Foundations of Modern Macroeconomics Second Edition

Chapter 7: Trade unions and the labour market

Ben J. Heijdra

Department of Economics & Econometrics
University of Groningen

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Outline

Aims of this lecture

- To discuss the most important trade union models and their implications for unemployment.
  - Monopoly union model.
  - Right-to-manage model.
  - Efficient bargaining model.
- To study the phenomenon of "corporatism".
- To show how an insider-outsider model can explain (near) hysteresis in the unemployment rate.

Union

- Objective function of the union:

$$V(\underset{+}{w}, \underset{+}{L}) \equiv \frac{L}{N} u(\underset{+}{w}) + \left[1 - \frac{L}{N}\right] u(\underset{+}{B}), \quad w \geq B$$

  - N the (fixed) number of union members.
  - L the number of employed members of the union ($L \leq N$).
  - w is the real wage rate ($w \geq B$).
  - B is the pecuniary value of being unemployed (referred to as the unemployment benefit).
  - $u(.)$ is the *indirect* utility function of the representative union member.

Union indifference curve

- Graphical device: the union indifference curve: (w, L) combinations for which $V(w, L)$ is constant. See **Figure 7.2**. The slope of an indifference curve of the union is determined in the usual way:

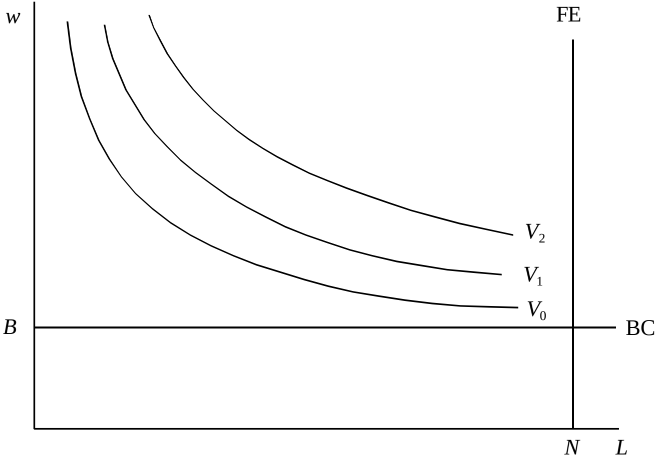
$$dV = V_w dw + V_L dL = 0 \;\Rightarrow$$

$$\left(\frac{L}{N}\right) u_w dw + \frac{1}{N}\left[u(w) - u(B)\right] dL = 0 \Rightarrow$$

$$\left(\frac{dw}{dL}\right)_{dV=0} = -\left(\frac{u(w) - u(B)}{L u_w}\right) < 0$$

  - The union's indifference curves are downward sloping.
  - Union utility rises in North-Easterly direction (because $V_w \equiv (L/N)u_w > 0$ and $V_L \equiv (u(w) - u(B))/N > 0$), i.e. $V_2 > V_1 > V_0$ in Figure 7.2.
  - Note the constraints $w \geq B$ and $L \leq N$.

Figure 7.2: Indifference curves of the union



Firm

- Objective function of the firm:

$$\pi(\underset{-}{w}, \underset{?}{L}) \equiv \underbrace{AF(L, \bar{K})}_{Y} - wL$$

  - π is short-run profit.
  - A is index of general productivity.
  - $\bar{K}$ capital stock (fixed in the short run).

