

Tutorial 4. *Oligopoly.*

From EEA Ch. 16 do problems 4, 8, 13, 14 and 15.

Additional Problems

Problem 1. There are $N = 5$ firms selling homogeneous product in a market with demand $P = 180 - Q$, where Q is the output produced by all firms. Firms have identical costs $C_i = 150 + 30q_i$.

- (a) Suppose all firms except firm i produce identical output q_j . Derive $q_i^{BR}(q_j)$.
- (b) Find Cournot equilibrium.
- (c) Is this industry in long-run equilibrium?
- (d) How many firms will there be in the long-run in this market?

Problem 2. There are two identical firms in a market, each with costs $C_i = 30q_i$, where q_i is output produced by each firm. Market demand is $P = 210 - 1.5Q$, where $Q = q_1 + q_2$

- (a) Find Cournot equilibrium.
- (b) What will be the outcome if the firms decide to collude?
- (c) Suppose firm one believes that firm 2 honors collusion agreement. Does it have an incentive to honor it as well if this is a one-shot game?

Problem 3. There are two firms producing a differentiated product. For each firm the quantity demanded depends not only the price it is charging, but also on the price charged by the other firm. Firms' demands are:

$$\begin{aligned} q_1 &= 24 - 5p_1 + 2p_2 \\ q_2 &= 24 - 5p_2 + 2p_1 \end{aligned} \tag{1}$$

Assume production costs are zero.

- (a) Suppose the firms compete in prices, derive the best response functions for the firms.
- (b) Find equilibrium prices and quantities when firms choose prices simultaneously.
- (c) Suppose the firms decide to collude. What prices should they charge? What are the profits if they collude?
- (d) Using a diagram with p_1 on the horizontal axis and p_2 on the vertical, plot each firm's BR function; demonstrate the results from parts (b) and (c), draw the appropriate isoprofit curves.

- (d) Suppose one of the firms decides to defect on the agreement they formed in part (c). If firm 1 believes that firm 2 will honor the agreement, what price should it charge? How much profits will it make? How is firm 2 doing in this scenario?
- (e) Find subgame perfect equilibrium if firm 1 chooses its price first.

Do parts (a) and (b) from problem 11 in EEA Ch. 16.