Model Solutions: Exam 1

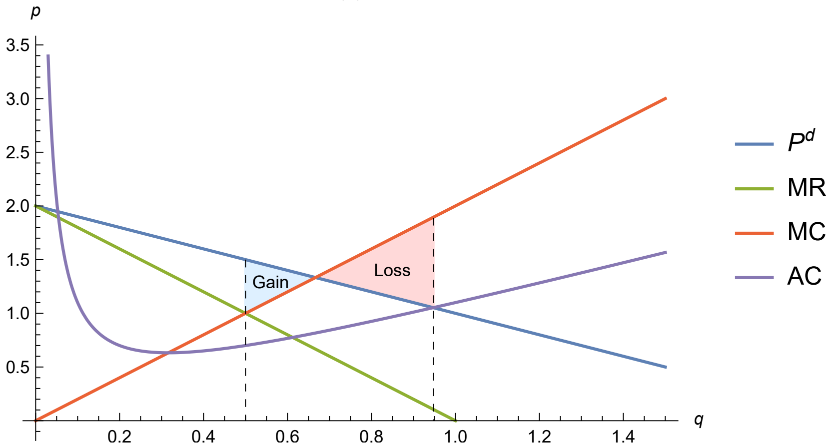
I The rent is a fixed cost and doesn't therefore affect Rääsy's optimal price or quantity supplied. If Rääsy, however, would find production unprofitable after the price hike, it would exit the market causing the prices at other retailers to increase.

II If the speculators have suffered losses, they must have made purchases when price is high and sold when prices are low. The purchases increase demand and therefore have further increased the price whereas sales have further decreased the price as they increase supply. Therefore, if the speculators have made losses, their presence has increased price volatility an vice versa.

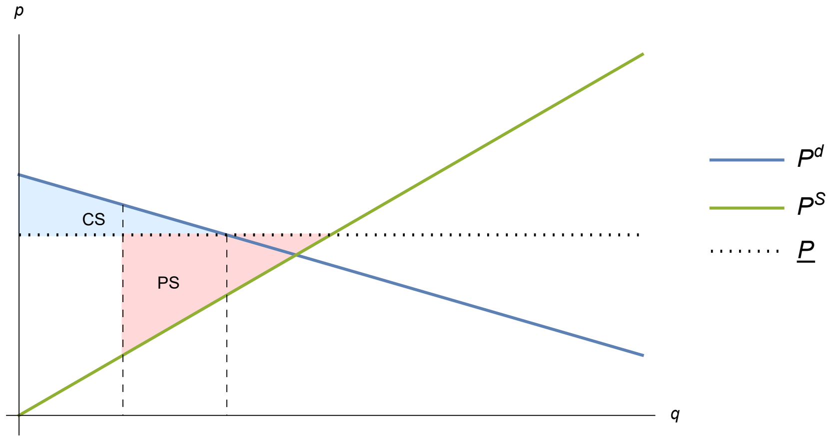
III Workers, having a more elastic demand, are more likely to vote with their feet if price is increased. Acme would therefore like to set a higher price for students but they wouldn't show their ID if that'd give a higher price. Acme therefore is out of luck trying to discriminate between the groups.

IV .

(a)



(b)



V (a) Marginal cost equals transportation cost plus production cost and is uniformly distributed between 5+5=10 and 4+5=50. Quantity supplied therefore is zero at $p \leq 10$ and 1000 at $p \geq 50$. Uniformly distributed costs imply linear supply, and knowing two points on the curve, $p^S(0) = 10$ and $p^S(1000) = 50$ we can deduce its formula: $p^S(Q) = 10 + q/25$. Inverse demand is $p^d(Q) = 48 - q/25$. Equilibrium quantity and price are found by equating supply with demand:

$$\begin{aligned} 10 + q/25 = 48 - q/25 \implies \\ q* = 475 \implies \\ p^* = 29 \end{aligned}$$

Since each estate produces 1 unit of pellets, 475 estates produce in the equilibrium.

