There are two parts in the exam, with some choice in section I. Overall, you should allocate 1.5 hours to each part. Be sure to use graphs and/or equations whenever they would be helpful in clarifying your reasoning.

WRITE YOUR ANSWERS FOR EACH QUESTION IN A SEPARATE BOOK

PART I

Answer any three questions in this part. Each question is weighted equally and should take about 30 minutes. Read the entire question before you start and make sure you allocate your time carefully, answering all parts as fully as possible given the time constraint.

1. Suppose you have access to a sample of individual micro-data that includes the following information for each person: hourly wage; age; completed years of education; gender; exact date of birth (day/month/year); current place of residence; and state where the individual lived at age 14. (For simplicity assume that everyone in the sample is between 30 and 60 years of age; is working at the time of the survey; and that everyone is observed at the same calendar date – e.g., July 2007).

(a) Briefly describe a statistical model for wages that you would fit by OLS to summarize the main features of the data, including the “return to schooling”, the “experience profile,” and the “male-female wage gap”.

(b) Focusing on the “return to schooling,” explain what is meant by “ability bias”, and discuss the concerns that have been raised about interpreting observed wage differentials between workers with different education levels as causal estimates of the effect of added schooling. Would you expect the OLS estimate to understate or overstate the true causal effect?

(c) You obtain a file that lists the minimum school-leaving ages for every state in every year of the past century. Suppose you run a regression of completed schooling on a polynomial in age, a set of dummies for the different states where each person lived at age 14, and a “minimum schooling” variable equal to the number of years of completed schooling the individual would have if he or she started first grade in September of the year he or she reached age 6, and dropped out of school as soon as he or she reached the minimum school-leaving age. You find the coefficient of the minimum schooling variable is 0.10, with a standard error of 0.03. Describe an instrumental variables (IV) procedure for estimating the return to schooling, and discuss some of the issues you would anticipate in interpreting the IV estimate, and how it differs from the OLS estimate.

2. As an avid reader of the NY Times, you are interested in the question of whether women are forced by employers to work “too many hours.” Suppose a worker can take a job with fully flexible hours paying wage \( w_0 \), and also has the opportunity to take other jobs (1,2,3,...) that pay wages \( w_1, w_2, w_3 \) but require her to work a fixed number of hours \( h_1, h_2, h_3, \ldots \). Assume she uses a simple one-period (or static) framework to evaluate different jobs.
(a) Use a diagram to show that if the worker chooses $h_0$ hours on the flexible job when faced with the wage $w_0$, then if $h_1 > h_0$ the wage for job 1 must be higher than $w_0$ (i.e. $w_1 > w_0$). Explain how the wage premium for job 1 is related to the hours gap $h_1 - h_0$ and the compensated elasticity of labor supply. NOTE: a formal derivation would be nice but you can provide an intuitive discussion using the graph only.

(b) Suppose you postulate a specific functional form for the worker’s utility function $U(x, h, z)$ where $x$=goods, $h$=hours of work, and $z$ is a vector of characteristics about the worker’s family, with the property that

$$-U_h(x, h, z)/U_x(x, h, z) = \exp(z'b) h^\gamma$$

which does not depend on $x$.

You have access to a data set that has information on a sample of working women who report their wage ($w$), hours of work ($h$), family characteristics ($z$), and the answer to the following question:

*Compared to your current job, would you prefer to work fewer hours than you are now, with a proportional reduction in earnings? (yes or no).*

Explain how you would set up a statistical model for the observed hours choices of women, taking into account their answers to this question. HINT: think about the relationship between $U_h/U_x$ and $w$ for someone who answers yes or no to the question.

(c) Suppose, in contrast to the situation in part (b), that you only observe wages and hours, and not whether a woman would prefer to reduce her hours and earnings. However, you have a panel data set and see some women who change jobs, and have different wages and hours on the second job than the first. Explain how you could use the job changers to try to identify whether there are some people who are “constrained to work long hours.” Discuss the likely issues that would arise in interpreting these results. SUGGESTION: think about people who change jobs voluntarily vs. involuntarily.

