Ph.D. Preliminary Examination

Labor Economics

Spring 2014

Answer only one of the two Blocks.
Labor Prelim Exam, Spring 2014

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Block A

In the following there are 8 questions for 100 points. Answer all questions. Be as precise as you can and good luck.

Health and Insurance

Imagine an agent with finite life where utility depends on health (which has discrete support). It depends in a separable way on health care goods of type A, denoted $c_a$. The utility of these health care goods is increasing with themselves and decreasing with health status. The utility of regular consumption, denoted $c$, is given by a standard CRRA function. Health status also affect the efficiency units of labor that a person gets that follows also a Markov chain. Survival probability up to age $I$ is 1. The Markov chain that determines the evolution of health is affected by investments in another type of health care goods (type B) denoted $c_b$, so that the probability of better health status next period conditional on current health status is increasing in those goods. All three goods are perfect substitutes in production. Initial wealth is zero and initial earnings and health are drawn from probability distributions $\gamma^c$ and $\gamma^h$.

1. (15 points) Pose an agent’s problem that implements this environment where the household has access only to savings at interest rate $r$. State necessary conditions for optimality of the decision (write down the Euler equations).

2. (10 points) Pose a general equilibrium version of this economy with many agents. Define equilibrium. State some properties of the age dependent wealth distribution.

3. (15 points) Imagine now that there is an insurance market for type B health expenditures and that both current and future $h$ are observable. Here the insurance payments are constrained by the amount actually spent on $c_b$. Describe equilibrium. Would agents want to buy long term insurance?

4. (10 points) Carefully argue whether it would be different to set the market with unlimited amounts of insurance (not limited to the amount spent on $c_b$). Would agents want to buy long term insurance?
Bargaining and Promotion

Imagine a couple that lives for two periods. If they live together they both get in period zero \( u_i^{T,0} = \left( \frac{\epsilon_M + \epsilon_F}{1.8} \right)^{\sigma} + \eta_0, \ i \in \{M, F\} \), with \( \eta_0 < 0 \).

In period 1, there are two states of the world. In state \( A \) (probability \( p_A \)) agent \( M \) gets an endowment of a private good in amount \( d_M^A \) so its utility in this period (there is no discounting) is \( u_i^{T,A} = \left( \frac{\epsilon_M + \epsilon_F}{1.8} + d_M^A - y \right)^{\sigma} \) where \( y \) is the amount of the private good transferred to agent \( F \). In state \( A \) agent \( F \)'s utility is \( u_i^{T,A} = \left( \frac{\epsilon_M + \epsilon_F}{1.8} + y \right)^{\sigma} - \eta^{AF} \).

In state \( B \) there is no such endowment \( d \) and the utility is given by \( u_i^{T,B} = \left( \frac{\epsilon_M + \epsilon_F}{1.8} \right)^{\sigma}, \ i \in \{M, F\} \). If they are alone at 1, their utility is to consume the individual endowment at

The utility of living alone in each period is \( u_i = \epsilon_i^{\sigma}, \ i \in \{M, F\} \), except in state \( A \) for agent \( M \) when it is \( u_M^A = (\epsilon_i + d)^{\sigma} \).

To be together both agents have to agree at each node and there is no commitment. In state \( A \) agent \( M \) can unilaterally give amount \( y \) to agent \( F \).

5. (10 points) If they can choose both in period zero and in period one whether to live together, what is the lowest value of \( \eta_0 \) that will induce them to live together in period 0.

6. (15 points) What is the amount \( y \) that would be given (if any) by \( M \) to \( F \) in state \( A \). Would it be different than if they chose it by Nash Bargaining with equal weights?

7. (15 points) Consider the case that if they choose not to be together at 0 they cannot be together in period 1, but if they are together in period 0 they can reconsider after the realization of the shock to split in 1. What would be the lowest value for agent \( F \) to stay together in period 0? What about for agent \( M \)?

8. (10 points) Imagine now that there is commitment and that there is Nash bargaining with equal weights in period 0. Characterize the solution.
Labor Prelim Exam, BLOCK B

May 22, 2014

There are 3 questions totaling 100 points in this block. You have 4 hours to complete the exam. Remember that if you choose a certain block you need to answer questions only in that block. Good luck!

