Industrial Organization - Exercises Chapter 3

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Exercise 1: Collusion in a quantity oligopoly

Consider a repeated game where in each period $t \in 1, 2, \ldots, T$, n firms (the same discount factor $\delta \in [0, 1]$) independently choose the quantity of an identical good they produce. We denote

— $N = \{1, 2, , ..., n\}$: the set of n firms;
— $C(q) = cq$: identical production cost function for each firm, with $c \in [0, 1)$;
— $\pi_i(p, q) = (p - c)q$: firm i's profit when producing q units and selling it at price p;
— $q_i(t)$: the quantity produced by firm i at period t; and
— $Q(t) = \sum_{i=1}^{N} q_i(t)$: aggregate output at period t.

Once the quantities produced have been observed, all firms sell the good at market price $p\,(t)$ which is established at $1 - Q(t)$ if $Q\,(t) \leq 1$ and zero otherwise.

a) *In the stage game, determine the aggregate quantity that maximizes the aggregate profit that the firms can be led to share within a cartel (hint: think as if the cartel were a monopoly).*

b) *Determine the unique pure strategies Nash equilibrium payoff of the stage game.*

c) *Is collusion sustainable in equilibrium when the game is finitely repeated?*

d) *In the infinitely repeated game define a grim-trigger strategy devoted to sustain collusion.*

e) *For which discount factors is the corresponding strategy profile a Nash equilibrium of the repeated game? A subgame perfect Nash equilibrium? What is the influence of the number of firms?*

f) *Is collusion on another quantity sustainable in equilibrium? Under what conditions?*