Written Preliminary Ph.D. Examination

Graduate Program in Applied Economics
June 16, 2014

Labor Economics

Instructions

• Answer a total of FOUR out of the six questions.

• Identify yourself by code letter, not name, on all pages.

• Start each answer at the top of a new page.

• Number the pages of your answers.

• You have four hours to complete the examination.

• This is a closed book exam. No notes, articles, books or other sources may be used other than the article provided to you for Question 1.
QUESTION 1: This question concerns the paper by Cahuc and Carcillo distributed in advance. A copy of the paper is available to you during the exam.

A. The paper’s two research questions have to do with an exogenous change in the marginal return to work. What are the two research questions? Section III presents “theoretical remarks” about the research questions. However, a standard static labor-supply diagram might be more illustrative for one of the questions. Construct a static labor supply diagram that illustrates the labor supply decision for hours worked in one week. Assume that hours beyond 35 per week are overtime. What does static labor-supply theory predict about the results of the empirical work?

B. One can infer from the reported results that laborers’ overtime hours did not respond significantly to the change. ("Laborers" is used here in the same way Cahuc and Carcillo use the term.) Explain how this inference can be made from the results. How can this result for laborers be interpreted with respect to the static labor supply model (part A)? What is another interpretation of similar results (which has been suggested elsewhere in the literature)?

C. Thinking carefully about the regression specification in equation (1), what is the source of variation that is being used to identify the causal effect of the change in overtime taxation?

D. The authors employ a triple difference methodology described on pages 379-380. What is the point of this? Is there an advantage over feasible double difference (i.e., difference in differences) alternatives? Why/why not?

E. Clearly and in your own words, discuss one threat to the validity of the authors’ identification strategy. How do the authors address the problem, if at all?
QUESTION 2: Answer both parts A and B if you choose this question.

2A. Human capital production: An early model of human capital by Ben-Porath assumed a human capital production function of the following form:

\[ Q_t = \beta_0 (s_t K_t)^{\beta_1} D_t^{\beta_2} \]

where \( \beta_1, \beta_2 > 0 \) and \( \beta_1 + \beta_2 < 1 \), where

- D is the quantity of purchased inputs with price \( P_D \)
- \( K_t \) is (total available) human capital services per unit of time
- \( s_t \) is the fraction of available human capital stock allocated to the production of human capital. (With no joint production, it is the fraction of time allocated to HC production.)
- \( Q_t \) is the flow of human capital produced

Discuss the assumptions underlying this production function – what does it model well about human capital and what aspects of human capital production are missing? (Define human capital.) Describe and discuss one alternative model of human capital production that would capture more of these missing aspects. Be sure to explain the basic assumptions underlying the alternative model and explain its predictions.

2B. Labor supply elasticity: What is the predicted effect on labor supply of a temporary wage increase in a standard neoclassical lifetime utility maximization model? In other words, what is the predicted sign of the intertemporal substitution elasticity? Explain. Describe one alternative model that tests the labor supply response of workers to a temporary wage change or estimates the intertemporal labor supply elasticity (briefly explain the study hypothesis, methods and findings).
QUESTION 3:

A colleague makes the following claim: “In the classic model of general human capital, a worker engages in training, that training raises the worker’s productivity (e.g. output for a given level of effort), and that increase in productivity allows workers to extract higher pay in a competitive labor market. I take issue with this account. Rather than raising productivity, I propose that training makes workers intrinsically motivated to perform higher quality work. It does not make them more skillful, only more willing to provide the skill they have.”

a. Do you agree or disagree with your colleague’s argument that boosting intrinsic motivation is a possible channel by which training can boost employers’ willingness to pay for workers’ labor? Discuss your approach to formalizing this claim (or your objection), incorporating the principles of utility maximization.

b. In Becker’s (1964) model of human capital, general skills training are borne by employers. If the colleague’s claim were accurate, would employers bear the cost of training? Discuss why or why not.

c. Suppose there are two jobs: Production and Compliance. For both jobs, firms observe only production output and whether there is a compliance breach, and not effort. Output is a function of production effort, production noise, and whether there is a compliance breach in any period. Effort in Production jobs is closely related to output; workers choose high or low effort, and there is relatively little noise in the measurement of production. This makes these jobs easily amenable to pay-for-performance and monitoring.

Increased effort in Compliance reduces the likelihood of a compliance breach in any given period, but this effort is difficult for firms to monitor and measure. This is because an absence of breaches is the only observable output of Compliance, and breaches are rare, even when Compliance effort is low. When breaches occur, they are extremely costly to the firm. As such, high effort is Pareto optimal in Compliance, albeit difficult to contract upon because Compliance effort is measured with great error.

