Model Solutions, Exam 2023-10-17.

Multiple choice questions.

1. b 2. d 3. f 4. b 5. b 6. d 7. a 8. f

Text questions.

I (a) A decision-maker who values uncertain payoffs below their expected value displays **risk aversion**. For example, a gambler who is willing to pay less than €50 for a 50-50 chance of €100 or nothing displays risk aversion.

(b) The demand for **inferior goods** is decreasing in income. For example, if income growth results in reduced levels of spending on fast food, then fast food is an inferior good.

(c) **User cost of capital** is the economic one-period cost of a long-lasting capital good. For example, the one-year user cost of a car takes into account the decrease in its resale value after a year of use and the lost return that the funds tied up in the car could have earned elsewhere.[1]

II Consumers can re-optimize their consumption choices after a change in the price of staples. Using the fixed spending shares based on previous consumption choices as the weights, the average change in prices is indeed 15%, but this would surely be an overestimate because it does not allow for any substitution. The argument is based on a simplistic idea of how consumer price index should be calculated and is therefore flawed.

III (a) Reservation price is the lowest price at which a deal gives non-negative profits. Because Omnibus has already committed to providing the urban bus service, the fixed cost of operating a bus depot is sunk. The reservation price for providing the urban service is just the additional cost of providing the urban service, that is, €30 million/year.

(b) Now there are no sunk costs. The reservation price is simply the total cost from operating both lines, that is, $30 + 15 + 25 = 70$ (€m/year).

(c) Omnibus accepts one or both offers if at least one of the following deals are profitable: i) providing only urban services (U), ii) providing only suburban services (S), or iii) providing both the suburban and the urban services.

Either of the one-service deals would give positive profits when accepted separately if the price covers total cost (€m/year): $P_S \geq 30 + 25 = 55$ and $P_U \geq 15 + 25 = 40$.

[1] A perfect answer addresses both 1) the change in resale value (real depreciation) and 2) discounting (opportunity cost of capital).

Accepting both deals would give positive profits if the sum of prices meets the total cost from part IIIb: $P_S + P_U \geq 70 \iff P_U \geq 70 - P_S$. However, it never makes sense to agree to offers that don't cover their marginal cost. Even when accepting both offers would give positive profits, it is more profitable to accept only S if $P_U < 15$ and only U when $P_S < 30$. Figure 1 shows the areas implied by these inequalities in $\{P_S, P_U\}$-space.

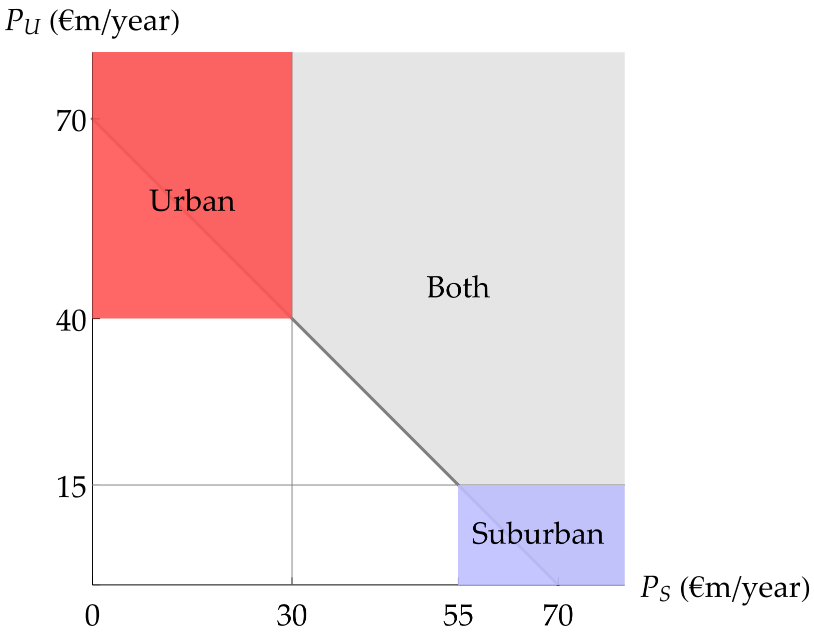

Figure 1: Shaded regions correspond to combinations of prices $\{P_S, P_U\}$ at which Omnibus should accept one or both take-it-or-leave-it offers in part IIIc.

