Microeconomics III - Assignment 1

tqn889, ldg790 og pmv384

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1.

a)

The strategy c is strictly dominated by a and we can eliminate it. C is strictly dominated by A and we can eliminate it.

b)

The following figure shows the best responses and the Nash equilibria.

$$NE = \{(A, b)(B, a)\}$$

	a	b	c
A	1, 1	3, 4	6, 0
B	4, 3	1, 1	2, 2
C	~~0, 6~~	~~2, 2~~	~~5, 5~~

c)

No, The strategy C and c will never be played which means there are no full support. We have two pure strategies which would be played with propability zero.

d)

$$
\begin{gathered}
\text{For player 1} \\
E(a) = 1 * q + 3 * (1 - q) = q + 3 - 3q \\
E(b) = 4 * q + 1 * (1 - q) = 4q + 1 - q \\
q + 3 - 3q = 4q + 1 - q \\
7q = 2 \\
q = \frac{2}{7} \\
\text{For player 2} \\
E(A) = 1 * p + 3 * (1 - p) = p + 3 - 3p \\
E(B) = 4p + 1 * (1 - p) = 4p + 1 - p \\
p + 3 - 3p = 4p + 1 - p \\
p = \frac{2}{7}
\end{gathered}
$$

The mixed strategy NE for both players are:

$$NE = \{(Player1, Player2) = (\frac{2}{7}, \frac{5}{7})(\frac{2}{7}, \frac{5}{7})\}$$

2.

a)

False as the problem is not inherent in the missing communication, but due to the higher payoff from confessing.

b)

True as IESDS will not eliminate a NE, because a NE can´t be strictly dominated by another strategy.

c)

True as both a_i and $a_i^{'}$ are Best Responses to the same strategy s_{-i}, therefore they must have the same utility, thus making the parameter p insignificant.

3.

a)

Player: Firm 1 and firm 2. Strategy: $S_1 = S_2 = R^+$ Payoff:

$$\pi_1(q_1, q_2) = (1 - q_1 - q_2 - \bar{q})q_1$$

$$\pi_2(q_1, q_2) = (1 - q_1 - q_2 - \bar{q})q_2$$

b)

$$\frac{\partial \pi_1}{\partial q_1} = 0 \Leftrightarrow$$

$$1 - 2q_1 - q_2 - \bar{q} = 0 \Leftrightarrow q_1 = \frac{1 - q_2 - \bar{q}}{2}$$

For firm 2:

$$q_2 = \frac{1 - q_1 - \bar{q}}{2}$$

This is the best response functions: for every quantity of the other firm, the quantity will maximize own payoff. The equilibrium will be:

$$q_1^* = \frac{1 - q_2^* - \bar{q}}{2}$$

For firm 2:

$$q_2^* = q_1^* = \frac{1 - q_1^* - \bar{q}}{2}$$

$$2q_1^* + q_1^* = 1 - \bar{q}$$

$$q_1^* = q_2^* = \frac{1 - \bar{q}}{3}$$

The nash equilibrium for both firms will be:

$NE = \{(player1, player2) = (\frac{1-\bar{q}}{3}), (\frac{1-\bar{q}}{3})\}$

c)

Firm 2 is better off when $\bar{q}$ is low (close to zero). This is due to the fact that, when $\bar{q}$ is low firm 2 wil produce more and earn higher profits.

4.

a)

Player 1 have the pure strategies L and R. Player 2 have the following pure strategies, AI, AO, BI, BO, CI, CO.

b)

If we start in the left node player 2 will play C and the payoff is (2,3). If we are in the right node player 2 will play I and the payoff is (1,0). Therefore player 1 will choose the node L because it will result in the highest payoff. The NE is then $(L)(CI)$

c)

Player 1 have the pure strategies; LMP, LMM, LPP, LPM, RMP, RMM, RPP, RPM. Player 2 have the pure strategies; OI, OO, II, IO.

d)

We start in the end node LI and player 1 will choose M. In the end node RI player 1 will choose P. In end node L player 2 will choose I. In end node R player 2 will choose I. Therefore we end up with the node, for player 1, RMP. For player 2 the node will be OI.

The Nash equilibrium is $NE = \{(RMP), (OI)\}$