14.271 Final Exam
December 16, 2013

Answer <u>all</u> questions. You have 3 hours in which to complete the exam. Don't spend too much time on any one question.

1. (50 Minutes – 24 Points)

(a) The equation below is taken from one of the papers on our reading list. What paper is it? Describe the main idea of this paper in three or four sentences and say how this equation fits into the paper.

$$S(\mathbf{Y}, \lambda) = \text{town population} + \lambda_1 \text{ nearby population}$$
$$+ \lambda_2 \text{ positive growth} + \lambda_3 \text{ negative growth} \tag{9}$$
$$+ \lambda_4 \text{ commuters out of the county.}$$

(b) What aspects of the sugar industry did Genesove and Mullin think made it a good environment in which to study predation? Where in their analysis do they exploit opportunities that might not be available in other industries? Which theories of predation that we discussed in class do they mention in their paper? What do you make of any omissions?

(c) Hendricks and Porter's sample includes both drainage tracts adjacent to one wildcat tract and drainage tracts that have multiple "incumbents" because they are adjacent to multiple wildcat tracts. Given their model of the auctions, how would you expect bidding on multiple-incumbent tracts to differ from bidding on single-incumbent tracts?

Their paper includes the table below comparing how often incumbents win tracts of both kinds and what their profits are. What conclusions can we take away from this table?

TABLE 4—THE EFFECT OF NEIGHBOR FIRM COMPETITION ON NEIGHBOR FIRM PARTICIPATION AND PROFITS[a]

	Single Neighbor Tracts	Multiple Neighbor Tracts No. of Neighbor Bids		
		1	≥ 2	Total
No. of Tracts	40	48	15	74
No. of Tracts with No Neighbor Bid	8	–	–	11
No. of Wins	19	29	11	40
Average Winning Bid	4.795	2.615	17.193	6.624
of Neighbor Firm	(1.444)	(0.697)	(9.953)	(2.885)
Average Gross Profits	13.601	4.670	32.597	12.350
of Neighbor Firm	(5.608)	(2.148)	(11.506)	(3.965)
Average Net Profits	8.806	2.055	15.404	5.725
of Neighbor Firm	(4.762)	(1.690)	(10.963)	(3.297)

[a]Dollar figures are in millions of $1972. The numbers in parentheses are the standard deviations of the sample means.

(d) Give a brief description of the methodology that Lewis and Reiley use to measure the effect of online advertising on retail sales. Why do they feel that estimating ad effectiveness is difficult? Can you think of other applications for which estimating ad effectiveness might be easier?

(e) Answer the following in one sentence or less:

What do Bresnahan and Reiss do with the data they collected on veterinarians, movie theaters, car dealers, and cooling contractors? Why?

What does Ellison's survey paper on bounded rationality say about competition between local telephone companies in the early 20th century?

What paper on our syllabus discussed "locally envy-free" equilibria?

What is Progressive Grocer?

2. (40 Minutes – 26 Points)

Consider a model similar to that of Grubb. A monopolist can provide cell phone service at a marginal cost of one dollar per hour. Assume that there are a continuum of consumers of unit mass. Assume that each consumer's demand varies from month-to-month in two different ways. First, the number of hours x_{it} that the consumer would enjoy using in each month is an independent random draw from a uniform distribution on $[0, 100]$. Second, the per-hour value v_{it} that the consumer will receive from making up to x_{it} hours of calls is an independent random draw from $[1, 3]$. More formally, assume that consumer i's utility from making x hours of calls and paying a total of T is

$$u(x, p; x_{it}, v_{it}) = \mathrm{Min}(x, x_{it})v_{it} - T,$$

where $x_{it} \sim U[0, 100]$ and $v_{it} \sim [1, 3]$. Each consumer i, however, does not learn x_{it} and v_{it} until after he has signed up for a cell phone plan. Hence, x_{it} and v_{it} can affect the number of minutes of calls the customer chooses to make in month t, but not the plan he has signed up for before the start of the month.

(a) Suppose first that consumers are fully rational. Suppose the monopolist can offer a fully nonlinear tariff $T(x)$ to consumers (or a menu of such tarrifs) and makes a take-it-or-leave-it offer to consumers before they learn their valuations. What is the monopolist's optimal pricing policy?

(b) Suppose now that consumers have an overconfidence bias. Suppose that they although x_{it} is actually a uniform random draw from $[0, 100]$ (and the monopolist knows this), the consumers believe that x_{it} is a uniform random draw from $[25, 75]$. What is the monopolist's optimal pricing policy?

