

Written Exam for the B.Sc. or M.Sc. in Economics summer 2014

**Labour Economics**

Final Exam/ Elective Course/ Master's Course

June 27, 2014

This exam question consists of 7 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 (including the standard cover and the appendices). The PDF document must be named with exam number only (e.g. '1234.pdf') and uploaded to Absalon.***

**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.

The Faculty of Social Sciences  
The Study and Examination Office  
October 2006

## Part I - Shorter questions (max 1200 words)

### Question A

Daniel and Nikolaj are two completely identical workers in the same labor market. Each of them has just gotten a new job but the jobs are in two different firms.

In their new jobs, Daniel and Nikolaj both automatically accumulate human capital via learning-by-doing but the rate at which this happens is different across the two jobs. In the job that Daniel has accepted, human capital accumulates at a very high rate. In the job that Nikolaj has accepted, human capital accumulates at a very low rate.

- What would you expect regarding the relative wages of Daniel and Nikolaj today and in the future? You may assume that the two jobs differ only with respect to human capital accumulation and (possibly) their wage.

### Question B

Two very different countries, Gondor and Mordor, both have a flat proportional tax on income. In 2010, the two countries enacted two very different tax reforms. In Gondor, the income tax rate was temporarily lowered by one percentage point in 2010 but was restored to its old level again in 2011. In Mordor, the income tax was permanently lowered by one percentage point in 2010.

The two tax reforms had very different effects: In Gondor, the change in the tax rate caused the total number of hours worked in the economy to increase by 2 percent in 2010. In Mordor, the change in the tax rate caused the total number of hours worked in the economy to increase by only 0.5 percent in 2010.

Assume now that we go back to 2010 and swap tax reforms between the two countries: In Mordor we implement the tax reform that Gondor had originally implemented and in Gondor we implement the tax reform that Mordor had originally implemented.

- What do you think would happen to the total number of hours worked in the two countries in 2010 under this alternative scenario? You may assume that both countries always just burn their tax revenue.

## Part II - A job search model (max 1100 words)

Consider an economy where all agents, workers and firms, are rational, forward-looking and risk-neutral. Assume also that all workers are ex-ante identical and firms are ex-ante identical.

Workers search for (better) jobs both as unemployed and employed, but they cannot choose their intensity of searching. As unemployed, workers have the income  $z$  from home production. In other words, unemployment income  $z$  does not include unemployment benefits. Assume that the number of workers is given by a constant  $n$ , so that in equilibrium  $nu$  workers are unemployed and  $n(1 - u)$  workers are employed.

The number of firms operating in the market,  $m$ , is determined endogenously. It is assumed that firms have some market power and post wages. A firm is constrained to posting and paying the same wage to all workers. The profit of a firm paying the wage  $w$  is given by  $\pi(w) = (y - w)\ell(w) - c_f$ , where  $y$  is the productivity,  $\ell(w)$  is the number of employed workers in a firm paying the wage  $w$ , and  $c_f$  is a fixed flow cost of operating in the market. There is free-entry to the market so equilibrium profits will in equilibrium be zero. To simplify matters, we consider the case where the discount rate  $r = 0$ .

The number of new job matches is given by the constant returns to scale matching function  $M(m, n)$  such that the job arrival rate for both unemployed and employed workers is given by  $\lambda(m/n) = \frac{M(m, n)}{n} = M(m/n, 1)$ . Finally,  $\lambda'(\cdot) > 0$  and  $\lambda''(\cdot) < 0$ . Finally, jobs are destructed with the exogenous rate  $q$ .

### Question A

- What is the workers' reservation wage as unemployed? Explain the intuition for your result.

### Question B

- Will the model generate wage dispersion? Explain why or why not.

### Question C

- Derive the steady-state unemployment level in terms of persons.

### Question D

- Derive the steady-state employment level for a firm paying a wage of  $w$  as a function of  $w$ ,  $m$  and model parameters. What is the steady-state employment level for firms paying a wage equal to the unemployed workers' reservation wage?

### Question E

- The social planner maximizes welfare with respect to the number of firms  $m$ . Write up the social welfare function and derive the planner's first-order condition. Interpret your results.

### Question F

- Use the free-entry condition evaluated in the workers' reservation wage, that is  $\pi(x) = 0$ , and compare this with the planner's solution. Is the optimal number of firms higher or lower than the number of firms operating in the free-entry search equilibrium?

