3.6 Market failure and intervention

Name: _____ Class: _____ Date: _____ **Total: 20 marks**

KEY WORDS externality • marginal social cost • incidence

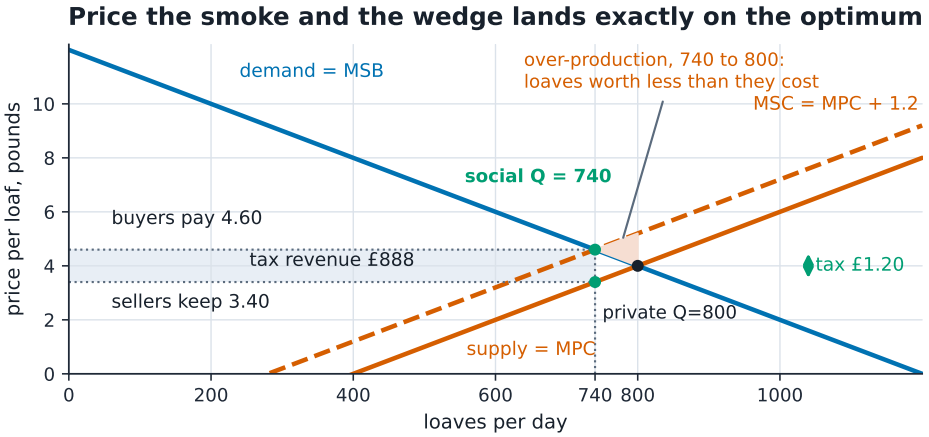
Objective

Compute a market's private equilibrium and its social optimum under an external cost; size the Pigouvian tax and its wedge; separate the revenue rectangle from the welfare triangle; classify failures; state the limits honestly.

1 Key knowledge and worked examples

■ Costs that miss the bill

An **externality** puts a cost on outsiders, so the private curves miss it: **marginal social cost** = private cost + external cost. The optimum sets MSB = MSC; a tax equal to the external cost makes the private arithmetic tell the social truth, and elasticities – not paperwork – divide the burden (**incidence**).



Price the smoke and the wedge lands exactly on the optimum

■ Worked example. The mill's £1.20

Private: 800 loaves at £4. With the £1.20 damage priced, buyers face P_c and sellers keep $P_c - 1.2$: $1200 - 100P_c = 400 + 100(P_c - 1.2)$ gives £4.60 / £3.40 and Q = 740 ✓ – the MSB = MSC quantity, wedge split £0.60/£0.60 ✓, revenue $740 \times 1.2 =$ £888 ✓, pure gain the small triangle ≈ £36 a day ✓.

2 Practice

The brewery downstream empties warm water into the canal; each crate of beer carries £1.00 of unpriced damage. The private market has $Q_d = 800 - 100P$ and $Q_s = 100P$ (P in £ per crate).

2.1 Compute the private equilibrium. Then compute the social optimum: the price buyers pay, the price sellers keep, and the quantity. [5]

2.2 Check crate 390 explicitly: the buyer's value, the seller's private cost, and the full social cost. Should it be brewed? [3]

2.3 For the £1 tax at the optimum: compute the tax revenue, and explain in one line each why the revenue is a transfer but the triangle is a gain. [4]

2.4 Classify each situation: (a) the canal damage above; (b) the towpath's new street lighting; (c) a stall selling day-old pastries as fresh; (d) beer prices rising because barley is dearer this year. [4]

2.5 The council levies £1 per crate as ordinary revenue and leaves the brewery's outfall unpriced; separately, an engineer values the true damage at £1.40, not £1.00. In two lines each: what does each error do? [4]

exercises.lol exercises.com.cn

Solutions

2.1

- Private: $800 - 100P = 100P$ gives $P = £4$, $Q = 400$ crates.
- Social: buyers pay P_c, sellers keep $P_c - 1$.
- $800 - 100P_c = 100(P_c - 1)$ gives $P_c = £4.50$, $P_p = £3.50$.
- $Q = 350$.
- Fifty crates fewer than the private market.

2.2

- Buyer's value at 390: $8 - 390/100 = £4.10$.
- Private cost £3.90; social cost $3.90 + 1.00 = £4.90$.
- $£4.90 > £4.10$ – **not worth brewing**, even though the private ledger shows a 20p gain. Crates 351–400 all fail this test.

2.3

- Revenue: $350 \times £1 = £350$.
- It is money moved from buyers and sellers to the council – nothing created: a transfer.
- The triangle $\frac{1}{2} \times 1 \times 50 = £25$ is damage that no longer happens, net of value forgone.
- The only pure gain – and small.

2.4

- (a) Externality – an external cost on the canal.
- (b) Public good – non-rival and non-excludable, so no price can fund it.
- (c) Information failure – the seller knows what the buyer cannot.
- (d) No failure – a real cost moved, and the price tells the truth.

2.5

- Wrong target: the wedge still cuts quantity to 350, but the outfall still pours – the quantity moved, the failure did not.
- Wrong number: a £1 tax under-prices a £1.40 damage.
- Solving with 1.4 gives Q = 330, so crates 331–350 are still brewed although they should not be.
- Measurement IS the policy.

exercises.lol exercises.com.cn