UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Term paper in: ECON4715 – Labour economics

Handed out: Monday, March 1, 2004

To be delivered by: March 15, 2004 between 1:00 p.m. and 4:00 p.m.

Place of delivery: Next to SV-info-center, ground floor

Further instructions:

- This term paper is **compulsory**.
- You must use a printed front page, which will be found at \\aasta\www-oekonomi\info\EMNER\Forside_obl_eng.doc
- It is of importance that the term paper is delivered by the deadline (see above). Term papers delivered after the deadline, **will not be corrected**.*)
- All term papers must be delivered to the place given above. You must not deliver your term paper to the course teacher or send it by e-mail. If you want to hand in your term paper **before** the deadline, please contact the department office on 12th floor.
- If the term paper is not accepted, you will be given a new attempt. If you still not succeed, you will not be permitted to take the exam in this course. You will then be withdrawn from the exam, so that this will not be an attempt.

*) If a student believes that she or he has a good cause not to meet the deadline (e.g. illness) she or he should discuss the matter with the course teacher and seek a formal extension. Normally extension will only be granted when there is a good reason backed by supporting evidence (e.g. medical certificate).

Both problems are to be answered.

Problem 1

a) Consider a firm which uses labor as the only input in its production, and has production function $X = A \ln(N)$, where X is output and N employment of the firm, and A is a positive constant. Workers are identical with utility functions $U = \ln(w) + b$, where w is money income (wages and/or other types of income), b is leisure. The logarithmic utility function implies that workers are risk averse in income. Assume that when a worker is employed in the period, $b = 0$, while when the worker is unemployed, $b = v > 0$. Working hours and work effort on the job are fixed, and the firm may, if it wishes, pay private unemployment benefits to workers. There is no public unemployment benefit. Assume also that the firm faces ex ante probability 0.5 of a "high" product price, which equals 1, and probability 0.5 of a "low" product price,

which equals $p < 1$, in the production period Workers must be hired before production starts, and cannot move between firms after the production period has started. The firm is risk neutral.

Derive the optimal ex ante contract between the firm and its workers (i.e., a contract that maximizes the firm's expected profits given workers' expected utility). Find expressions for the number of workers hired by the firm. Derive also the condition on p, which makes the firm select layoffs in the low-demand period.

Discuss some possible problems with implementing the derived contract (Do firms always have incentives to honor such a contract ex post in all states, in particular in the low-demand state? And do workers always have incentives to stay with the firm ex post in all states, in particular in the high-demand stats?).

b) Assume now instead that the firm cannot pay unemployment benefits to its workers, and that workers who are laid off in the low-demand state (if any) receive a public unemployment benefit equal to a fraction θ of the wage paid to employed workers in this state, where $0 < \theta < 1$. Most importantly, study whether the wage and layoff behavior of the firm is different in this case relative to case a. Concentrate on cases where θ is close to zero, and where θ is close to one.

c) Assume that the utility function for workers now takes the form $U = \ln (w+b)$. Try to indicate conditions under which such a utility function may be realistic. Derive the optimal contract, under case a, and when assumptions otherwise are as under that case.

Problem 2

Consider a labor market with surplus labor (not all workers are employed), and where workers are averse to putting up higher effort, where effort is denoted by the variable e. Workers are risk neutral, and their net utility of working (relative to being unemployed) equals

$$U(work) = w - b - h(e),$$

where w is the wage, b is income when unemployed, and h(e) is subjective disutility of work effort e, $h' > 0$, $h'' > 0$. Firms have production functions of the type $X = f(eN)$, where N is employment and f is a concave increasing function, $f' > 0$, $f'' < 0$.

a) Derive the firm's optimal allocation with respect to e and N, when there is surplus labor, implying that some workers are unemployed at equilibrium. (Hint: In this case the firm only needs to pay a wage that exactly compensates for the disutility of effort and the foregone income when unemployed, i.e., $w = b + h(e)$. The solution for e may also be illustrated in a figure.)

b) Assume now that $b = 0$. Study the solution in this case. Is it now reasonable to assume that there will be unemployment in equilibrium?

c) Consider a case with $b > 0$, and full employment, such that the wage that the firm must pay to its workers is given by $w = b + h(e) + w_0$, where $w_0 > 0$ is some minimum net compensation necessary to attract workers to the firm, determined (outside of the model) by competition in the labor market. Derive the firm's optimal allocation in this case. You may also illustrate it in a figure.