a single equilibrium price.

(Total for Question 3 is 1 mark)

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4 Labelling a supply and demand diagram for the competitive market for 'canned tea' in the town of Harwell: draw a standard downward-sloping demand curve and upward-sloping supply curve that meet at equilibrium price GBP 8 and quantity 40 units. On your diagram, label the consumer surplus area and the producer surplus area clearly.

(Total for Question 4 is 2 marks)

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5 In Harwell's canned tea market the demand curve crosses the price axis at GBP 20 (intercept) and the supply curve crosses the price axis at GBP 0. Using the equilibrium price GBP 8 and quantity 40 given in Question 4, calculate the numerical value of consumer surplus and producer surplus before any tax. All prices are pounds, quantities are units, and areas are triangular.

(Total for Question 5 is 4 marks)

6 A specific indirect tax of GBP 4 per unit is imposed on the producers of canned tea in Harwell. The tax is legally levied on producers and shifts the supply curve vertically up by GBP 4. If the new market equilibrium price paid by consumers becomes GBP 10 and the new equilibrium quantity is 30 units, calculate the new consumer surplus and producer surplus (net of tax). Also calculate total tax revenue and the deadweight loss (DWL) arising from the tax. Use the original demand intercept GBP 20 and original supply intercept GBP 0 where needed. Give all numerical answers in GBP.

(Total for Question 6 is 6 marks)

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7 Explain how an ad valorem indirect tax (for example a 25% tax levied as a proportion of price) imposed on producers differs from a specific per-unit tax in the way it affects the supply curve and the market price. Use the Harwell canned tea market context and make your answer precise. No numerical calculation is required.

(Total for Question 7 is 4 marks)

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8 Analyse how the price elasticity of demand (PED) and the price elasticity of supply (PES) determine the incidence of an indirect tax in a competitive market. In your answer use diagrams and numerical examples where helpful, explain the logic of who bears more of the tax when demand is relatively inelastic or elastic compared with supply, and mention relevant limitations of the elasticity-based result.

(Total for Question 8 is 10 marks)

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9 A per-unit subsidy of GBP 3 is introduced for canned tea producers in Harwell. As a result the consumer price falls to GBP 6 and the new equilibrium quantity rises to 50 units. Using the original demand intercept GBP 20 and original supply intercept GBP 0, calculate the new consumer surplus, the producer surplus (including the subsidy), and the cost to the government. State whether social welfare (total surplus net of government cost) increases or decreases relative to the original no-tax, no-subsidy equilibrium where total surplus was GBP 400.

(Total for Question 9 is 4 marks)

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10 State the formula for the price elasticity of demand (PED) and the price elasticity of supply (PES), and give the economic interpretation of a PED value of -0.5 and a PES value of 2.0 in the context of a typical goods market.

(Total for Question 10 is 2 marks)

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11 Using the specific tax example from Question 6 (GBP 4 per unit, consumer price rose from GBP 8 to GBP 10, quantity fell from 40 to 30), calculate the total monetary burden borne by consumers and by producers. Show your working.

(Total for Question 11 is 2 marks)

12 Evaluate the view that indirect taxes always fall mostly on consumers. In your answer consider the role of elasticities, the type of tax, market structure and time period, and provide a supported judgement.

Evaluate the view that indirect taxes always fall mostly on consumers. In your answer consider the role of elasticities, the type of tax, market structure and time period, and provide a supported judgement.

(Total for Question 12 is 15 marks)

Mark scheme · ECO.MIC12 Consumer and Producer Surplus and the Incidence of Indirect Taxes

Question 1

- **B1** correct option selected, interpretation: consumer surplus is the area above demand and below price
- **Answer: The area above the demand curve and below the market price, measuring the extra benefit consumers receive.**

Question 2

- **B1** a concise definition: the difference between the maximum price consumers are willing to pay and the price they actually pay, summed over all units bought
- **Answer: The difference between the maximum price consumers are willing to pay and the price they actually pay, summed over all units bought.**

Question 3

- **B1** a concise definition: the difference between the market price received by producers and the minimum price at which they would supply, summed over all units sold
- **Answer: The difference between the market price received by producers and the minimum price at which they would supply, summed over all units sold.**

