

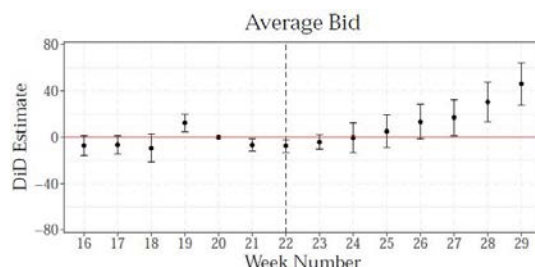
14.271 Final Exam
December 16, 2022

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

1. (50 Minutes – 34 Points)

(a) What actions by pharmaceutical firms do Ellison and Ellison examine as possible “strategic investments.” What does their paper say about the conditions under which we should expect the investment vs. market size relationship to be monotone if firms are not influenced by the strategic entry deterrence motive? Another paper covered on the syllabus presented a similarly motivated analysis of another potential “strategic investment”. What was the setting and what was the investment?

(b) The empirical advertising papers we discussed used a variety of different methodologies. Briefly discuss the methodologies of some of the papers and how they fit with what the paper was trying to estimate. What paper is the figure below taken from and what role does it play in the paper?



(c) In class I discussed Einav, Kuchler, Levin, and Sundaresan’s analysis that involved using seller experiments to understand why eBay sellers use the reserve prices they use. Other sections of their paper use seller experiments to examine several other questions. If you remember any of the other questions say what they are. Do you remember anything about the physical used book stores from which Ellison and Ellison collected price data? What quantity data does that paper use for its demand estimates?

(d) Describe very briefly the general methodology of Hendricks and Porter’s paper on auctions of offshore drainage tracts. Their paper includes the table below. Which of the numbers in this table provide support for their hypothesis? Athey, Levin, and Seira’s paper starts with a similarly motivated reduced form analysis. What do they predict about how the relative likelihood of entry and winning will differ between loggers and mills when we compare open and sealed bid auctions? What does their structural analysis suggest about whether the mills were colluding in the auctions studied?

TABLE 3—SAMPLE STATISTICS ON TRACTS WON BY EACH TYPE OF FIRM^a

	Wins by Neighbor Firms		Wins by Non-Neighbor Firms		
	A	Total	B	C	Total
No. of Tracts	35	59	19	36	55
No. of Tracts Drilled	23	47	18	33	51
No. of Productive Tracts	16	36	12	19	31
Average Winning Bid	3.28	6.04	2.15	6.30	4.87
	(0.56)	(2.00)	(0.67)	(1.31)	(0.92)
Average Gross Profits	10.05	12.75	-0.54	7.08	4.45
	(3.91)	(3.21)	(0.47)	(2.95)	(1.99)
Average Net Profits	6.76	6.71	-2.69	0.78	-0.42
	(3.02)	(2.69)	(0.86)	(2.64)	(1.76)

^aDollar figures are in millions of \$1972. The numbers in parentheses are the standard deviations of the sample means. Column A refers to tracts which received no non-neighbor firm bid, column B refers to tracts which received no neighbor bid, and column C to those in which a neighbor firm bid, but a non-neighbor firm won the tract.

(e) Milyo and Waldfogel's paper, "The Effect of Price Advertising on Prices: Evidence in the Wake of 44 Liquormart," includes the two tables shown below. Why do they present each of these tables and what conclusions do they draw from them?

TABLE 7—PERCENT OF RHODE ISLAND LOTTERY SALES AT ADVERTISING AND NONADVERTISING STORES IN THE SAMPLE

	Number of stores	Entire year 1995	Early 1996 (1/1–9/30)	Late 1996 (10/1–12/31)	Early 1997 (1/1–4/22)	Mid-1997 (4/23–9/1)
Advertising stores	9	16.38	16.44	17.14	17.35	18.40
Nonadvertising stores	42	83.62	83.56	82.86	82.65	81.60

Notes: "Advertising stores" refers to stores ever employing newspaper price ads in effect during months of price data collection (through June 1997). "Nonadvertising stores" are stores that do not employ newspaper advertising, although they may post prices in their windows.

TABLE 8—PRICE DISPERSION IN RHODE ISLAND AND MASSACHUSETTS BEFORE AND AFTER ADVERTISING

	Rhode Island	Massachusetts
A. Standard deviation of store effects		
Preadvertising	\$0.620	\$0.689
Postadvertising	\$0.735	\$0.783
B. Standard error of regression of prices on product and time dummies		
Preadvertising	\$1.018	\$1.248
Postadvertising	\$1.283	\$1.320

Notes: Panel A standard deviations are calculated as the standard deviations of store fixed effects from regressions of prices on store, product, and time dummies. Four separate regressions are run for Massachusetts and Rhode Island, before and after the change in the law. The standard errors in Panel B are based on four separate regressions of prices on product and time dummies.

2. (30 Minutes – 18 points)

Consider a Cournot model. There are N firms with marginal costs $c \in [0, 1)$. The market inverse demand curve is $P(Q) = 1 - Q$.

