ECON3510 Tutorial 11 Answers - See Claudio's Answer Guide for Text/Missing Sections

2019

Exercise 1

1.1 Question 1

A's profit is:

$$\pi = (P - MC) \cdot Q_A = (130 - Q_A - Q_B - 10) \cdot Q_A$$

Taking FOC with respect to Q_A we have:

$$0 = \frac{\partial \pi}{\partial Q_A} = (130 - Q_A - Q_B - 10) + (-Q_A) \qquad (1)$$

Since the maximization problem is symmetrical for B so we have:

$$0 = 120 - 2Q_B - Q_A \qquad (2)$$

Setting equation $(1) = (2)$ we get:

$$120 - 2Q_A - Q_B = 120 - 2Q_B - Q_A$$

$$\therefore Q_A = Q_B \qquad (*)$$

We can plug equation (*) into (1) to find:

$$0 = 120 - 2Q_A - Q_B$$

$$0 = 120 - 3Q_A$$

$$Q_A = 40$$

$$Q_B = 40$$

$$P = 130 - Q_A - Q_B = 130 - 80 = 50$$

$$\pi_A = \pi_B = (P - MC)(Q_A) = (50 - 10) \cdot 40 = 1600$$

1.2 Question 2

A's profit is now:

$$\pi = (130 - Q_A - Q_B - 4)Q_A$$

Take FOC with respect to Q_A we have:

$$0 = 126 - 2Q_A - Q_B \qquad (1)$$

B's profit has not changed so:

$$0 = 120 - 2Q_B - Q_A \qquad (2)$$

Setting $(1) = (2)$ to yield:

$$126 - 2Q_A - Q_B = 120 - 2Q_B - Q_A$$

$$6 - Q_A = -Q_B$$

$$Q_B = Q_A - 6 \qquad (*)$$

Substitution equation (*) into (1) to get the following:

$$0 = 126 - 2Q_A - Q_A + 6$$

$$3Q_A = 132 \therefore Q_A = 44$$

$$Q_B = 38$$

$$P = 130 - 38 - 44 = 48$$

$$\pi_A = (P - MC)Q_A = (48 - 4)44 = 1936$$

$$\pi_B = (P - MC)Q_B = (48 - 10)44 = 1444$$

$$\Delta Revenue EU = 0 - 44 \cdot 6 = -264$$

$$\Delta Welfare EU = \Delta\pi_A + \Delta Rev = (1936 - 1600) - 264 = 72$$

$$\Delta Welfare US = \Delta\pi_B = 1444 - 1600 = -156$$

1.3 Question 3

Since B also applies the subsidy it has a symmetrical FOC with firm A so that:

$$0 = 126 - 2Q_A - Q_B \qquad (1)$$

$$0 = 126 - 2Q_B - Q_A \qquad (2)$$

Setting $(1) = (2)$ we get the following:

$$126 - 2Q_A - Q_B = 126 - 2Q_B - Q_A$$

$$Q_A = Q_B \qquad (*)$$

Substituting (*) into (1) yields:

$$0 = 126 - 2Q_A - Q_A$$

$$3Q_A = 126$$

$$Q_A = 42$$

$$Q_B = 42$$

$$P = 130 - 42 - 42 = 46$$

$$\pi_A = \pi_B = (46 - 4)42 = 1764$$

$$RevenueLossEU = RevenueLossUS = 42 \times 6 = 252$$

$$\Delta WelfareUS(rel1) = 1764 - 1600 - 252 = -88$$

$$\Delta WelfareEU(rel1) = 1764 - 1600 - 252 = -88$$

$$\Delta WelfareUS(rel2) = 1764 - 1444 - 252 = 68$$

$$\Delta WelfareEU(rel2) = 1764 - 1936 + 12 = -160$$

Note that both countries will be better off in the no subsidy case (question 1), however if we have case 2 with one subsidy then the US will retaliate with case 3

Exercise 2

See Claudio's answer guide or the tutorial recording