

PRELIMINARY EXAMINATION FOR THE Ph.D. DEGREE
Industrial Organization June 22, 2004

Answer **four** of the six questions. You must choose at least one question from each of the three sections (A, B, and C) of the exam.

Section A

1. There are two complementary goods that are consumed together (each individual good is of no value to the consumer). Let k_1 be the quality of good 1 and k_2 be the quality of good 2, with $k_1, k_2 \in \{3, 6, 9\}$ (thus possible values for the pair (k_1, k_2) are (3,3), (3,6), (9,6), etc.). The quality of the composite good (the pair consisting of one unit of good 1 and one unit of good 2) is $k = \min(k_1, k_2)$. There are N consumers with the same income E but different values of the taste parameter θ , which is uniformly distributed in the interval $[0, 1]$. A consumer with taste parameter θ who buys the composite good of quality $k = \min(k_1, k_2)$ at price $p = p_1 + p_2$ obtains a utility of $E - p + \theta k$. If she does not buy the good her utility is equal to E . Each consumer either buys nothing or exactly one unit of the composite good (that is, one unit of good 1 and one unit of good 2).

There are two firms, one producing good 1 and the other producing good 2. The two firms play a two-stage game: in stage 1 they simultaneously choose the quality $k_i \in \{3, 6, 9\}$ of their products ($i = 1, 2$) and in stage 2, after the qualities have become known to both, they simultaneously choose their prices p_1 and p_2 . Prices can be any non-negative numbers. The **unit** cost of producing good i is constant and equal to $c_i k_i$ with $c_1 = 0$ and $c_2 = \frac{1}{3}$. To simplify calculations, let the number of consumers be $N = 81$.

- (a) Find the subgame-perfect equilibria of this two-stage game.

- (b) Rank the equilibria from the point of view of the firms, consumers and society.

2. Consider a street of length L miles, represented by the interval $[0, L]$. At every point on this street lives a consumer. Each consumer considers buying at most one unit of a particular good. If the consumer does not buy the good, her utility is zero. If she buys one unit of the good offered at location x at price p , her utility is equal to $E - p - |x - y|$, where y is the point where the consumer is located and $|\cdot|$ denotes the absolute value.

(a) Consider first the case where there is exactly one firm, located at point $\frac{L}{2}$. The firm

has to decide how much to spend on advertising and what price to charge. Advertising makes consumers aware of the firm's existence and its price. If the firm wants to inform consumers that live within a miles from it, it has to spend $\$(c \cdot a)$ on advertising. Thus, for example, if the firm spends \$100 on advertising, then the

consumers that live within $\frac{100}{c}$ miles on either side of the firm will be aware of the

firm's existence and the price it charges, so that the firm's potential market will be the

segment $\left[\frac{L}{2} - \frac{100}{c}, \frac{L}{2} + \frac{100}{c} \right]$. Find the firm's profit-maximizing price and advertising

expenditure, assuming that production costs are linear: $C(q) = k \cdot q$ ($k \geq 0$).

- Your answer should cover all the possible values of the parameters (L , E , c and k).
- Calculate the profit-maximizing price and advertising expenditure and the corresponding profits in the following two special cases: (1) $E = 16$, $L = 10$, $k = 2$, $c = 4$ and (2) $E = 10$, $L = 17$, $k = 6$, $c = 4$.

(b) Consider now the case where $E = \infty$ (consumers have an infinite reservation price), $k = 0$ (production costs are zero) and there are two firms, one located at point 0 and the other at point L . Each firm has to decide how much to spend on advertising (as before, if it spends $\$A$ on advertising then its potential market is the set of consumers who live within $\frac{A}{c}$ miles of the firm, in the relevant direction) and how much to charge for its product. To further simplify the analysis, let $c = 1$. The products they sell are in every other respect (i.e. apart from location) identical. Find the subgame-perfect equilibrium of the two-stage game where the firms first simultaneously set their prices and then (having observed each other's prices) they simultaneously decide how much to spend on advertising.