Question 4

- **B1** correctly labels the consumer surplus area, as the triangular area above price GBP 8 and below the demand curve, up to quantity 40
- **B1** correctly labels the producer surplus area, as the triangular area below price GBP 8 and above the supply curve, up to quantity 40
- **Answer: Consumer surplus: triangle above price GBP 8 below demand up to Q=40; Producer surplus: triangle below price GBP 8 above supply up to Q=40.**

Question 5

- **M1** method: area of triangle = 1/2 x base x height, consumer surplus height = demand intercept minus price = 20 - 8 = 12
- **A1** consumer surplus = 1/2 x 40 x 12 = GBP 240
- **M1** producer surplus height = price minus supply intercept = 8 - 0 = 8, area = 1/2 x 40 x 8
- **A1** producer surplus = 1/2 x 40 x 8 = GBP 160
- **Answer: Consumer surplus = GBP 240; Producer surplus = GBP 160.**

Question 6

- **M1** consumer surplus: height = demand intercept minus consumer price = 20 - 10 = 10, so CS = 1/2 x 30 x 10
- **A1** consumer surplus = 1/2 x 30 x 10 = GBP 150
- **M1** producers receive net price = consumer price minus tax = 10 - 4 = 6; producer surplus height = 6 - supply intercept = 6 - 0 = 6, so PS = 1/2 x 30 x 6
- **A1** producer surplus = 1/2 x 30 x 6 = GBP 90
- **M1** tax revenue = tax per unit x quantity = 4 x 30 = GBP 120
- **A1** deadweight loss = loss of total surplus: before tax total surplus = 240 + 160 = 400; after tax total surplus = CS + PS + tax revenue = 150 + 90 + 120 = 360, so DWL = 400 - 360 = GBP 40
- **Answer: Consumer surplus after tax = GBP 150; Producer surplus (net of tax) = GBP 90; Tax revenue = GBP 120; Deadweight loss = GBP 40.**

Question 7

- **M1** identifies that a specific tax shifts the supply curve vertically up by a fixed amount per unit, whereas an ad valorem tax shifts the supply curve in a way that the vertical distance between original and taxed supply increases with price (a percentage wedge)
- **A1** explains that with an ad valorem tax the supply curve effectively becomes steeper or pivots, because at higher prices the absolute tax is larger, so the upward shift is larger the higher the price
- **M1** applies to Harwell: a 25% ad valorem tax means producers face a tax equal to 25% of the price, so the consumer price will rise by less than 25% but the upward shift varies with price rather than being constant
- **A1** concludes that ad valorem taxes generally lead to different changes in equilibrium price and quantity compared with a specific tax, and the incidence may vary with the level of price
- **Answer: Specific tax shifts supply up by a fixed vertical amount per unit; ad valorem raises the vertical distance by a proportion of price so the shift increases with price, making the taxed supply steeper and incidence dependent on the price level.**

Question 8

- **Level 1** (1-3): Basic statements about tax incidence with limited or no use of elasticity. Limited or no diagrams. Little or no development or evaluation.
- **Level 2** (4-7): Clear explanation that the relatively more inelastic side bears more of the tax, supported by at least one diagram or simple numerical example. Some development of the mechanism by which prices change and burdens are shared.
- **Level 3** (8-10): A well-developed analysis that uses diagrams and numerical examples to show how varying PED and PES change the division of tax burden. Discussion of limitations, such as time periods, market imperfections, non-linear curves, and practical measurement issues, leading to a reasoned conclusion.
- **Indicative content:**
  - Tax incidence depends on relative PED and PES: the more inelastic side of the market bears a larger share of the tax burden
  - Diagram: supply and demand with a vertical specific tax wedge, showing new consumer price and producer net price; label consumer and producer tax burdens
  - Numerical example: if demand is very inelastic and supply elastic, consumers pay most of the tax (price to consumers rises significantly, producers' net price falls little)
  - Conversely, if demand is elastic and supply inelastic, producers bear most of the tax
  - Explain mechanism: price adjustment occurs until consumers' reduced quantity demanded equals producers' quantity supplied net of tax; elasticities determine how quantity responds and therefore how the price split adjusts
  - Limitations: short run versus long run elasticities differ, ad valorem taxes change with price, market power and non-competitive behaviour alter incidence, tax shifting may be affected by contracts and regulations
  - Consider equity and distributional implications and practical difficulty in estimating elasticities, conclude that elasticity is the key theoretical determinant but real-world outcomes require empirical estimation and may differ

