Economics 380: Suggested Solutions 3

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1. A firm does not deviate

$$\pi^M \leq \frac{1}{1 - \delta} \pi^M \frac{N}{1 - \delta}$$

Now rearrange.

2. The first order conditions are given by

$$MR(q_1 + q_2) = MC_1(q_1) = MC_2(q_2).$$

3. (a) Under Bertrand, \( p = c_2 \). Profits are \( \pi_1 = c_2 - c_1 \) and \( \pi_2 = 0 \).

(b) Under monopoly pricing, \( p^M = v \) and \( \pi^M = v - c_1 \).

(c) To stop firm 2 deviating we require

$$(v - c_2) \leq \frac{1}{1 - \delta}$$

To stop firm 1 deviating we require

$$(v - c_1) + \frac{\delta}{1 - \delta}(c_2 - c_1) \leq \frac{1}{1 - \delta}(v - c_1 - t)$$

Putting these together,

$$(1 - \delta)(v - c_2) \leq t \leq \delta(v - c_2)$$

Hence we require \( \delta \geq 1/2 \).

(d) To stop firm 1 deviating we require

$$(v - c_1) + \frac{\delta}{1 - \delta}(c_2 - c_1) \leq \frac{1}{1 - \delta}q_1^*(v - c_1) \quad (1)$$

To stop firm 2 deviating we require

$$(v - c_2) \leq \frac{1}{1 - \delta}q_2^*(v - c_2)$$

If firm 2 is indifferent between deviating and not, \( q_2^* = 1 - \delta \), and \( q_1^* = \delta \). Substituting, into (1) and rearranging, cooperation requires

$$\delta \geq \frac{v - c_1}{2v - c_1 - c_2} > \frac{1}{2}$$

Intuitively, efficiency is higher in part (c), and so there is more to gain from cooperating.
4. If you bid 84, you’ll win with 43% chance, yielding profit 6.976.

5. A good answer would hit the following points.
   (a) Explain double marginalisation.
   (b) Explain what contractual devices can sidestep double marginalisation. For example, two-part tariffs.
   (c) Say what’s wrong with these contractual solutions. With two-part tariffs, we require a lot of information and need to stop arbitrage. Two-part tariffs are also unwieldy: can you imagine going to a two-part tariff style supermarket?
   (d) Practically there is evidence that it’s a problem. There are many real world examples, such as the hudson bay case.