ΠΜΣ «Οικονομική Επιστήμη»
ΕΚΠΑ Τμήμα Οικονομικών Επιστημών
Microeconomic Theory – Producer Theory January 2020
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Problem Set 2

1. A firm has a fixed cost F_0 and marginal costs

$$c = a + bq$$

where q is output.

(a) If the firm were a price-taker, what is the lowest price at which it would be prepared to produce a positive amount of output? If the competitive price were above this level, find the amount of output q^* that the firm would produce.

(b) If the firm is actually a monopolist and the inverse demand function is

$$p = A - \frac{1}{2}Bq$$

(where $A > a$ and $B > 0$) find the expression for the firm's marginal revenue in terms of output. Illustrate the optimum in a diagram and show that the firm will produce

$$q^{**} := \frac{A - a}{b + B}$$

What is the price charged p^{**} and the marginal cost c^{**} at this output level? Compare q^{**} and q^*.

(c) The government decides to regulate the monopoly. The regulator has the power to control the price by setting a ceiling p_{max}. Plot the average and marginal revenue curves that would then face the monopolist. Use these to show:

a. If $p_{max} > p^{**}$ the firm's output and price remain unchanged at q^{**} and p^{**}
b. If $p_{max} < c^{**}$ the firm's output will fall below q^{**}
c. Otherwise output will rise above q^{**}.

2. A monopolist has the cost function

$$C(q) = 100 + 6q + \frac{1}{2}[q]^2$$

(a) If the demand function is given by

$$q = 24 - \frac{1}{4}p$$

calculate the output-price combination which maximises profits

(b) Assume that it becomes possible to sell in a separate second market with demand determined by

$$q = 84 - \frac{3}{4}p$$

Calculate the prices which will be set in the two markets and the change in total output and profits from case (a).

(c) Now suppose that the firm still has access to both markets, but is prevented from discriminating between them. What will be the result?

3. Suppose that a firm owns two plants, each producing the same good. Every plant j's average cost is given by

$$AC_j(q_j) = a + \beta_j q_j \text{ for } q_j \geq 0, \text{where} j = \{1,2\}$$

where coefficient β_j may differ from plant to plant, i.e. if $\beta_1 > \beta_2$ plant 2 is more efficient than plant 1 since its average costs increase less rapidly in output. Assume that you are asked to determine the cost-minimizing distribution of aggregate output $q = q_1 + q_2$, among the two plants (i.e., for a given aggregate output q, how much q1 to produce in plant 1 and how much q2 to produce in plant 2.) For simplicity, consider that aggregate output q satisfies $q < \frac{a}{\max_j |\beta_j|}$. (You will be using this condition in part b.)

(a) If $\beta_j > 0$ for every plant j, how should output be located among the two plants?
(b) If $\beta_j < 0$ for every plant j, how should output be located among the two plants?
(c) If $\beta_j > 0$ for for some plants and $\beta_i < 0$ for others?

4. A firm has a fixed cost of €400 and a total variable costs = $20q + 0.25\,q^2$ where q is output.

(a) If the firm were a price-taker, what is the lowest price at which it would be prepared to produce a positive amount of output? How much output q^* would it produce at this price? What is the perfectly competitive firm's supply curve?
(b) If the firm is actually a monopolist and the inverse demand function is $p = 170 - q$. What is the price charged p^{**} and the marginal cost c^{**}at this ouput. Illustrate the monopoly optimum in a diagram.
(c) The government decides to regulate the monopoly. The government can set a ceiling of p_{max}. In a separate duplicate graph of b plot the average and marginal revenue curves that would face the monopolist, explaining how output will react to different price ceilings relative to c^{**} and p^{**}.
(d) Linking to diagram in (b) provide a diagramatic exposition of monopolistic competition and explain.