Question 9

- **M1** consumer surplus height = demand intercept minus consumer price = 20 - 6 = 14, so CS = 1/2 x 50 x 14
- **A1** consumer surplus = 1/2 x 50 x 14 = GBP 350
- **M1** producers receive price including subsidy = consumer price + subsidy = 6 + 3 = 9, producer surplus height = 9 - supply intercept = 9 - 0 = 9, so PS = 1/2 x 50 x 9
- **A1** producer surplus = 1/2 x 50 x 9 = GBP 225; government cost = subsidy x quantity = 3 x 50 = GBP 150; net total surplus = 350 + 225 - 150 = GBP 425, which is GBP 25 higher than the original GBP 400
- **Answer: Consumer surplus = GBP 350; Producer surplus = GBP 225; Government cost = GBP 150; Net total surplus = GBP 425, an increase of GBP 25 versus the original GBP 400.**

Question 10

- **B1** PED formula: % change in quantity demanded / % change in price; PES formula: % change in quantity supplied / % change in price
- **B1** interpretation: PED = -0.5 means demand is relatively inelastic, a 1% price rise reduces quantity demanded by 0.5%; PES = 2.0 means supply is relatively elastic, a 1% price rise increases quantity supplied by 2%
- **Answer: PED = % change in Qd / % change in P; PES = % change in Qs / % change in P. PED = -0.5 is relatively**

Question 11

- **M1** consumer burden per unit = consumer price after tax minus price before tax = 10 - 8 = GBP 2, total consumer burden = 2 x 30 = GBP 60
- **A1** producer burden per unit = tax minus consumer burden per unit = 4 - 2 = GBP 2, total producer burden = 2 x 30 = GBP 60
- **Answer: Consumers bear GBP 60 in total; producers bear GBP 60 in total.**

Question 12

- **Level 1** (1-3): Basic assertions about tax incidence with little application or development. Limited or no consideration of alternative factors. Conclusion, if any, is weak.
- **Level 2** (4-6): Clear explanation that taxes can fall on consumers depending on relative elasticities, with some examples or brief discussion of tax types. Limited evaluation of other factors or time dimension.
- **Level 3** (7-9): Good analysis using elasticities and types of tax, including diagrams or examples. Discusses market structure and time lags, and presents balanced argument with some evaluation of caveats.
- **Level 4** (10-12): Well developed answer covering elasticity effects, specific versus ad valorem distinction, market power, and short-run versus long-run differences. Includes strong use of examples and critical discussion of empirical and measurement issues.
- **Level 5** (13-15): Comprehensive evaluation that integrates theory and real-world considerations, weighs multiple arguments, addresses limitations and uncertainties, and reaches a clear, well-supported judgement on whether indirect taxes always fall mostly on consumers.
- **Indicative content:**
  - Theory: elasticity rule, more inelastic side bears larger share of tax; diagrams showing cases where consumers bear more and where producers bear more
  - Type of tax: specific versus ad valorem can affect incidence; ad valorem incidence can vary with price level
  - Market structure: in imperfect competition producers with market power may be able to pass on more of the tax, or may absorb more depending on demand sensitivity
  - Time dimension: short-run elasticities often lower than long-run elasticities so consumers may bear more initially but less later
  - Other factors: legal incidence differs from economic incidence; contracts, regulation, and vertical integration affect shifting; measurement problems in estimating elasticities
  - Empirical evidence: mixed results across markets, some goods with inelastic demand (tobacco) see most tax borne by consumers, others with elastic demand see producers absorb more
  - Judgement: indirect taxes do not always fall mostly on consumers; the distribution depends on elasticities, tax design, and market conditions. A qualified conclusion should state when the claim tends to hold and when it does not