This exam is comprised of three sections. The first section is for material covered in IO 220A taught in Spring 2015 or Spring 2016 by Ben Handel. The second covers material taught by Kei Kawai in Spring 2016. The third covers material by Joseph Farrell taught in Fall 2014 or 2015. There are three questions in section one, worth a combined 130 points. There is one question in section two worth 50 points and one quetion in section three worth 30 points. You should answer all questions in Part 1, unless you did not take IO 220A, and answer questions in Part 2 or 3 depending on the classes you took (if you took all three IO classes, you only need to answer Part 1 and either Part 2 or 3).

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,
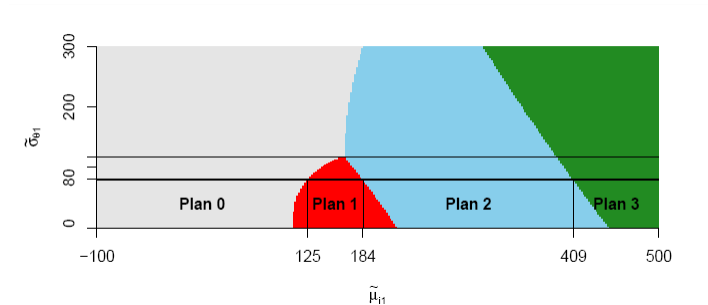
e.g. Handel (2013) or Cohen and Einav (2007)? Provide as much detail as possible to receive maximum credit, and explain what assumptions are necessary to justify the interpretations of these quantities in these papers. Write down two simple choice models to illustrate this comparison.

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 the Cardon and Hendel (2001) paper that tests for asymmetric information in health insurance markets. Please answers the following questions related to this paper.

1. (10 points) In Cardon and Hendel (2001) the authors test for asymmetric information in health insurance markets. The authors write down a structural model of two distinct and linked consumers choices. Clearly describe each of these choices, and write down the structural choice equations for each of these two choices.

2. (10 points) What is the key other phenomenon the authors separately identify asymmetric information from? What features of the data allow identification of these two behavioral phenomena?

3. (10 points) Handel (2013) studies adverse selection in health insurance markets. How does the adverse selection studied in that paper differ from the asymmetric information studied in Cardon and Hendel? What are the implications of these different economic phenomena for regulation of health insurance markets?

4. (20 points) Cardon and Hendel estimate their model via GMM. What moments do they use for estimation (5 points)? Imagine that instead you wanted to estimate the Cardon and Hendel model via simulated maximum likelihood. Describe in detail (i) the likelihood function you would estimate and (ii) a rough sketch of the process you would follow to estimate this in Matlab, R, or STATA?

Question 3 (30 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 break-fast 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?

- (10 points) What are the primary innovations made in BLP (1995) relative to Bresnahan (1987)? Describe innovations in both demand estimation and identification.

Part 2

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: $\{\varepsilon_{ij}\}_{j=1\ldots J} G_i$

    - $\{\varepsilon_{ij}\}$ 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 $\mathbf{a} = (j, \mathbf{a}_{-i})$, 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^*.

Please answer the following questions related to this dynamic game.

1. (10 points) Show that σ^* is identified, taking as given results of Hotz and Miller (1994)

2. (5 points) Do you need uniqueness of equilibria in identifying σ^*?

3. (10 points) Is the discount factor β identified in general? Briefly explain why or why not?

4. (10 points) Provide a rough sketch of identification/estimation strategy of Pakes Ostrovsky Berry (2007) (this one does not involve inequalities).

5. (15 points) Provide a rough sketch of identification/estimation strategy of Bajari Benkard Levin (2007) (this one does involve inequalities).

Part 3

Question 5 (30 points)

In John Kwoka's study of merger retrospectives, he found that studied mergers with conduct remedies had on average a substantially bigger price increase than mergers with divestiture remedies. If a reader were tempted to interpret this as a policy recommendation to use divestiture remedies rather than conduct remedies in a particular merger, that would amount to believing that the estimate reflects causation. Comment on some ways in which the data and analysis fail to establish causation. Then comment on potential methods, short of explicit policy experimentation, by which economists could come closer to firmly establishing causation regarding the effects of one type of remedy (say, conduct remedies) versus another (say, divestiture remedies).