1.15 Consumer and Producer Surplus and the Incidence of Indirect Taxes

Total Marks

AQA 7136 · Calculators not allowed · about 65 minutes · Write-in edition

Name: _____ Date: ____ / ____ / _____

Answer all questions. Full sentences are required for questions worth 4 marks or more. Allowed time: 65 minutes. No calculator is needed; round whole-number prices and quantities are used.

1 Using the specific tax example from Question 5 (£4 per unit, consumer price rose from £8 to £10.40, quantity fell from 40 to 32), calculate the total monetary burden borne by consumers and by producers. Show your working.

(Total for Question 1 is 2 marks)

2 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 2 is 15 marks)

3 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 £8 and quantity 40 units. On your diagram, label the consumer surplus area and the producer surplus area clearly.

(Total for Question 3 is 2 marks)

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4 In Harwell's canned tea market the demand curve crosses the price axis at £20 (intercept) and the supply curve crosses the price axis at £0. Using the equilibrium price £8 and quantity 40 given in Question 3, 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 4 is 4 marks)

5 A specific indirect tax of £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 £4. Using the demand curve $P = 20 - 0.3Q$ and supply curve $P = 0.2Q$ from Question 4 (fitted to intercept £20 and equilibrium price £8, quantity 40), the new market equilibrium price paid by consumers becomes £10.40 and the new equilibrium quantity is 32 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 £20 and original supply intercept £0 where needed. Give all numerical answers in GBP.

(Total for Question 5 is 6 marks)

6 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 6 is 10 marks)

7 A per-unit subsidy of £3 is introduced for canned tea producers in Harwell. Solving the demand curve $P = 20 - 0.3Q$ against the subsidised supply curve $P = 0.2Q - 3$ from Question 4's original curves, the consumer price falls to £6.20 and the new equilibrium quantity rises to 46 units. Using the original demand intercept £20 and original supply intercept £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 £400.

(Total for Question 7 is 4 marks)

Mark scheme · 1.15 Consumer and Producer Surplus and the Incidence of Indirect Taxes

Question 1

consumer burden per unit = consumer price after tax minus price before tax = 10.40 - 8 = £2.40, total consumer burden = 2.40 x 32 = £76.80 **M1**

producer burden per unit = tax minus consumer burden per unit = 4 - 2.40 = £1.60, total producer burden = 1.60 x 32 = £51.20 **A1**

Answer: Consumers bear £76.80 in total; producers bear £51.20 in total.

Question 2

Level 1 Basic assertions about tax incidence with little application or development. Limited or no consideration of alternative factors. Conclusion, if any, is weak. **1-3**

Level 2 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. **4-6**

Level 3 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. **7-9**

Level 4 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. **10-12**

Level 5 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. **13-15**

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

Question 3

correctly labels the consumer surplus area, as the triangular area above price £8 and below the demand curve, up to quantity 40 **B1**

correctly labels the producer surplus area, as the triangular area below price £8 and above the supply curve, up to quantity 40 **B1**

Answer: Consumer surplus: triangle above price £8 below demand up to Q=40; Producer surplus: triangle below price £8 above supply up to Q=40.

Question 4

method: area of triangle = 1/2 x base x height, consumer surplus height = demand intercept minus price = 20 - 8 = 12 **M1**

consumer surplus = 1/2 x 40 x 12 = £240 **A1**

producer surplus height = price minus supply intercept = 8 - 0 = 8, area = 1/2 x 40 x 8 **M1**

producer surplus = 1/2 x 40 x 8 = £160 **A1**

Answer: Consumer surplus = £240; Producer surplus = £160.

Question 5

consumer surplus: height = demand intercept minus consumer price = 20 - 10.40 = 9.60, so CS = 1/2 x 32 x 9.60 **M1**

consumer surplus = 1/2 x 32 x 9.60 = £153.60 **A1**

producers receive net price = consumer price minus tax = 10.40 - 4 = 6.40; producer surplus height = 6.40 - supply intercept = 6.40 - 0 = 6.40, so PS = 1/2 x 32 x 6.40 **M1**

producer surplus = 1/2 x 32 x 6.40 = £102.40 **A1**

tax revenue = tax per unit x quantity = 4 x 32 = £128 **M1**

deadweight loss = loss of total surplus: before tax total surplus = 240 + 160 = 400; after tax total surplus = CS + PS + tax revenue = 153.60 + 102.40 + 128 = 384, so DWL = 400 - 384 = £16 (matches 0.5 x tax x fall in quantity = 0.5 x 4 x 8 = £16) **A1**

Answer: Consumer surplus after tax = £153.60; Producer surplus (net of tax) = £102.40; Tax revenue = £128; Deadweight loss = £16.

Question 6

Level 1 Basic statements about tax incidence with limited or no use of elasticity. Limited or no diagrams. Little or no development or evaluation. **1-3**

Level 2 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. **4-7**

Level 3 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. **8-10**

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 7

consumer surplus height = demand intercept minus consumer price = 20 - 6.20 = 13.80, so CS = 1/2 x 46 x 13.80 **M1**

consumer surplus = 1/2 x 46 x 13.80 = £317.40 **A1**

producers receive price including subsidy = consumer price + subsidy = 6.20 + 3 = 9.20, producer surplus height = 9.20 - supply intercept = 9.20 - 0 = 9.20, so PS = 1/2 x 46 x 9.20 **M1**

producer surplus = 1/2 x 46 x 9.20 = £211.60; government cost = subsidy x quantity = 3 x 46 = £138; net total surplus = 317.40 + 211.60 - 138 = £391.00, which is £9 lower than the original £400, i.e. the subsidy induces overproduction beyond the efficient quantity and creates a deadweight loss (= 0.5 x subsidy x rise in quantity = 0.5 x 3 x 6 = £9) **A1**

Answer: Consumer surplus = £317.40; Producer surplus = £211.60; Government cost = £138.00; Net total surplus = £391.00, a decrease of £9.00 versus the original £400 (the subsidy creates a deadweight loss by inducing overproduction).