Assignment 2

Due: March 1, 2019 at 12.00 (the latest) to Carolina Persson.
The assignment should be solved in groups of two students. It can be handed in to the TA by using the mailbox for assignments on the 4th floor in House A or by email to carolina.persson@ne.su.se. Before handing in your assignments make sure to state the course name, your names and the TA's name and that all papers are stapled together.

We have an economy where wages are set through collective bargaining between individual firms and local trade unions. The economy is completely symmetric. Firms determine employment unilaterally (right-to-manage model). There is no labour mobility between firms. Unions attempt to maximize the expected utility of a representative member. Firms care about after-tax profits. The indirect utility function of a representative union member exhibits constant relative risk aversion (CRRA), i.e. $v(c) = c^{1-\delta}/(1-\delta)$, where $c =$ consumption and $\delta =$ the coefficient of relative risk aversion. For an employed union member $c = w$, where $w =$ the wage. For an unemployed union member $c = b$, where $b =$ the exogenously determined unemployment benefit. Firms are risk-neutral. The production function is Cobb-Douglas, which implies constant labour demand and profit elasticities w.r.t. the wage. If there is no wage agreement, workers receive the real unemployment benefit *b* and the firm's profit is zero. Unemployment benefits are financed through a proportional tax on firms' profits. The tax rate τ is adjusted so that tax revenues always cover the costs of the benefits. Collective bargaining should be modelled as a Nash bargaining solution with $\gamma =$ the relative bargaining strength of unions.

a) Derive an equation for the wage as a function of the unemployment benefit. Show that the utility of an employed worker is obtained as a mark-up over the utility level of an unemployed worker and the wage as a mark-up over the unemployment benefit. **Help:** In the Nash bargaining solution you should assume that the unemployment benefit *b* is the same in the case of no agreement between the union and the firm as in the case of agreement, although there is in this latter case no profits or wage incomes that can be taxed to finance the benefits (this amounts to assuming that the government then finances the benefits through borrowing – and that agents do not care about future repayment – or that the government uses some other unspecified revenue source to finance the benefits). When there is a collective agreement and production thus takes place, benefits are financed through taxes.

b) How is the wage affected by an increase in the unemployment benefit?

c) Assume now that the coefficient of relative risk aversion is unity, i.e. $\delta = 1$. This implies that $v(c) = \ln(c)$. Redo the analysis in (a) and (b) with this assumption.

d) Assume now instead that all local unions are amalgamated into one national trade union and that all firms are organised in one national employers' federation. Wages are now set in collective bargaining between these national labour market organisations. Show the first-order condition that is now determining the wage and compare it with the first-order condition under local bargaining. Analyse whether the wage will be higher or lower under national than under local bargaining. Explain the intuition. **Help:** The specific functional forms with CRRA are needed to solve questions (a) and (b). They are not needed for solving questions (c) and (d). These questions are most easily analysed by just looking at the first-order conditions in general form.

e) How will an increase in the unemployment benefit affect wages under national collective bargaining? Explain the intuition. Show that there will be both a direct effect of the benefit increase and an indirect effect because of the associated rise in the profit tax rate τ.

f) Now drop the assumption that unemployment benefits are financed through a profit tax. Assume instead that they are financed through a proportional tax on employed workers' wage incomes, where t is the tax rate. It follows that each employed worker pays a tax of tw. It also follows that the consumption of an employed worker is $c = (1-t)w$. Also, now assume that workers are risk neutral, so that $v(c) = c$. Derive a wage equation corresponding to (a) above under the assumption that there is local bargaining. How is the wage affected by an increase in the unemployment benefit?

g) Assume now that there is bargaining at the national level instead of at the local level. Assume now also that no benefits are paid to workers in the case of no agreement between the (national) union and the (national) employers' association. Derive the first-order condition that is now determining the wage and compare it with the first-order condition under local bargaining. Show why there is no interior solution under bargaining at the national level if we assume a Cobb-Douglas production function giving constant labour demand and profit elasticities and that an interior solution thus requires that these elasticities are not constant. Analyse in the latter case whether the wage is higher or lower under national bargaining in this case than under the local bargaining analysed in (e). How is the wage under national bargaining affected by an increase in the unemployment benefit?