ECN 453: Homework 3

Due: Start of class Monday 29th November.
You can work in groups of up to 3 people (hand in one solution per group).

1. New technology and market structure (30 points)

Consider an industry with market demand $Q = a - p$ and an infinite number of potential entrants with access to the same technology. Initially, the technology is given by $C = F + cq$. A new technology allows for a lower marginal cost $c' < c$ at the expense of a higher fixed cost $F' > F$.

Given $a = 10, F = 2, F' = 3, c = 2, c' = 1$.

a. Since there are an infinite number of potential entrants with access to the same technology, I am assuming a perfectly competitive market. In a perfectly competitive market, the profit maximization condition is given by:

$$\begin{aligned} MR &= MC \\ a - 2Q &= c \\ Q &= \frac{a-c}{2} \\ p &= \frac{a+c}{2} \end{aligned}$$

Then, equilibrium price under old technology:

$$p^{old} = \frac{10+2}{2} = 6$$

Then, equilibrium price under new technology:

$$p^{new} = \frac{10+1}{2} = 5.5$$

2. Repeated games (50 points)

Consider the following game and suppose that it is repeated an infinite number of times. Players have a discount value of δ.

		Player 2	
		L	R
Player 1	T	10 10	12 0
	B	0 12	1 1

a. Equilibrium payoff:

$$\Pi = 10 + \delta 10 + \delta^2 10 + \delta^3 10 + ... = \frac{10}{1-\delta}$$

Deviation payoff:

$$\Pi' = 12 + \delta + \delta^2 + \delta^3 + ... = 12 + \frac{\delta}{1-\delta}$$

Therefore, for collusion to sustain, we need:

$$\begin{aligned} \Pi &\geq \Pi' \\ \frac{10}{1-\delta} &\geq 12 + \frac{\delta}{1-\delta} \\ 10 - \delta &\geq 12(1-\delta) \\ \delta &\geq \frac{2}{11} \end{aligned}$$

b. Equilibrium payoff is the same.

Deviation payoff:

$$\Pi' = 12 + 0\delta + 0\delta^2 + 0\delta^3 + ... = 12$$

Therefore, for collusion to sustain, we need:

$$\begin{aligned} \Pi &\geq \Pi' \\ \frac{10}{1-\delta} &\geq 12 \\ 10 &\geq 12(1-\delta) \\ \delta &\geq \frac{2}{12} \end{aligned}$$

c. In part b, there is only a one-period benefit from deviating. After that the grim trigger strategy ensures that the payoff is zero forever. On the other hand, in part a, there is still a payoff after deviating of 1 forever. As a result, the agent would be incentivized to deviate at a lower cutoff value of δ (the discount factor), or in other words the agent would deviate if she values her future payoffs lower than what it would take her to deviate in part b.