Industrial Organization Field Exam
August 2019

Please answer each instructor's questions. At the top right-hand corner of each answer sheet, include their name (eg: Joe / pg 1 of 1).

Field Exam: Joe Farrell's Section

An incumbent firm M is initially the only seller of a good, G, which it produces at cost 0, using a proprietary production technology. Each of two ex ante identical consumers (i=1,2) wants to buy either 0 or 1 unit of good G per period, and values a unit at v>0. In each period M sets a price p for a unit of G, and each consumer accepts or rejects M's offer.

A new (although not improved) technology is then discovered, and it becomes common knowledge (and M and the consumers observe) that an entrant, E, could produce good G, although less efficiently than M. Specifically, E can produce with a cost function of C(x)=F+cx, where x is the number of units of good G that E produces, and c and F are strictly positive. E incurs F if it "enters," even if it then sells nothing.

(a) Assume that M must set p before E decides whether or not to enter and at what price q. For what values of p will E enter, and what price q will/would it set if it does so? What price p will M set? Give a simple expression for total consumer surplus.

(b) How would your answers differ if instead E must decide whether or not to enter, and set its price q, all before M sets p?

(c) Now return to the assumption that M must set its prices before E decides whether or not to enter and what (uniform) price q to set. Now however allow M to publicly offer each consumer *i* a potentially different "loyalty discount" price, p_i (different for different consumers, if M wishes), if *i* buys before E decides, in addition to offering its "list" price *p* if consumer *i* buys from M after E decides. Explain whether (perhaps depending on the parameters) M can profitably harm consumers in the aggregate by using this additional pricing strategy, relative to consumers' payoffs in case (a). If/when you determine that it can do so, briefly explain how; if/when you determine that it can't, explain why not.

Part 1

Question 1 (50 points)

In the Grubb and Osborne (2015) paper on cellular phone menu plan choice and design, the authors study micro-foundations of consumer choice and the implications of those micro-foundations for welfare and policy. Please answer the following questions about this paper and related work:

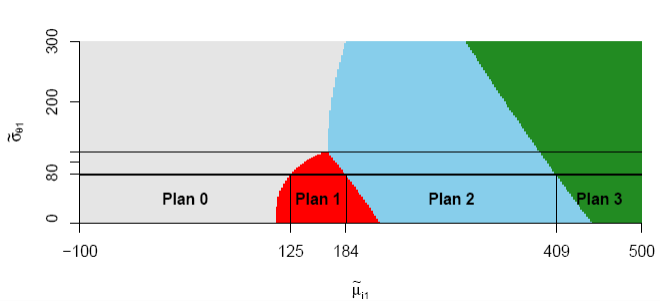
1. (10 points) Describe the data set used by the authors in detail. Approximately how many consumers do the authors observe making choices? What types of consumers are they? How many choices does each consumer make on average? Broadly, what features of this dataset are compelling, and what features of the dataset are less desirable for the questions the authors are trying to answer? Why?

2. (10 points) The figure on the next page describes identification of consumer beliefs about their upcoming monthly cell phone plan minutes utilization. Use this figure to describe identification of the key belief parameters being estimated by the authors.

3. (10 points) How does identification of beliefs in the Grubb and Osborne paper relate to identification of risk preferences in the structural literature on insurance choice, e.g. Handel (2013) or Cohen and Einav (2007)? Provide as much detail as possible to receive maximum credit, and explain what assumptions are necessary to justify the interpretations of these quantities in these papers. Write down two simple choice models to illustrate this comparison.

4. (10 points) How do Grubb and Osborne deal with consumer inertia in their framework? How is their approach different than that in Handel (2013)?

5. (10 points) Describe formally what Grubb and Osborne mean by "overconfidence"?



What are the implications of overconfidence for consumer chocies? What are the welfare consequences of debiasing consumers?

Question 2 (50 points)

This will be a multi-part question asking about selection markets.

1. (10 points) In Einav Finkelstein and Cullen (2010) the authors set up a simple framework to study adverse selection in competitive insurance markets. Draw a graph related to their framework that describes a competitive market with adverse selection. Label the key objects of interest, including the deadweight loss from adverse selection.

2. (10 points) Handel, Hendel and Whinston also describes equilibria in competitive health insurance markets. Describe **in detail** the key differences in the underlying models in EFC and HWW. Illustrate the difference in an EFC style graph, similar to what you drew in the first part of this question.

3. (10 points) Describe the central tradeoff studied in HHW and what the authors find empirically regarding this tradeoff.

4. (20 points) HHW uses a demand estimation model that draws upon the work in Handel (2013). This demand estimation exercise is similar in spirit to the problem set you completed in class. Please sketch the demand model and then describe in a series of steps how you estimate this model in practice.

