

**UCLA Economics Department Comprehensive Examination**  
**Industrial Organization**  
**June 2004**

**Answer four of the five questions. Some questions are easier than others. For the harder ones more credit will be given for incomplete answers.**

**1. Cross-border drug deal**

There is pressure currently to allow U.S. citizens to import pharmaceuticals from Canada at lower prices than they are asked to pay in the United States. That different prices can exist for the same good, when the good is durable and transportable, is due to existing U.S. law that bars re-importing pharmaceuticals. Removing this barrier presumably will make it difficult for two prices to exist for the same goods except for transportation costs.

Discuss the consequences of removing this barrier for (a) shareholders of U.S. pharmaceutical companies, (b) the well-being of present Canadian users of these pharmaceuticals, (c) the well-being of present U.S. users, and (d) the well-being of future generations of potential users in Canada and the U.S.

Note: Facts that may be relevant to your answer: There is free entry into the development, manufacture, and sale of pharmaceuticals except for patent protection. The structure of the existing pharmaceutical industry in the U.S. (and worldwide) is oligopolistic. Canadian citizens acquire most of their medications through purchases made by their national health service at prices negotiated with pharmaceutical suppliers by this service. Some of the answers to the questions asked above depend on the reason for the present difference in prices, so you had best think about this before answering (a) through (d).

**2. Corporate Governance**

Corporate governance problems are bringing forth new SEC and NYSE provisions. These largely deal with the size of corporate boards and compensation committees, how members of these boards and committees are to be selected, and how many of them need to be "independent" of the corporation (i.e., have no employment or business relationship with the corporation). The emphasis in these provisions is on putting more independent people on boards and compensation committees and on reducing the role of the CEO in selecting these people. These policies seem to view the present makeup of corporate boards as serving the interest of the CEO instead of shareholders. It could be, however, that board makeup serves corporate shareholders because of the direct influence of shareholders on corporate governance or because of market forces that make corporate management select boards that serve shareholders. (a) How would you determine the probability that shareholders do exert a meaningful influence on board makeup? (b) Are there some aspects of board makeup (i.e., size of board, fraction of board members who come from outside the firm and/or from different industries, time period of appointment to the board, and so on) that are likely to differ according to the strength of shareholder influence? (c) How would you model the board formation process for the task of assessing the influence of shareholder preferences on board structure and membership?

### 3. Product Differentiation and Consumer Poaching

There are two health clubs, each located at an end of a linear city on  $[-1, 1]$ . The left end club is club 1, and the right end club is club 2. Population density of the city is uniform. Residents in the city value an annual membership at a health club as  $V$ , and have a unit transportation cost of  $c \ll V$ . Both health clubs have zero marginal cost.

- (a) Consider first the problem of pricing competition in one period (year). Let the prices (membership fees) of the two clubs be  $p_1, p_2$ . Derive the equilibrium prices and profits.

Now consider the problem of two period pricing competition. At the beginning of the first year, the two clubs announce membership fees,  $p_1^1, p_2^1$ . At the beginning of the second year, they can announce a new set of prices. Suppose the clubs cannot offer long-term memberships that cover the two years, nor any other kind of commitment. Also suppose that at the beginning of the second year, the clubs can observe which club membership people had in the first year (e.g., showing membership cards or credit card receipts). Let  $r_1$  be club 1's renewal price for those who were club 1's members in the first year, and  $s_1$  be its offering of switch to those who were club 2's members in the first year. Similarly  $r_2$  and  $s_2$  can be defined. Assume there is no discounting.

- (b) Suppose in the first year, club 1's membership base is  $1+x$ , where  $x \in [-1, 1]$  is the indifferent customer in the first year. Derive the equilibrium prices and profits in the second period.
- (c) Derive the equilibrium prices in the first period and total profits for the clubs. Do the clubs make more money than twice of the equilibrium profits in (a)?

### 4. Price Dispersion of Homogeneous Products

Two supermarkets serve a community of consumers of mass 1. Consumers have unit demand (fixed demand of weekly food), and their reservation price is  $r$ . A proportion  $\alpha \in (0, 1)$  of the consumers are informed about the prices in the two supermarkets (e.g., from visiting them or reading the local newspaper), and will buy from the cheaper market. The rest of the consumers are totally uninformed (too busy) and will buy randomly from the two markets. Supermarket 1 has the same marginal cost as market 2:  $c_1 = c_2 < r$ . Suppose the two markets set prices simultaneously.

- (a) Is there any pure strategy equilibrium? If yes, find out the equilibrium prices and profits. If not, explain.
- (b) Find a symmetric mixed strategy equilibrium in which market  $i$  chooses prices according to a probability distribution  $F(p)$  on  $[\underline{p}, \bar{p}]$ .
- (c) Derive the equilibrium profits. If the mass  $1-\alpha$  of the informed consumers are not around anymore, will the markets' profit increase or decrease?

- (d) Suppose now that supermarket 1 has smaller marginal cost than market 2:  $c_1 < c_2 < r$ . Is there any mixed strategy equilibrium? If yes, find out the equilibrium prices and profits. If not, explain.

## 5. Asymmetric Information

Attempt either 5A or 5B but not both.

### 5A. Bidding for a contract

The city announces that it will pay \$200 (million) for the construction of a new City Hall. There are  $n$  approved bidders. Each has a cost which is an independent random draw from a uniform distribution with support  $C = [100, 200]$ . Each bidder must bid for the right to build the project. Bids are sealed and the high bidder is the winner. If firm  $j$  bids  $b_j$  and this is the high bid, it is paid  $200 - b_j$  upon completion of the project.

- What is the distribution of the value of the project (before bidding) to bidder  $j$ ?  
Hint:  $v_j = 200 - c_j$
- Characterize the equilibrium bid as a function of a bidder's valuation.
- Compare the expected cost in this auction with the expected cost if the high bidder pays the second highest price.
- In a typical procurement auction each bidder simply bids his project price  $p_j$ . The low bidder is the winner and is paid his bid upon completion. Characterize the equilibrium bid function in this case.
- Suppose that after the project is completed, the actual cost to the winning bidder will be revealed. Would it pay the procurer to charge announce that it will make an additional payment equal to some fraction of the cost? (Then if  $j$  is the winner he receives  $p_j + \alpha c_j$ ?  
(Hint: If  $\alpha$  is close to 1 what is the expected profit of the winner?)

### 5B. Price Discrimination

There are two types of customer. The  $n_1$  type 1 customers have a demand price function  $p_1 = 100 - 2q_1$ . The  $n_2$  type 2 customers have a demand price function  $p_2 = 100 - q_2$ . The cost of production is  $C(Q) = 20Q$  where  $Q = n_1q_1 + n_2q_2$ . Each person's type is private information.

- Characterize as completely as you can the profit maximizing non-linear pricing plans.
- Under what conditions, if any, is profit maximized with only one pricing plan?
- If some of the type 1 customers increase their demand for the product to  $p_3 = 100 - \frac{3}{2}q_3$ , how would this affect the quantity sold to type 2? How would it affect the amount that type 2 would pay?
- Explain carefully how you would set up and solve this problem if the cost of production  $C(Q)$  is quadratic rather than linear.