(c) When discussing some behavioral IO papers in class, I noted that we could understand pricing policies by thinking about the pricing policy as an aspect of "product quality" and remembering that monopolists choose the optimal product quality in some circumstances. Briefly discuss papers from syllabus for which this was relevant and whether this implies that contracts are also socially optimal. How can we think about the contract from part (b) in this light?

(d) Suppose now that there are two types of consumers. Half are fully rational like the consumers from part (a) and half are overconfident like the consumers from part (b). What is the optimal pricing policy for the monopolist? How does this fit with the standard intuition that a price discriminating monopolist will provide suboptimal quality to low types and optimal quality to high types?

3. (40 Minutes – 26 Points)

Suppose a local government wants to hire a contractor to repave a road. The government gets a value of 1 if the road is repaved. Suppose that there are two contractors that could potentially be hired to do the job. Assume that their costs of doing the job, c_1 and c_2, are independent draws from a uniform distribution on $[0, 1]$. In a departure from the standard model, however, assume that each firm does not initially know its cost. Instead, a firm must incur a sunk cost of E in order to learn its cost and submit a bid. (To be clear, a firm cannot submit a bid without incurring E.)

Suppose first that the government uses a second-price sealed bid mechanism to choose a contractor. The two firms are invited to simultaneously submit bids b_1 and b_2. If one or more firms submits a bid the low-bidder wins and is paid the second lowest bid (if two bids are submitted) or 1 (if only one bid is submitted). If no bids are submitted then the project is not carried out. Assume that the firms simltaneously choose whether to invest E to learn their values, and then simultaneously submit their bids (or don't submit anything), and that each firm cannot observe whether the other firm invested E to learn its value so they don't know if the other firm wil be submitting a bid.

(a) Explain very briefly why it is an equilibrium for firms to bid their true cost in this auction if they decide to bid. Assuming that firms do bid this way, what is the expected price paid by the government and the expected profit of the winning bidder as a function of the number of firms that choose to bid?

(b) Find a symmetric Bayesian Nash equilibrium of this game. For what values of E does the equilibrium involve the firms mixing between bidding and not bidding? What is the expected social surplus in this case as a function of E?

(c) When E is in the range where the symmetric BNE is mixed, how does the equilibrium entry probability compare with the probability p that would maximize expected social surplus? Discuss briefly why entry can be too low or too high socially in imperfect competition models and give some intuition for why things turn out as they do in this model.

(d) Suppose that the government instead uses a sequential mechanism. It first asks firm 1 to submit a bid b_1. It then announces b_1 and asks firm 2 if it would like to bid as well. Find the equilibrium strategies for the firms in this model. What is the government's expected surplus? Can you think of an alternate sequential mechanism that might work better for the government?

4. (40 Minutes – 24 Points)

Consider a simple Butters-style model of informative advertising. Assume that there is a unit mass of consumers. Suppose that a firm can inform a fraction x of consumers about the existence of its product by spending x^2 on advertising. Assume that consumers who are informed get utility $1 - p$ if they purchase the product at price p and utility 0 if they do not purchase.

(a) What advertising level and price would a firm choose in a monopoly model?

(b) Consider a duopoly version of the model in which consumers who see both firms' advertisements buy from the firm with the lower price (assuming the price is less than one). Suppose that firm 1 has chosen to advertise to a fraction x_1 of consumers, that firm 2 has chosen to advertise to a fraction $x_2 \leq x_1$ of consumers, and that both firms know this before they simultaneously choose prices p_1 and p_2. Find an equilibrium of the pricing subgame and compute the equilibrium profits of both firms. (Hint: Recall that in an asymmetric model like this one firm can have a mass point on the upper bound of the support of the price distribution.)

(c) Consider a three-stage game in which firm 1 first chooses x_1, firm 2 then chooses x_2, and the firms then simultaneously choose p_1 and p_2 (after having observed x_1 and x_2). What level of x_2 will firm 2 choose if x_1 is large? Thinking about the analogy to strategic entry accomodation models comment on whether you would expect firm 2 to choose a larger or smaller value of x_2 if x_2 were not observed by firm 1.

(d) Suppose that firm 2's cost of advertising were $E + x^2$ instead of x^2. For what values of E would entry in this model be "blockaded"? Without doing a lot of calculations sketch how you would expect x_1^* to vary with E in this model and give a brief intuitive explanation for why you think this would occur.

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