3. Ebenstein has proposed that the policy of imposing fines on families that have a second child, coupled with the strong desire of families to have at least one son, has led to a “shortage of girls” in China. Outline a simple model of dynamic fertility choice in which families prefer to have at least one boy, and have available a sex-selective abortion technology. For simplicity, you can assume that families only have 1 or 2 children.

(a) Show that the ratio of boys to girls among second births will be higher than among first births. Explain why.

(b) Show that an increase in the fine for a second child will lead to more sex-selective abortions and fewer girls being born.

4. You have been asked to examine the potential effect of a change in the unemployment insurance (UI) program on the incentives to obtain vocational training. The focus is on two groups: young men who finish high school only, and those who attend junior college for 2 years after high school and obtain training. You have access
to a longitudinal data set for a sample of men in the two groups, including information on earnings in each quarter and the timing and duration of spells of unemployment. You notice that men with vocational training have higher earnings, and a lower incidence and duration of unemployment. Under the current UI system, an unemployed worker receives average UI benefits equal to 60% of previous earnings. It is proposed to reduce these payments to 40% of previous earnings.

(a) Sketch a dynamic model of training choice that you could use to evaluate the incentive effects of the UI reform. Discuss the key equations and behavioral choices in the model, and explain how you would use the data to estimate the various components of this model. NOTE: for simplicity you can ignore job-specific elements of pay. Building on what you know from other studies, write down a simple dynamic model for earnings if employed, and for the probabilities of job destruction and job finding (if unemployed) and use these to define the various value functions in your model.

(b) Analysts have noted that the fraction of men who choose vocational training is higher among those who grew up within 20 miles of a college that offers this training. Explain how you could use this information to aid in the estimation of your choice model, and the assumptions needed to justify this procedure.

(c) Suppose you find out that under the current UI replacement rates vary from 40% in some states to 60% in others. Explain how you could use this information to test the validity of your model.

PART II

Answer all three questions in this part. Note that the questions are weighted unequally. You should plan to spend about 35 minutes each on questions 1 and 2, and 20 minutes on question 3.

Question (1): 40% of part II

(a) Develop a simple model that illustrates the principal-agent problem in the case where output has a stochastic component and the worker and the employer are risk neutral. Present the assumptions that you need, the first order conditions and the equilibrium contract.

(b) How and why does your answer to part (a) change when the worker is risk-adverse and the employer is risk-neutral? Be specific.

(c) Explain what happens in case (b) when the variance of the stochastic component of output increases.

(d) In case (b), can a contract be “too strong” and generate too much output? (Hint: In class, we have seen a paper that document such case)

(c) How and why does your answer to part (a) change when the worker is risk-neutral and the employer is risk-adverse? Be specific.
Question (2): 40% of part II

This question focuses on the estimation of preferences of families for different schools. Assume that the utility of family $i$ from school $j$ is

$$U_{ij} = X_{ij} b_i + e_{ij}$$

where $X$ is a vector of demographic characteristics; $e_{ij}$ is distributed iid extreme value; and $b_i$ is allowed to vary across families according to a mixing distribution with mean $\mu$. In particular:

$$b_i \sim f(\mu, \theta),$$

where $\theta$ is a second parameter characterizing the distribution.

(a) Give an expression for the probability that family $i$’s top three choices are schools $j_1$ $j_2$ and $j_2$. Make explicit any assumptions you might need.

(b) Using this probability, describe how you would use a mixed logit model to estimate how preferences for school quality vary in the population. Be precise: describe what type of data you would need, derive the log-likelihood function, describe what you would do with the estimated parameters, etc.

(c) Compare the case where your data set includes each family’s top three choices and the case where your data set includes only the top choice of each family. Explain how the additional information affects your ability to infer the distribution of tastes.

(d) Is the assumption that $e_{ij}$ is distributed iid realistic? Provide 2 examples in which this assumption fails.

Question (3): 20% of part II

Suppose you want to estimate the effect of college quality on wages. You have the options of linear regression and matching.

(a) Describe in words and with a graph the “common support” problem. How do linear regression and matching compare in terms of “common support” assumptions?

(b) How do linear regression and matching compare in terms of identification assumptions?

(c) How do linear regression and matching compare in terms of functional form assumptions?