Section B

- 3.** (a) Discuss the logit demand model. In particular, discuss the assumptions underlying the model and the data needed to estimate the model.
- (b) The next few questions deal with Berry, Levinsohn and Pakes (*Econometrica* 1995) which estimates a model partially based on the logit demand model. Discuss the empirical setting of the model and the data.
- (c) Discuss the major differences between BLP and a “standard” logit demand model as well as any issues/weaknesses with the standard model that BLP seek to address.
- (d) Give a brief overview of BLP’s estimation strategy. Given the nature of their data are there additional hurdles that the authors must overcome? Discuss their results.
- (e) Compare and contrast BLP with Goldberg (*Econometrica* 1995). What are the similarities between the two papers? What are the key differences in the data and estimation strategies? In doing so discuss Goldberg’s empirical model and how it relates to the logit demand model.
- 4.** This question relates to “New Empirical Industrial Organization” studies that seek to estimate market power levels without marginal costs data.
- (a) Discuss the identification strategy of NEIO models. That is, what equation NEIO papers are estimating as well as the theoretical underpinnings of this key equation?
- (b) The NEIO model has been challenged on at least two fronts. Discuss two challenges to the validity of the NEIO model. Be as specific as you can.
- (c) Discuss Genesove and Mullin (Rand 1998). What is the empirical setting, what is the key feature of their data, what is the main research question and what are the key results?

Section C

5.

- a) Discuss in general some of the difficulties of testing capture theory or the economic theory of regulation.
- b) Explain the general structure of Laffont and Tirole's (QJE 1991) model of capture theory. In this model, explain the countervailing incentives an interest group has as it chooses how much "power" to have (e.g., the ability to organize, lobby the regulator, etc.).

One approach to empirical applications of capture theory is to use the capital asset pricing model (CAPM) to examine the return on the firm's stock before and after a regulatory change. Recall that the CAPM relates the return on the firm's stock, r , to the risk-free return r_f and the overall market return r_m as:

$$r = r_f + \beta(r_m - r_f) \quad (1)$$

In Lamdin's 1999 JRE article, he examines the effect of the cigarette advertising ban on tobacco companies with the following estimation equation:

$$r_t = \alpha + \beta r_{mt} + \gamma D_t + \delta D_t r_{mt} + \varepsilon_t \quad (2)$$

where D is a dummy variable that equals 1 during a time span shortly after the news of the ad ban was announced, and the t subscripts refer to time periods.

- c) Interpret what the coefficient γ is in (2). If Stigler's view of capture theory is correct, what do you expect the sign of γ to be?
- d) Interpret what the coefficient δ is in (2). Does capture theory have anything to say about the sign of δ ?
- e) Why is the cigarette ad ban a natural candidate for a capture theory model?

- 6.** In Lower Slobobia all electricity is provided by a publicly-owned enterprise. The manager of the firm is concerned only about the present discounted value of his income. In particular, the manager is *not* the residual claimant for the firm's profit. The manager in each period is paid a base salary Y large enough to put food on his table for his 16 children, and an incentive component A_t . Y is constant but A_t changes according to the compensation formula

$$A_t = (\pi_t - \pi_{t-1}) + x_{t-1}(p_t - p_{t-1})$$

where π is profit and the second component is the quantity-weighted output price change. Y is taken to be part of production cost, but A_t is paid "off the books" as a subsidy.

- Discuss the incentives this gives the manager. What will output and prices be after one period? In the limit?
- How does the manager's discount rate affect the outcome?
- Is this mechanism related to any others you are familiar with in the literature?
- Modify the incentive component to

$$B_t = x_{t-1}(p_t - p_{t-1}) - D \cdot \mathbf{1}(\pi_t < 0)$$

where D is a very large number and $\mathbf{1}(\cdot)$ is the indicator function. On an output and price graph, show the manager's incentive payments over a sequence of declining prices. Using the graph, explain the incentives B_t gives the manager.

- What is the outcome over time for prices under this incentive pay scheme?
- What informational requirements do the above mechanisms place on the regulator (i.e., the governmental authority that pays the manager's salary)?