

Written Exam Economics Summer 2017

Labour Economics

Date: June 10, 2017

This exam question consists of 4 pages in total

Please note that the language used in your exam paper must correspond to the language of the title for which you registered during exam registration. I.e. if you registered for the English title of the course, you must write your exam paper in English. Likewise, if you registered for the Danish title of the course or if you registered for the English title which was followed by “eksamen på dansk” in brackets, you must write your exam paper in Danish.

If you are in doubt about which title you registered for, please see the print of your exam registration from the students’ self-service system.

The paper must be uploaded as one PDF document. The PDF document must be named with exam number only (e.g. ‘1234.pdf’) and uploaded to Digital Exam.

Focus on Exam Cheating

In case of presumed exam cheating, which is observed by either the examination registration of the respective study programmes, the invigilation or the course lecturer, the Head of Studies will make a preliminary inquiry into the matter, requesting a statement from the course lecturer and possibly the invigilation, too. Furthermore, the Head of Studies will interview the student. If the Head of Studies finds that there are reasonable grounds to suspect exam cheating, the issue will be reported to the Rector. In the course of the study and during examinations, the student is expected to conform to the rules and regulations governing academic integrity. Academic dishonesty includes falsification, plagiarism, failure to disclose information, and any other kind of misrepresentation of the student’s own performance and results or assisting another student herewith. For example failure to indicate sources in written assignments is regarded as failure to disclose information. Attempts to cheat at examinations are dealt with in the same manner as exam cheating which has been carried through. In case of exam cheating, the following sanctions may be imposed by the Rector:

- 1. A warning
- 2. Expulsion from the examination
- 3. Suspension from the University for at limited period or permanent expulsion.

Question 1 - Unemployment search and activation (max 1400 words)

Suppose the unemployment period is divided into two. The first period of unemployment is called the passive period. During the passive period workers are not required to participate in active labor market programs. The duration of this passive period is P . When the passive period ends, the worker enters the active period, where she is required to participate in active labor market programs. This active period lasts for the remaining unemployment duration. The only difference the worker faces when entering the active period of unemployment, is that for a given search effort level, the effect on the job arrival rate is lower in the active period as she also has to participate in activation. Hence, there is no effect on the productivity of the unemployed from participating in the activation. Furthermore, unemployment benefits stay constant and last forever as unemployed. The unemployed worker can decide on both how much to search as well as her reservation wage. Once a job is accepted, we assume that the job lasts forever.

Let $V_u(t)$ be the value of being unemployed at a duration of unemployment t . Consider a short time-interval dt . Then, we can write the Bellman equation for an unemployed worker as

$$rV_u(t) = b - s(t) + \psi(t) \lambda(s(t)) \int_{x(t)}^{\infty} [V_e(w) - V_u(t + dt)] dw + \frac{V_u(t + dt) - V_u(t)}{dt} \quad (1)$$

where b is the benefit level, $s(t)$ is the search effort at a unemployment duration of t , $\psi(t) \lambda(s(t))$ is the job arrival rate for a search effort of $s(t)$ at a duration of t , r is the discount rate, $x(t)$ is the reservation wage at a duration of t , $V_e(w)$ is the value of being employed at the wage w .

Let $\lambda(s(t)) = \frac{1}{\gamma} s(t)^\gamma$ where $0 < \gamma < 1$. In addition to this, let $\dot{V}_u(t)$ be the time-derivative of the value of being unemployed, that is $\dot{V}_u(t) = \lim_{dt \rightarrow 0} \frac{V_u(t+dt) - V_u(t)}{dt}$. With some derivations, we can express the value of being unemployed as

$$rV_u = b - s + \frac{\psi \frac{1}{\gamma} s^\gamma}{r} \int_x^\infty (1 - H(w)) dw + \dot{V}_u \quad (2)$$

where we have suppressed the time dependence. The expression in equation (2) will be easier to work with in solving the questions below compared to equation (1).