### Question G

- Provide an intuitive argument for why a minimum wage could increase efficiency.

### Question H

- Derive the optimal minimum wage.

## Part III - Paternal leave and discrimination (max 1600 words)

In Denmark there is a very generous system of parental leave which gives new parents the opportunity of going on leave from their jobs for up to around 12 months in total. To a large degree, parents are free to divide these 12 months between the mother and the father in any way they choose. In practice, however, the vast majority of the parental leave is taken by women. In the public debate about gender, labor market outcomes and discrimination, one often hear statements like the following:

*”The fact that only women go on parental leave in Denmark is a major reason for why there is a gap in labor market outcomes between men and women. To improve gender equality, we need to get men to take more parental leave.”*

In this part of the exam, you are asked to explore some aspects of the statement above from the point of view of labor economics.

In particular, consider the following model: The economy consists of a number of workers,  $N$ , and some large number of firms. Half of the workers are men and half are women. In addition, a share  $p$  of the both the men and women would like to of have children, while a share  $(1 - p)$  do not. Assume  $0 < p < 1$ .

The model is a one-period model. Within the period, however, events proceed in four stages as follows:

1. Initially, all workers are unemployed and all firms will make a job offer to each worker.
2. Next, workers will accept the job offering the highest wage (randomizing if indifferent) and get paid the associated wage.
3. Next, those men and women who would like to have children automatically have a child.
4. Finally, workers will work some amount of time and produce output for the firm they have been employed in.

During production in stage 4, we assume that each worker will work some share of his or her time  $h$ , where  $0 \leq h \leq 1$ . A worker who works a share  $h$  of his or her time produces according to the per-worker production function  $f(h) = y \cdot h$ , where  $y > 0$  is some constant hence a firm who employs  $k$  workers that each work a share  $h$  of their time will produce a total output of  $k \cdot f(h) = k \cdot y \cdot h$ .

When making job offers to each of the individual workers in stage 1, we will assume that firms can only specify the wage that the worker will be paid but cannot specify any requirements about how much the worker will have to work if they accept the contract. In other words, a firm pays the full wage to the worker, regardless of whether the worker goes on paternity leave. Similarly workers cannot make any promises to firms about how much they will work. Below we will consider different assumption about how much workers actually work once they are hired.

In terms of preferences, we will assume that workers aim to maximize their income and have no disutility of working. Firms aim to maximize expected profits, where profits are simply equal to output minus wage payments.

### Question A

Assume initially that in stage 4 of the model, men and women who do not have a child always work full time ( $h = 1$ ). In addition, assume that among men and women who do have a child, the men also work full time ( $h = 1$ ), but the women all go on full time parental leave which means that they do not supply any work to their employer in stage 4 ( $h = 0$ ).

- In equilibrium, what is the wage of the different workers in the economy? How does it depend on what firms can observe about workers when making wage offers in stage 1? You may assume that firms can always observe a worker's gender.

### Question B

From now on and for the rest of this part of the exam, focus only on the case where wages cannot differ across different workers of the same sex but may differ across men and women.

- Discuss whether there is a gender gap in labor market outcomes between men and women in this model and explain why. Also discuss whether anyone is being discriminated against and in what sense.

### Question C

In line with the quote from the beginning of the question, the government now introduces a new policy regarding paternal leave that forces couples to split the leave period equally between the mother and the father. As a result, both men and women who have a child now go partially on paternal leave and work half the time ( $h = \frac{1}{2}$ ). Men and women without children continue to work full time ( $h = 1$ ).

- Under this new policy, what is the wage of the different workers in the economy? What has happened to the gap between men and women and why?

### Question D

Because workers only care about wage income in this model and firms only care about output minus wages, an efficient outcome in this model is one that maximizes total output.

- Compare total output without the new government policy (as in Question A) and with the government policy (as in Question C). Has the new policy improved efficiency? Why? Would you say that the new policy is a good idea?

### Question E

We now introduce a small constant fixed cost,  $c$  for each worker that works positive hours so that the per-worker production function becomes:

$$f(h) = \begin{cases} y \cdot h - c & \text{if } h > 0 \\ 0 & \text{if } h = 0 \end{cases}$$

The fixed cost,  $c$ , could for example reflect the fact that workers need to be transported from their home to the firm in order to work for the firm. We will assume that  $c$  satisfies  $0 < c < \frac{y}{2}$ .

- How does your answers from Question D change with this new production function?