Question 3 (40 points)

Answer the following questions relating to papers we discussed in class.

- (10 points) What are the major innovations in the Nevo Econometrica paper on breakfast cereals, relative to BLP (1995)? Describe innovations in (i) demand estimation and (ii) dealing with endogeneity. What are the main results Nevo finds in his paper?
- (10 points) In the Hortacsu and Syverson paper on search costs in mutual funds, describe at least two modeling approaches the authors use to deal with the issue that Vanguard has such high market share?
- (20 points) Ho and Lee and Crawford and Yurokoglu both use bargaining models to study market equilibrium in different industries. Why do they need bargaining frameworks, relative to more typical IO analyses (e.g. BLP)? Pick one of these papers and describe all of the key agents in the paper and the different core model components. So, for one paper, comprehensively describe the core model equations / elements.

Field Exam : Kei Kawai's Section

For Questions 1 and 2, you may invoke any proposition that we showed in class without proof.

Q1. Consider the following model:

$$y = F(\alpha' \mathbf{x}, u),$$

where u is uniformly distributed on $[0,1]$, $y \in \mathbb{R}^1$, $\mathbf{x}, \alpha \in \mathbb{R}^K$. F is a mapping $\mathbb{R} \times [0,1] \twoheadrightarrow \mathbb{R}$. It is strictly increasing in both arguments. Assume that $\mathbf{x}$ has full support on $\mathbb{R}^K$. Assume also that $F(0,0) = 0$. $(y, \mathbf{x})$ are observed, u is not.

1) Are (F, α) identified?

2) Suppose that the first element of α, $\alpha_1 = 1$. Are (F, α) identified?

Q2. Consider the following discrete choice model

$$y = \begin{cases} 1 & \text{iff } b(\mathbf{x}) - c(\mathbf{x}) + u_1 \geq -b(\mathbf{x}) - c(\mathbf{x}) + u_2 \\ 0 & \text{iff } b(\mathbf{x}) - c(\mathbf{x}) + u_1 < -b(\mathbf{x}) - c(\mathbf{x}) + u_2 \end{cases},$$

where $\mathbf{x} \in \mathbb{R}^K$, $u_1, u_2 \in \mathbb{R}^1$. $b(\cdot)$ and $c(\cdot)$ are mappings $\mathbb{R}^K \twoheadrightarrow \mathbb{R}$. Assume that the distribution of (u_1, u_2) is known. Are the functions $b(\cdot)$ and $c(\cdot)$ identified?

Consider a second price auction in which the highest bidder wins at a price of the second highest bidder. Suppose that you have a sample of transaction prices from these auctions (i.e., the second highest bids). You do not observe any other bid, but you observe the number of bidders who participate in each auction. Let $F(\cdot)$ be the distribution from which bidders draw valuations. Assume symmetric independent private values.

1) Is $F(\cdot)$ identified?

2) Propose an estimator for $F(\cdot)$

3) How would your answers to 1) and 2) change if bidders are risk averse/loving.

Q3 Consider a dynamic game with the following setup.

- There are N agents.
- Actions: let $a_i \in \{1, \cdots, J\}$ be the action of agent i and $\mathbf{a} = (a_1, ..., a_N)$ be profile
- State X
- Choice-specific random shocks: $\{\varepsilon_{ij}\}_{j=1 \cdots J} \sim G_i$

  - $\{\varepsilon_{ij}\}$ are realized before choosing action.

- Period utility function of agent i (net of ε_{ij}): $\pi_i(\mathbf{a}, X)$
  - Hence, the period utility of agent i for action profile $\mathbf{a} = (a_i, \mathbf{a}_{-i})$, state X, and realization ε_i is $\pi_i(\mathbf{a}, X) + \varepsilon_{ij}$.
- $P(X'|X, \mathbf{a})$ denotes the transition of state variables.
- Agents discount future by common param β
- Agent i at time t observes past and current states ($X^1 \cdots, X^t$), past action profiles ($\mathbf{a}^1, \cdots \mathbf{a}^{t-1}$) and own shocks ($\varepsilon_i^1, \cdots \varepsilon_i^t$).
- Researcher observes states and action profiles. Assume G_i is known.
- Function π_i is unkown to the researcher.
- Assume that there exists a (stationary) Markov equilibrium σ^* and that data is generated by σ^*.

1) Show that σ^* is identified, taking as given results of Hotz and Miller (1994).

2) Do you need uniqueness of equilibria in identifying σ^*?

3) Provide a rough sketch of identification/estimation strategy of Pakes Ostrovsky Berry (2007) (this one does not involve inequalities).

4) Provide a rough sketch of identification/estimation strategy of Bajari Benkard Levin (2007) (this one does involve inequalities).a