In the passive period, the worker has the job arrival rate $\frac{\psi_p}{\gamma} s^\gamma$ for a search effort of s , whereas in the active period the worker has the job arrival rate $\frac{\psi_a}{\gamma} s^\gamma$ for a search effort of s . We assume that the search technology parameters are related as follows, $\psi_p > \psi_a$. This reflects that in the active period, the worker also has to spend time on activation. Furthermore, we assume that $\psi_p > \psi_a > \gamma r$ and that parameters are such that there exists a model solution where the worker has a strictly positive search effort level ($s > 0$).

Q1: Derive the optimal search effort given x and the model parameters [Hint: when differentiating the value function with respect to the search effort, you can use that the optimal search effort $s^*(t)$ implies $\frac{\partial V_u(t)}{\partial s^*(t)} = 0$ and that there is no effect of the current search effort on future values of being unemployed, i.e. $\frac{\partial V_u(t+dt)}{\partial s^*(t)} = 0$. Hence, we have that $\frac{\partial \dot{V}_u(t)}{\partial s^*(t)} = 0$]. Keeping the reservation wage, x , fixed, what is the effect of a higher search technology parameter ψ for the optimal search effort? In addition to this, does a higher reservation wage imply a higher or lower search effort?

Q2: Write up the reservation wage and insert the optimal search effort found in the previous question. Consider the stationary solutions for both the passive and active periods of unemployment by setting $\dot{x} = 0$ (this corresponds to cases where both the passive and active periods of unemployment last forever). Is the reservation wage higher or lower during the passive period of unemployment?

Q3: Write up the differential equation and boundary condition that characterize the evolution of the reservation wage until an unemployment duration P is reached. Will the reservation wage increase or decrease as we approach the end of the passive period?

Q4: Is the search effort increasing or decreasing as we approach the end of the passive period?

Q5: Write up the hazard rate. Is the hazard rate increasing or decreasing as the worker approaches the end of the passive period of unemployment?

Q6: Explain in words referring to your results in the previous questions, what will happen to the search effort at the moment the active period of unemployment begins? Contrast the effect on the search effort with the reservation wage at the time where the active period of unemployment begins.

Q7: Explain in words what is the effect of increasing the length of the passive period on the hazard rate out of unemployment for a worker who is in the passive period of unemployment?

Question 2 - Education subsidies (max 1800 words)

In Denmark, education is heavily subsidized. Most education costs are funded by the government and in many cases students are even eligible to receive income support (SU) while studying. Recently there have been much discussion around decreasing the level of subsidies to education in Denmark. In this question, we will analyze the effect of these subsidies.

Throughout the question we will assume that the role of education is simply to increase workers' levels of general human capital. Since we will not be interested in details regarding the timing of education, you may also assume that educational investments happen instantaneously (this means that people do not have to spend any time on education, however, education will still be costly in terms of other resources).

Q1: Based on the course curriculum, present a model of general human capital investment that can be used to analyze education decisions and education subsidies [hint: you should try to find the simplest possible model that fits

the question description above and allows you to meaningfully answer all the subquestions below]. Solve the model to find an equation characterizing the level of education that people will choose in the absence of education subsidies.

Q2: Modify your model from the previous question by introducing an education subsidy that is funded by a lumpsum tax on workers. Solve the model to show how the level of education varies with the level of the subsidy.

Q3: What is the economically efficient level of the education subsidy - that is, what level of the subsidy would be chosen by a social planner trying to maximize welfare? Briefly explain the intuition behind this result.

Q4: In public debates regarding education subsidies, educational inequality is often a central part of the discussion. Modify your model from above so that it contains (at least) two different agents who will get different levels of education when there is no education subsidy.

Q5: In your modified model from Q4, introduce the same education subsidy as in Q2. How do educational outcomes change with the level of the education subsidy? What is the economically efficient level of the education subsidy? Briefly explain the intuition behind this result.

Q6: Can you suggest a realistic change to the model that would cause the economically efficient level of the subsidy to be higher than what you found in Q5?