- (a) Find the equilibrium quantities and profits as a function of N .
- (b) Consider a two stage game where the firms first have a choice to exit and receive a payment of X . Firms that don't exit then engage in Cournot competition. How many firms would choose to exit in a pure strategy equilibrium as a function of X ? Why did I specify “pure strategy equilibrium” in the statement of the problem?
- (c) Give a brief informal discussion of whether entry tends to be too low, socially efficient, or excessive in imperfect competition models with entry costs. Without doing any calculations what can you say about exit in this model relative to the social optimum?
- (d) How would you modify this model to turn it into a “signal jamming” model of predation. Be as clear as you can about what uncertainty you are adding to the model, what the timing of the game is, and who observes what. How would the quantities produced and profits compare with those you solved for in part (a)?

3. (40 Minutes – 20 Points)

Consider a version of the standard competition-on-a-line model. A continuum of consumers have types θ uniformly distributed on $[0, 1]$. Assume that a consumer of type θ gets utility $v_1 - t\theta - p_1$ if she purchases from firm 1, utility $v_2 - t(1 - \theta) - p_2$ if she purchases from firm 2, and zero utility if she does not purchase.

(a) Suppose that firm 1's product is slightly superior, $v_1 \in (v_2, v_2 + 3t)$, and that v_2 is large enough so that all consumers purchase from one of the two firms in equilibrium. What are the equilibrium prices in a game in which the firms simultaneously choose prices p_1 and p_2 ?

(b) Consider a two stage game. Initially, firms 1 and 2 have products that are equal in quality and would provide utility $v - t\theta$ and $v - t(1 - \theta)$, respectively. In the first period firm 1 has the opportunity to pay A to increase the value of its good from $v - t\theta$ to $v + \Delta v - t\theta$ where $\Delta v \in [0, 3t]$. Firm 2 observes whether the investment was made. In the second period the firms compete in prices. In this model firm 1 invests in equilibrium if and only if $A < \bar{A}$. What is \bar{A} ?

(c) Consider the model of part (b), but now suppose that firm 2 does not observe whether firm 1 invested. Firm 2 does know A . This model will have a Perfect Bayesian Equilibrium in which firm 1 invests if and only if $A < \hat{A}$. Describe how the Fudenberg and Tirole's framework for strategic entry deterrence and strategic entry accommodation can be used to help think about whether \hat{A} is greater than or less than \bar{A} .

No need to compute \hat{A} , but do say whether you think it is larger or smaller than \bar{A} and why. If you have time at the end, go ahead and try to compute \hat{A} to verify your conjecture.

4. (45 Minutes – 28 Points)

Consider a multi-unit auction. A seller has two units of a good that he can sell. There are two potential bidders. Bidder 1 has a value of v_1 for one unit and gets no additional utility from owning two units, i.e. he values the second unit at zero and has no opportunity to resell it. Bidder 2 has a value of v_2 for one unit and $2v_2$ for two units.

Assume that v_1 is drawn from a uniform distribution on $[0, 1]$ and v_2 is independently drawn from a uniform distribution on $[0, 2]$.

(a) Suppose that the seller decides to use a VCG mechanism to sell the goods. Describe as precisely as you can how this mechanism would work. What would the players be asked to announce? How would the goods be allocated and what would the payments be as a function of the announcements? What would the seller's expected revenue be?

(b) Suppose that the goods are auctioned off via an ascending bid 3rd price auction. Each bidder starts holding up both hands and a bid clock increases from zero. Each firm can put one or both of its hands down at any time. As soon as only two hands are being held up, the auction ends and the winning bidder or bidders make per unit payments equal to the value of bid clock at that time. What is firm 1's weakly dominant strategy? Will it be a dominant strategy for player 2 to keep both hands up until the clock reaches v_2 ?

(c) Consider a PBE in which firm 2 never puts its right hand down. What is firm 2's payoff as a function of v_2 and the bid b at which it puts its left hand down (assuming firm 1 is playing its weakly dominant strategy). What is firm 2's strategy in such a PBE?

(d) How does the seller's revenue in the equilibrium you found in part (c) compare with the seller's revenue in the VCG mechanism? Any comments on why you would or would not have expected the comparison to work out this way?

(e) In class I described how Edelman, Ostrovsky, and Schwarz modeled Google's advertising auction as a game in which there is an increasing price clock and the bidder i who wins position k gets a payoff of $z_k(v_i - b^{k+1})$ where z_k is the number of clicks received by the advertisement in position k , v_i is bidder i 's per-click valuation, and b^{k+1} is the drop out point of the bidder in position $k + 1$. To compute when bidder i would drop out I used an argument that noted that bidder i would have to be indifferent to first order between dropping out at $b^*(v_i, k, b^{k+1})$ and $b^*(v_i, k, b^{k+1}) + db$. Briefly sketch this argument and make as much progress as you can toward finding $b^*(v_i, k, b^{k+1})$.

(f) Why do you think I decided to order this question with part (c) before part (e)?

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