UCLA

Department of Economics

Second-Year Field Examination in

INDUSTRIAL ORGANIZATION

(Spring 2007)

Instructions:

- You have 4 hours for the exam.
- Answer any 5 out the 6 questions. All questions are weighted equally. Answering fewer than 5 questions is not advisable, so do not spend too much time on any question. Do NOT answer all questions.
- Be Sure To Clearly Number Each Question.
- Use a SEPARATE blue book to answer each question.
- Calculators and other electronic devices are not allowed.

GOOD LUCK!

1. Second degree price discrimination

There are 20 buyers with low demand price function $p_1(q_1) = 20 - 2q_1$ and 10 with high demand price function $p_2(q_2) = 40 - 2q_2$. The monopoly seller has the seller has $\bar{q}$ units available

(a) Write down the monopolist's optimization problem.
(b) If the seller has $\bar{q} = 240$ units available, are either of the following output vectors optimal?
$(q_1, q_2) = (3,18)$, $(q_1, q_2) = (4,16)$
(c) For what values of $\bar{q}$ will the monopolist sell only to the 10 high demanders?
(d) Describe how you would solve for the profit maximizing selling scheme if the monopolist can produce $\bar{q}$ units at a total cost of $C(\bar{q})$?
(e) The "problem" of monopoly is that the seller undersupplies buyers. To what extent it this true for the optimal selling scheme?

2. Merger Analysis

Suppose that the Ford and GM auto companies are proposing to merge. The US government has hired you as a consultant to help them decide whether to challenge this merger. Specifically, they want to know how much prices might increase as a result of the merger. They provide you with data on prices, quantities sold, and product characteristics of all automobiles for each of 20 years.
a) Describe carefully how you could use this data to answer their question.
b) Suppose that the government also has environmental concerns and are curious how the miles per gallon of new cars might change as a result of the merger. Is there a way you could assess this? How? What might the problems be?

3. Dynamics

Consider a dynamic equilibrium model of a market with J firms. Suppose that single period profits are given by:

P(S(jt),S(-jt),A(jt);theta(1))

where S(jt) is the capacity level of firm j in time t, S(-jt) are the capacity levels of the other firms in the market at time t. In each period, firm j chooses investment level A(jt). These investments impact future capacity according to the equation:

S(jt+1) = f(S(jt), A(jt), epsilon(jt), theta(2))

where epsilon is an i.i.d. shock to the capacity accumulation process that is not observed by firms before making their investment decision A(jt). Assume there is no entry or exit in this market.

a) Describe how you would use the Bajari, Benkard, and Levin (2007) methodology to estimate the parameter vectors theta(1) and theta(2). Be precise in your description.
b) How would you change this procedure if epsilon(jt) was observed by firms before making their investment decision?

4. Demand

Consider the homogeneous product demand curve:

$$Q(t) = \text{beta}(0) + \text{beta}(1)*P(t) + \text{beta}(2)*X(t) + \text{beta}(3)*Z(t) + \text{beta}(4)*Z(t)*P(t) + \text{epsilon}(t)$$

where t indexes market, Q(t) and P(t) are observed quantity and price, and X(t) and Z(t) are observed exogenous variables that affect demand. epsilon(t) is an unobserved demand shock.

Assume that firms are identical, and have marginal cost functions of:

$$MC(t) = \text{gamma}(0) + \text{gamma}(1)*Q(t) + \text{gamma}(2)*W(t) + \text{eta}(t)$$

where W(t) is an observed cost shifter and eta(t) is a cost shock.

a) Derive the industry supply relationship for this market as a function of theta, the "conjectural variations" parameter.
b) Describe precisely the interpretation of theta.
c) Under what conditions on the demand parameters (beta) is theta(t) identified? In other words, for what values of beta is theta identified, and for what values is theta not identified? Prove (with a similar degree of rigor as used in class) that this is the case.

Problem 5 There are N symmetric locations. Aggregate demand for the product offered by a competitive industry (e.g. retail) in each location is $p_j = D(Q_j)$, where Q_j is total output of firms in location j. There is a cost of entry to each location c_e for an outsider. A new entrant gets a shock s from a distribution $G(s)$ which then evolves according to a persistent Markov process with conditional cdf $F(s'|s)$. An incumbent that participates in n locations has net profit $\pi(n, s, p)$ in each location, where π is increasing in p and s Assume also $\partial\pi/\partial p$ is increasing in s.

At the beginning of every period an incumbent firm that participates in n markets gets a draw c from distribution H for its cost of entry to an arbitrary additional location. Let $v(n, s; p)$ denote the value of a firm with idiosyncratic productivity shock s that participates in n locations each with price p prior to getting this realization. Firms may also choose to exit markets, but assume they cannot exit more than one market in a given period.

1. Write down the dynamic programming equation for this firm's decision problem. What kind of assumptions would you need to make so that there is a stationary equilibrium with new (fresh) entry every period.

2. Define a stationary equilibrium with entry and exit. Provide an existence argument.

3. What testable empirical implications does the model have about store size of a firm and the number of markets it participates in? (If you think it may be ambiguous, explain why.)

4. What does the model imply about the relationship between the number of markets a firm participates and age? (If you think it may be ambiguous explain why.)

Problem 6 Consider the Lucas model of *span of control* with the following variation. There are two goods but each firm can produce only one of them. Production function for good 1 is zn^{α} where z is managerial ability and the production function for good 2 is $\theta z n^{\alpha}$, where $\theta > 1$ and $\alpha < 1$. The representative consumerhas preferences $u(c_1, c_2) = \ln(c_1) + \ln(c_2)$. The distribution of talent is given by $F(z)$.

1. Characterize the best you can the competitive equilibrium. Does the model have any predictions about the relative size of firms between the two sectors?

2. Suppose now the production function is identical in the two sectors but good one requires in addition n_0 workers to operate (this is like a fixed cost.) Characterize the best you can the competitive equilibrium. Does this model have different predictions?

3. Go back now to the assumptions of the original model but suppose the production function for good 2 is now given by $g(z)n^{\alpha}$, where $g(z)$ is strictly increasing, strictly concave and $g(0) = 0$. Characterize the best you can the competitive equilibrium.