

**Seminar Set 5 - Wed. 6 April**

Question 1. (exam 2012)

(a) Consider a duopoly where firm  $i$ 's demand is given by

$$D_i(p_i, p_j) = a - bp_i + dp_j,$$

where  $i, j = 1, 2, i \neq j$ ,  $p_i$  and  $p_j$  are the two firms' prices, and  $a, b$ , and  $d$  are parameters such that  $a > 0$  and  $b > d > 0$ . Suppose the two firms have identical unit costs of production equal to  $c$ , where  $0 < c < a$ , and let firms choose prices simultaneously. Illustrate the equilibrium in this market by drawing firms' best-response curves in  $(p_1, p_2)$  space. Explain why firms' prices are strategic complements. Find firms' equilibrium prices.

(b) Suppose now that firm 1 has a unit cost equal to  $c_1$ , which is known to both firms, while firm 2 has a unit cost equal to  $c_2$ , which is known only to firm 2 itself. Firm 1 only knows that  $c_2 = c_L$  with probability  $x$ , and  $c_2 = c_H$  with probability  $(1-x)$ , where  $c_1 > 0$ ,  $c_H > c_L > 0$ , and  $0 < x < 1$ . Illustrate the equilibrium in this situation with the help of a graph similar to the one used in (a).

(c) Discuss, in the situation described in (b), how an increase in  $x$ , the probability of firm 2 being low-cost, affects equilibrium prices. If firm 2 could choose  $x$ , which value would it choose?

(d) Discuss whether, by way of signalling, the privately informed firm can credibly convey information about its true cost to its rival firm.

Question 2. (modifications of an exam question in 2004)

Until 2004, the stated objective of Norwegian competition law was to ensure economic efficiency. In the 2004 law, a paragraph was added that emphasises the interest of consumers. The change of objective may have implications for how the competition authorities treat market developments, such as mergers.

<sup>1</sup>Updated version, with a fix in 2.c.

Consider the following market model. Demand is linear and given by  $p = 1 - Q$ , where  $p$  is market price and  $Q$  is total supply. There are two firms, 1 and 2. Output  $q_i$  of firm  $i$  is produced at constant unit costs, denoted  $c_i$ ,  $I = 1, 2$ . For simplicity, let:

$$c_1 = 0 \quad c_2 = c < \frac{1}{3}.$$

- (1) Assume first that the two firms compete in a Cournot fashion. Derive the following equilibrium values for profits, market price and consumer surplus:

$$\pi_1^D = \frac{1}{9} [1 + c]^2, \quad \pi_2^D = \frac{1}{9} [1 - 2c]^2, \quad p^D = \frac{1}{3} [1 + c], \quad CS^D = \frac{1}{18} [2 - c]^2$$

The sum of producer and consumer surplus becomes (you do not need to show this):

$$W^D = \pi_1^D + \pi_2^D + CS^D = \frac{1}{18} [8 - 8c + 11c^2].$$

- (b) Assume next that the two firms operate as a single entity. Derive the following equilibrium values for profits, market price and consumer surplus:

$$\pi_{1+2}^M = \frac{1}{4}, \quad p^M = \frac{1}{2}, \quad CS^M = \frac{1}{8}.$$

The sum of producer and consumer surplus becomes:

$$W^M = \pi_{1+2}^M + CS^M = \frac{3}{8}.$$

- (c) Compare the two outcomes above and discuss the merit of a merger between the two firms (hint:  $W^M < W^D$  if  $c < \frac{5}{22}$  and *vice versa*). Does the conclusion depend on to what extent consumer interests are taken into account?

- (d) Discuss how the above conclusions might be affected by different assumptions regarding

- economies of scale,
- number of firms,
- entry (or exit) following a merger,

- capacity constraints.

Does a consumer-welfare standard always lead to a more restrictive policy towards mergers than a standard based on total welfare?