Microeconomic Analysis — Solutions for Chapter 10 from Pindyck & Rubinfeld

FALL 2012 HEC MONTRÉAL — MARIO SAMANO

3. Substituting in the formula for the Lerner index we get $\frac{P-20}{P} = -\frac{1}{-2}$, which gives $P = 40$. When MC increases by 25% the new value for MC is $1.25 \times 20 = 25$, then the new Lerner index is $\frac{P-25}{P} = -\frac{1}{-2}$ which gives $P = 50$ and the increase from $P = 40$ to $P = 50$ is of 25%.

4. a) $TR = P \times Q = 120Q - 0.02Q^2$, by taking its derivative with respect to Q gives $MR = 120 - 0.04Q$. The derivative of the TC gives $MC = 60$. The condition $MR = MC$ gives $120 - 0.04Q = 60$, or $Q = 1,500$. Substituting in the demand function gives the price $P = 120 - 0.02 \times 1500 = 90$. Profits are $\pi = TR - TC = 90 \times 1500 - (60 \times 1500 + 25,000) = 20,000$.

   b) With the tax $MC = 60 + 14 = 74$. Now $MR = MC$ gives $120 - 0.04Q = 74$, or $Q = 1150$. Substituting in the demand function gives the price $P = 120 - 0.02 \times 1150 = 97$. Profits are $\pi = TR - TC = 83 \times 1150 - (60 \times 1150 + 25,000) = 1,450$.

11. a) $TR = P \times Q = 11Q - Q^2$, by taking the derivative with respect to quantity we get $MR = 11 - 2Q$. Since AC is constant and assuming there are no fixed costs, $MC = AC$. Therefore the quantity that maximizes profits is given by $11 - 2Q = 6$, or $Q = 2.5$. Plugging in the demand function we get $P = 8.5$. Profits are $\pi = TR - TC = 8.5 \times 2.5 - 6 \times 2.5 = 6.25$. Lerner index is $\frac{P-MC}{P} = \frac{8.5-6}{8.5} = 0.29$.

   b) The price ceiling makes the shape of the MR curve to be constant and equal to the price ceiling level for all output levels up to the intersection with the demand curve, then it continues on the original MR curve for output levels beyond that intersection. The demand curve gives a price of 7 when $Q = 4$. The intersection with MC still happens at $P = 6$ but the price charged is 7. The profits are $\pi = TR - TC = 7 \times 4 - 6 \times 4 = 4$. Lerner index is $\frac{7-6}{7} = 0.14$. Thus monopoly power decreased with the price ceiling.

   c) When price ceiling is equal to AC we have the largest level of output, which is given by the demand function: $6 = 11 - Q$, or $Q = 5$. Here the Lerner index is $\frac{6-6}{6} = 0$.

16. a) Total demand is the horizontal sum of the 10 household demands: $Q = 10 \times (50 - P)$, or $P = 50 - 0.1Q$. In order to not have deadweight loss, the price should be set equal to MC. Since $TC = 500 + Q$, $MC = 1$. Then that intersection occurs at $Q = 490$. Profits are $\pi = 1 \times 490 - (500 + 490) = -500$. And $CS = \frac{1}{2}(50 - 1)(490) = 12,005$.

   b) To ensure the monopoly doesn't lose money, price should be set at the AC level. Solve $\frac{500}{Q} + 1 = 50 - 0.1Q$.

c) The amount has to be equal to the losses in profits which are 500. When divided among the 10 households it gives $50 to be paid by each of them.