(b) Marginal cost is now uniform between 15 and 95. The two known points on the supply curve are $p^S(0) = 15$ and $p^S(1000) = 95$ and therefore the supply stands as $p^S(Q) = 15 + 2q/25$.

$$\begin{aligned} 15 + 2q/25 = 48 - q/25 \implies \\ q = 275 \implies \\ p = 37 \end{aligned}$$

Higher transportation cost causes $475 - 275 = 200$ estates to stop production.

(c) The household cooperative is now a monopsonist. It maximizes consumer surplus by purchasing a total quantity at which marginal expenditure equals marginal benefit:

$$\begin{aligned} \frac{\partial}{\partial q} q(10 + q/25) = 48 - q/25 \implies \\ 10 + 2q/25 = 48 - q/25 \implies \\ q^m = 316.666... \approx 317 \end{aligned}$$

This implies that it sets the price at $p^m = p^s(q^m) \approx 22.67$. Welfare aka total surplus is reduced because quantity is reduced. This reduction in welfare is the area between demand and supply curves that covers the change in quantity. In general it is $\int_{q^m}^{q^*} (p^d(q) - p^s(q) \mathrm{d}q$. Now with linear demand and supply this welfare loss is the area of a triangle

$$\begin{aligned} \Delta W &= (p^d(q^m) - p^s(q^m))(q^* - q^m)/2 \\ &= (35.33 - 22.67) \times (475 - 316.67)/2 \approx 1002 \end{aligned}$$

VI Since Bonk doesn't have fixed costs and its marginal cost is constant, it will produce at full capacity 500k whenever it can sell its products at $p \geq 20$. This generates on average a yearly profit of $500\,000 \times (40-20) = 10\,000\,000$ euro. For convenience, let's switch units to millions.

(a) Bonk would pay 100 now ($t = 0$) and earn a profit of 10 in periods 1,...,10. Starting in $t = 11$ the investment would be obsolete. Present value of profits is convenient to calculate as the difference in a positive perpetuity that begins in $t = 1$ and a negative that wipes out the profits starting in $t = 11$.

$$PV = -100 + \frac{10}{0.02} - (\frac{1}{1.02})^{10}\frac{10}{0.02} \approx -10.2$$

(b) The probability that the investment has not become obsolete after t years is $(1 - 0.06)^t$. The effective discount factor is therefore $(1 - 0.06)/(1 + 0.02)$ and present value from investing

$$\begin{aligned} PV &= -100 + 10\frac{1-0.06}{1+0.02} + 10\Big(\frac{1-0.06}{1+0.02}\Big)^2 + 10\Big(\frac{1-0.06}{1+0.02}\Big)^3 + ... \\ &= -100 + 10\frac{0.94}{1.02-0.94} = 17.5 \end{aligned}$$

(c) Bonk has the following options: invest right away, wait 5 years and invest if the news on x is good, or don't invest at all. Clearly investment after 5 years is not profitable if $x > 0$: $-10 + \frac{0}{0.02} < -10 + \frac{0.5}{1.02-0.5} \approx -9.04$. Present value of waiting and investing only if $x = 0$ is

$$PV_W = \frac{1}{3}\frac{1}{(1+0.02)^5}(-100 + \frac{10}{0.02}) \approx 118$$

Investing now means that theres is a risk of obsolescence after 5 years. Each of the obsolescence scenarios have 1/3 chance; if $x = 1$ it is immediate, if $x = 0$ Bonk continues to earn 10 per year forever, and the middle case $x = 0.5$ is similar to part VIb except the probability is now higher.

$$\begin{aligned} PV_N = -100 + \underbrace{\frac{10}{0.02} - \frac{10}{(1+0.02)^5}\frac{1}{0.02}}_{\text{years 1 to 5}} + \frac{10}{(1+0.02)^5}\frac{1}{3}\Big(\underbrace{\frac{1}{0.02}}_{x=0} + \underbrace{\frac{0.5}{1.02-0.5}}_{x=0.5} + \underbrace{0}_{x=1}\Big) \\ \approx 102 < PV_W. \end{aligned}$$

Bonk should wait 5 years and invest if it turns out that obsolescence is not a threat ($x = 0$).