

Assignment 3

Due: March 15, 2019 at 13.00 (the latest) to Carolina Persson

The assignment should be solved in groups of two students. It can be handed in to the TA before the start of the seminar session, 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.

This assignment features an intertemporal general-equilibrium model of trade union behaviour. Assume a symmetric economy where monopoly unions set wages in perfectly competitive firms. This is done so as to maximise the rents from unionisation $U_t^i = N_t^i(V_t^i - V_t^a)$ in each firm i , where $U_t^i =$ union utility, $N_t^i =$ employment in the firm, $V_t^i =$ the discounted present value of employment in the firm and $V_t^a =$ the discounted present value of the alternative of not being employed in firm i . The subscript t denotes time. $N_t^i = N(w_t^i)$ is a constant-elastic labour demand function, where $w_t^i =$ the real wage in firm i . Assume that $V_t^a = \eta_t V_t + (1 - \eta_t)V_t^u$, where $V_t =$ the discounted present value of employment elsewhere in the economy, $V_t^u =$ the discounted present value of unemployment and $\eta_t =$ the probability that a worker from firm i who does not find employment there finds it elsewhere in the economy. Workers are risk-neutral. Let $q_t =$ the probability that an employed worker becomes unemployed, $s_t =$ the probability that an unemployed worker stays unemployed, $b_t =$ the unemployment benefit and $w_t =$ the real wage elsewhere in the economy (the aggregate wage). Assume finally that the wage, w_i , is set for *only one period*.

- Write down the expression for the discounted present value of employment in firm i at time t , V_t^i . Be careful to write out time subscripts properly. Let $\delta =$ the discount factor, so that $\delta = 1/(1 + r)$, where $r =$ the discount rate.
- Write down the expression for the discounted present value of unemployment at time t , V_t^u . Again, be careful to write out time subscripts properly.
- Write down the expression for the discounted present value of employment elsewhere in the economy at time t , V_t . Again, be careful to write out time subscripts properly.
- Derive the first-order condition (FOC) for the wage in firm i . When doing that, remember that the wage is set for only one period. This means that the discounted present value of employment in firm i one period ahead, V_{t+1}^i , can be taken as *exogenous* in the utility maximisation. Rewrite the FOC so that it shows a relationship between on the one hand the wage in firm i , w_i , and on the other hand the labour demand elasticity, ε , the discounted present value of employment in firm i , V_t^i , and the discounted present value of not being employed in firm i , V_t^a .
- Now assume that the economy finds itself in a steady state and impose symmetry. Use these assumptions to derive an equation for the aggregate real wage, w_t , according to which it depends on $\varepsilon, \eta, \delta, b, s$, and q . **Help:** Use the FOC derived in (d) and the expressions for the discounted present values derived in (a)-(c).
- The change in employment (= the change in unemployment) from one period to another equals the flow into employment (= the flow out of unemployment) minus the flow out of employment (= the flow into unemployment). Assume that a firm i worker who cannot find a job in the firm has the same probability of finding a job elsewhere as an unemployed worker so that $\eta_t = 1 - s_t$. Write down the expression for the change in the (un)employment rate between periods $t-1$ and t . Then assume a steady state with a constant unemployment rate from period to period (i.e. $u_t = u_{t-1}$) and derive an expression according to which s depends on q and u . Insert this expression into the wage equation from (e) and use it to show how a change in unemployment affects the wage.