Suppose that the content of training can boost either productive skills or intrinsic motivation. What does this imply for the optimal HR practices and the optimal mix of training types in Production jobs? In Compliance jobs? Be explicit about any assumptions.
QUESTION 4: Optimal Choice of Schooling and Returns to Schooling

Suppose earnings are given by \( y = w f(S,A) \) where \( S \) denotes years of schooling, \( A \) denotes ability, \( f(S,A) \) is the human capital production function and \( w \) is the wage of a unit of human capital. Assume that the only cost of schooling is the foregone earnings associated with being in school, individuals choose the amount of schooling that maximizes present value of lifetime earnings, and that individuals live forever. Denote the interest rate \( r \). Assume \( w \) and \( r \) are time-invariant. There are no earnings while in school.

a) Set up the individual’s lifetime earnings maximization problem using a continuous time framework and derive the first order condition for optimal schooling. Does the optimal choice of schooling depend on \( w \)? Explain why or why not. Be sure to define all terms and assumptions.

b) Why does a standard Mincerian earnings equation use a log-linear form? Use the first order condition from part a to explain.

c) Suppose that the human capital production function has the form: \( f(S,A) = \exp(AS^b) \) with \( b<1 \) and assume that variation in schooling is due solely to variation in ability \( A \). In a simple wage regression with years of schooling as the only covariate, demonstrate the bias in the estimate of the returns to schooling. Is it positive or negative? Explain.

d) Describe two possible approaches to dealing with the omitted variable bias problem in estimating an earnings equation. Provide examples from the literature.

e) The basic Mincerian wage equation takes the form \( \log W = \beta_0 + \beta_1 S + \beta_2 X + \beta_3 X^2 + \) controls. For each of the variables \((W, S, X)\), discuss the theoretical concept that we are trying to measure and the actual measure(s) that are typically used. What conditions does this standard model impose on returns to experience \((X)\)? What alternative specification or additions would you recommend based on recent empirical evidence (particularly from the U.S. and other developed countries)? Explain.
QUESTION 5: Alan Benson’s job market paper posits a theoretical model of sales managers’
decision either a) to retain or b) to terminate and replace sales employees. Firms offer managers
annual bonuses tied to whether or not each manager’s subordinates’ total sales exceed a given
threshold in a given time period. The model specifies sales output of subordinate employee i in
period t (Y_{it}) is given by:

\[ Y_{it} = r_{it} + \alpha_i + \epsilon_{it} \]

where \( r_{it} \) is i’s months of experience at time \( t \), \( \alpha_i \) is time-invariant individual ability, and \( \epsilon_{it} \) is
idiosyncratic influences from the sales environment. \( \epsilon_{it} \) is distributed with mean 0 and standard
deviation of \( \sigma \). The theory predicts that managers may tend to delay termination of employees
believed to be low ability, especially at end of the quota-measurement period, despite the fact
that this is worse for the firm in the long run. Benson finds empirical evidence consistent with
this model.

a. Why would managers sometimes delay terminating employees believed to be low ability?
   Discuss the situations in which this would be most likely in this model.

b. Suppose that employee experience has no effect on output. How would this affect the
   theoretical prediction above?

c. If firm owners risk losing money by delayed termination of low performers, why do they
delgate termination authority to managers? What value would a manager need to provide
to the firm owners? (Hint: This hinges on an assumption Benson makes that is not
specified in the description above about an advantage front-line managers have over
central authorities.)

d. How would the value of a manager vary by characteristics of the environment, in
   particular by the value of \( \sigma \)?
QUESTION 6: Consider a model where employers learn about worker ability through observation at work over time. Worker ability ($\alpha_i$) is difficult for employers to observe fully at the start of a worker’s career but that is revealed over the course of work experience ($r_{it}$) through noisy signals. Assume real productivity is ($Y_{it}$), where $\epsilon_{it}$ captures idiosyncratic factors:

$$Y_{it} = r_{it} + \alpha_i + \epsilon_{it}$$

Employers pay employee wages equal to expected productivity conditional on available information at a given time and that over time differences in ability are revealed. To test this model, Altonji and Pierret (2001) estimate a wage equation using a panel of wage data with employee characteristics, including a hard-to-observe-at-hire variable that is positively correlated with ability (AFQT score), the interaction of AFQT with work experience, an easy-to-observe-at-hire variable that is correlated with ability, years of education prior to hire ($E_d$), and the interaction of this variable with experience.

$$\ln(W_{it}) = \beta_0 + \beta_1 r_{it} + \beta_2 AFQT_i + \beta_3 r_{it} * AFQT_i + \beta_4 E_d + \beta_5 r_{it} * E_d + u_{it}$$

a) Why and how does this regression test their story? What parameter is most important and how should its sign be interpreted? What finding would be most consistent with their story of employer learning about worker ability as worker experience increases?

b) Altonji and Pierret use interactions with work experience (years with any employer) rather than job tenure (years with current employer)? What assumption does this imply about the process of employers’ learning?

c) A different, complementary story for explaining differences in wage trajectories is that employees differ in their reservation wage or mobility costs ($\rho_i$) in ways that are difficult for employers to observe at the time of hire but which employers learn about over time. If one wanted to test this theory (maybe using an approach similar to Altonji & Pierret), how might it be done? What properties are necessary for an observable that would play a role similar to AFQT? Please define variables, specify an estimable wage equation, and explain the interpretation of parameters.