IV (a) Total surplus is the sum of producer and consumer surplus. Here marginal costs are constant, so the only way to pay for the fixed costs is to either set price above marginal costs or to get a subsidy. Subject to the balanced budget constraint, the water utility maximizes total surplus by setting price equal to average cost, $\text{AC}(Q^D(p)) = p$:

$$\text{MC} + \frac{\text{FC}}{Q^D(p)} = p$$
$$2 + \frac{240}{40 - p} = p \iff$$
$$320 - 42p - p^2 = 0 \implies$$
$$p^{\text{AC}} = 10.$$

The other solution to the quadratic equation is nonsensical (budget is in balance, but higher price results in lower surplus). Hence, the price is €10 m/Gl.

(b) The efficient price maximizes total surplus. This price is such that the marginal buyer valuation equals the marginal cost of production, which is 2 (€m/Gl). At this price the utility would make a loss, which a subsidy will have to cover. Since marginal costs are constant, the revenue from customers will exactly offset the variable costs. It remains for the government subsidy to pay for the fixed costs, €240 million.

(c) The water utility maximizes profits by applying the MR=MC rule. It faces demand (in inverse form) $P^D(q) = 40 - q$, so marginal revenue is

$$\text{MR}(q) = \frac{\partial(P^D(q)q)}{\partial q} = 40 - 2q.$$

We can now solve the profit-maximizing level of output from $\text{MR}(q) = \text{MC}$:

$$40 - 2q = 2 \implies q^M = 19.$$

The profit-maximizing price is $p^M = P^D(q^M) = 40 - 19 = 21$.

Total surplus is now reduced compared to average-cost pricing in part IVa, because less tap water is consumed. The reduction in surplus equals the area below the demand curve and above the marginal cost curve, between the two levels of output q^M and q^{AC}. (This is illustrated as the shaded area in Figure 2.) Noting that $q^{\text{AC}} = Q(p^{\text{AC}}) = 30$, we can calculate this area.

$$\begin{aligned}\Delta\text{TS} &= \Big(\frac{p^{\text{AC}} + p^M}{2} - \text{MC}\Big) \times (q^{\text{AC}} - q^M) \\ &= \Big(\frac{10 + 21}{2} - 2\Big) \times (30 - 19) \\ &= 148.5\end{aligned}$$

Profit-maximization reduces total surplus from tap water by €148.5 million.

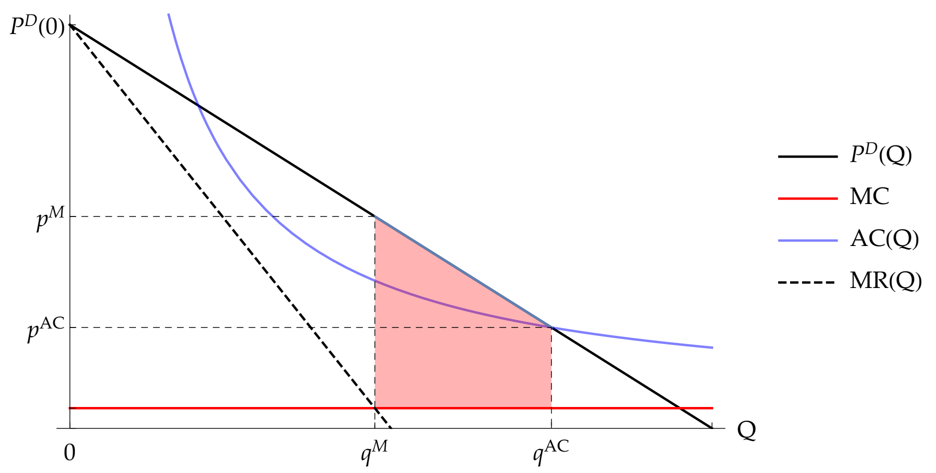

Figure 2: Shaded region corresponds to the reduction in total surplus in part IVc.