

PRELIMINARY EXAMINATION FOR THE Ph. D. DEGREE

**INDUSTRIAL ORGANIZATION**

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Answer **all** questions.

1. In 1972 the U.S. Federal Trade Commission charged the four largest U.S. manufacturers of ready-to-eat breakfast cereal (RTE cereal) with several antitrust violations, including conspiring through brand proliferation and differentiating similar products to prevent entry into the industry. The top six firms had 95% of the sales of cereal and, moreover, between 1950 and 1972 they introduced over 80 brands! Let us concentrate on the issue of *brand proliferation*. The charge was that those four firms introduced far more brands than would have been justified on the basis of simple profit maximization, with the purpose of crowding out the product space so that no new firms could enter (no profitable niches were left in the product space). One of the main arguments to support this claim was the claim that in the case of RTE cereal it costs less to serve the whole market with one product than with two or more products. The defendants countered that – even if it costs less to serve the whole market with one product than with more than one product – simple profit maximization justifies the marketing of more than one product. Is this possible? Doesn't profit maximization imply cost minimization? Show, by means of a detailed model, that the defendants' argument is not a contradictory argument.

2. There are two separate regions,  $A$  and  $B$ ,  $n$  firms in region  $A$  and  $m$  firms in region  $B$ . Each firm competes only with firms in the same region and competition is Cournot style (i.e. in output levels). Inverse demand in region  $i$  is given by

$$P_i = a_i - b_i Q_i \quad i \in \{A, B\}$$

where  $Q_i$  denotes total output in region  $i$ , while all firms have the same cost function:

$$C(q) = F + cq.$$

Each firm decides whether it should stay where it is or move to the other region by comparing the profit it is making now with the profit it would make if it moved. Assume that the firm has rational expectations about the latter (i.e. they look at the new equilibrium that would establish after the move) and expects that every other firm will stay put. *An equilibrium is defined as a situation where no firm wants to move.* Suppose that  $F = 0$ ,  $c = 1$ ,  $b_A = b_B = 2$ ,  $a_A = 100$ ,  $a_B = 50$ . Is  $n = 20$  and  $m = 10$  an equilibrium? If not, can you find values of  $n$  and  $m$  that give an equilibrium?

3. Carolina Electric is a single-product monopolist. Due to concerns about the electricity supply, the public utility regulator believes that conservation should be encouraged. The firm can undertake conservation efforts (advertising and so forth) of two types: effective and ineffective. Call the firm's expenditure on effective conservation efforts  $R_e$ , and expenditure on ineffective conservation efforts  $R_i$ . The demand function is  $Q = g(p, R_e)$ , with  $\partial Q / \partial p < 0, \partial Q / \partial R_e < 0, \partial Q / \partial R_i = 0$ . Assume that the firm is required to meet all demand at its posted price, so that it always operates on the demand curve. State any assumptions you make as you answer the question.
- What are the firm's optimal choices of price  $p$  and conservation efforts  $R_e$  and  $R_i$  when the firm is not constrained by the regulator in any way? If you use math, explain the outcome in words also.
  - If the regulator provides a subsidy to the firm of  $S = a(R_e + R_i)$ ,  $a > 1$ , with a maximum subsidy of  $S_{\max}$ , what is the outcome? Again, find the firm's optimal choices of  $p$ ,  $R_e$  and  $R_i$ . Explain the intuition behind your results.
  - If the regulator provides a subsidy to the firm of  $S = b(Q_0 - Q)$ ,  $b > 0$ , what is the outcome? Assume  $Q_0$  is your answer from part a. What are the firm's optimal choices of  $p$ ,  $R_e$  and  $R_i$ ? Explain the intuition behind your results.
  - Assume now the same setup as in part c, except that the firm faces a price cap of  $\bar{p} < p^m$ , where  $p^m$  is the monopoly price in the absence of any conservation or regulation. What are the firm's optimal choices of  $p$ ,  $R_e$  and  $R_i$ ? Explain the intuition behind your results.

4. Firm XYZ Corp is a regulated, single-product monopolist that has a downward sloping average cost curve. Assume that the second-best outcome is in the inelastic portion of demand. Assume that the firm knows the cost and demand curves, but the regulator does not.

- a. Define the concept of the second best in this case.

For each of the following, state and explain whether the firm is induced to produce at (or near) the second best. Note: you may not have time for complete mathematical proofs. Give your answer and reasoning first, and then prove as much as you can mathematically in the time remaining.

- b. Rate of return regulation with  $f > r$ .
- c. Rate of return regulation with  $f = r$ .
- d. Return on cost regulation, with the regulator setting an allowed rate of return on costs very low.
- e. Return on output regulation, with the regulator setting an allowed rate of return on output very low.
- f. The Vogelsang-Finsinger mechanism in equilibrium.