1. [35 points] In the United States, the college premium—the average wage of college graduates relative to the high-school graduates—fell throughout the 1970s and then increased significantly in the 1980s and 1990s.

   (a) Suppose that, in addition, you are told that the relative supply of college graduates (i.e., the number of workers with a college degree relative to the number of workers with a high school degree) has increased very fast in late 1960s and 1970s, but this trend has slowed down after that. Assume that the latter trend is exogenous and write a simple model that generates the non-monotonic behavior of the college premium observed in the data. Be as specific as possible: State your assumptions—the necessary functional forms, etc., and make any necessary derivations to support your arguments. [12 points]

   (b) Based on the empirical evidence you know, how can you justify taking the relative supply of college workers as exogenous? What would be the problem in your model if the relative supply cannot be taken exogenous? [8 points]

   (c) Krusell et al (2000, ECMA) tackled this problem from a slightly different angle, by following Griliches’ capital-skill complementarity hypothesis to endogenize the increasing demand for skilled workers. Describe how this approach works, including the particular production function that one needs, and the restrictions on the parameters of this function that need hold for the explanation to go through. How is this explanation related to Gordon’s (1990) work on the quality-adjusted equipment prices index? [15 points]

2. [40 points] This question considers a model of occupational switching in the presence of human capital accumulation and learning about one’s own abilities. We approach this problem in several steps.

   (a) First, consider the following human capital accumulation problem. Individuals start life with a human capital stock of $h_0$ and invest a fraction $\tau \in [0, 1]$ of their time endowment learning new skills. New human capital is created according to the production function:
\( h_{t+1} = Ah_t^\gamma i_t^\delta, \) where \( A \) is the learning ability of the individual and \( \gamma \) and \( \delta \) are positive parameters. Wage income at age \( t \) is given by \( h_t \varepsilon_t(1 - i_t) \) where \( \varepsilon_t \) is an i.i.d shock to the price of human capital in that period.

i. [10 points] First assume that individuals know their own \( A \). State the dynamic program corresponding to this problem.

ii. [15 points] Now consider the case where \( A \) is initially unknown but is learned over time. Specifically, individuals begin with a prior belief about \( A \), which they then update as they observe their wage income in each period. State the dynamic programming problem paying special attention to equations that specify how beliefs evolve. [Hint: You may need to transform some variables judiciously in order to make standard Kalman filtering techniques applicable.]

(b) [Multi-dimensional skills and occupational switching] Now suppose that there are \( J \) types of human capital, each produced according to their individual production function: \( h^j_{t+1} = A^j(h^j_t)^\gamma (i^j_t)^\delta \). Notice that this specification allows the individual to have different learning abilities in different skills. There are \( K \) occupations, each of which differ in how they value different types of human capital. Specifically, let \( p^k_j \) be the price of skill \( j \) in occupation \( k \). The wage earnings of an individual in this occupation is given by \( \left( \sum_j p^k_j h^j_t \varepsilon_t^j \right) (1 - \sum_j i^j_t) \), where \( \varepsilon_t^j \) is the i.i.d shock to skill \( j \)'s price. Now assume (as before) that an individual begins life without perfectly knowing his abilities \( A^1, A^2, \ldots, A^J \).

i. [15 points] Describe in words (but as precisely as you can) the decisions of individuals in this model. Specifically, What determines how much an individual invests in one skill versus another? What determines occupational switching? How do you expect the pace of switching to change over the life cycle?

3. [25 points] This question asks you about Jovanovic’s (1979) model of wage growth, job switching, and tenure effects.

   (a) [20 points] Describe this model in as much detail as possible. If you can write down the equations that describe the model you get extra points, although this is not necessary. Explain how the model works, especially how a given worker’s problem changes from period to period. Also state which specific empirical facts this model is consistent with (at least qualitatively).

   (b) [10 points] Suppose we now introduce firing costs into this model. That is, when a match is broken the firm incurs a fixed cost. How would this policy affect the dynamics of the model (job tenure, wage profiles, etc.) relative to the baseline in part (a)?