- The (profit maximizing) demand for labour is such that $\pi_L \equiv \partial\pi/\partial L = 0$ or:

$$\begin{aligned} \pi_L &= AF_L(L, \bar{K}) - w = 0 \quad \Leftrightarrow \\ L^D &= L^D(\underset{-}{w}, \underset{+}{A}, \underset{+}{\bar{K}}) \end{aligned}$$

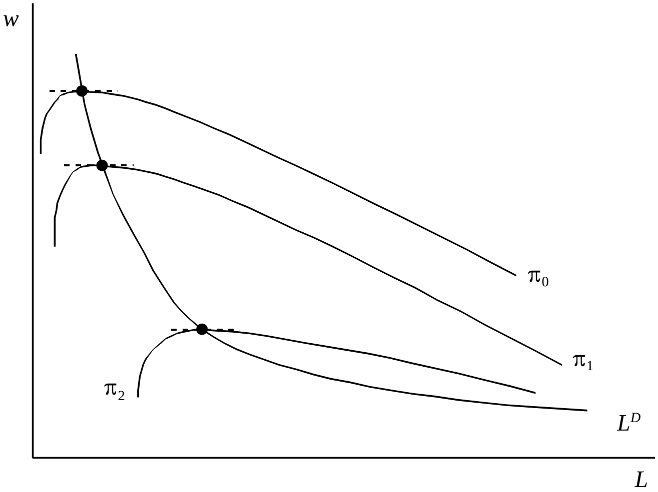
Iso-profit line

- Graphical device: the iso-profit line ($\approx$ indifference curve for the firm): (w, L) combinations for which $\pi(w, L)$ is constant. See **Figure 7.1**. The slope of an iso-profit curve can be determined in the usual fashion: $d\pi = \pi_w dw + \pi_L dL = 0 \;\Rightarrow$

$$\left(\frac{dw}{dL}\right)_{d\pi=0} = -\frac{\pi_L}{\pi_w}$$

  - We know that $\pi_w = -L < 0$ so π_L determines the slope of an iso-profit line.
  - But $\pi_L \equiv AF_L - w$, and $F_{LL} < 0$, so π_L is positive for a low employment level, becomes zero (at the profit maximizing point), and then turns negative as employment increases further.
  - Top of the iso-profit line is on the labour demand function.
  - As we move downward along labour demand profit increases.

Figure 7.1: The iso-profit locus and labour demand



Three major trade union models

(A) Monopoly union model [Dunlop (1944)]: union exploits monopoly power in its labour market.

(B) Right-to-manage model [Leontief (1946)]: union and firm bargain over the wage. The firm sets the employment level.

(C) Efficient bargaining model [McDonald and Solow (1981)]: union and firm bargain over wage *and* employment simultaneously.

(A) Monopoly union model (1)

- The union picks the wage to maximize union utility subject to the labour demand curve:

$$\max_{\{w\}} V(w, L) \ \text{ subject to } \ \underbrace{\pi_L(w, A, L, \bar{K}) = 0}_{(a)}$$

  (a) The firm determines employment and thus the constraint means that the solution lies on the demand for labour curve.

- Substituting the constraint yields:

$$\max_{\{w\}} V\left(w, L^D(w, A, \bar{K})\right)$$

(A) Monopoly union model (2)

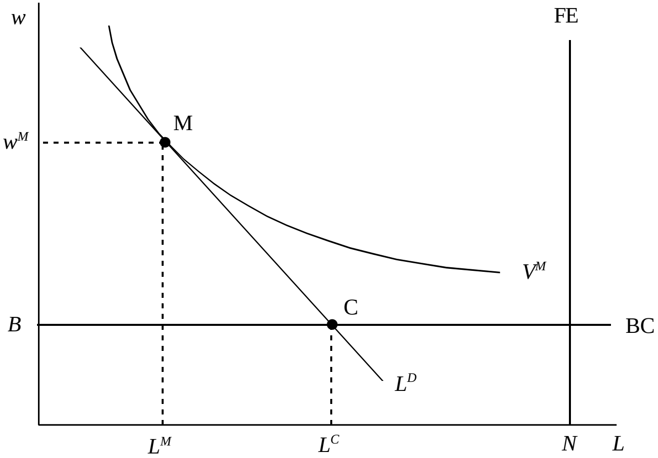
- The first-order condition:

$$\begin{aligned} \frac{dV}{dw} &= 0: \quad V_w + V_L L_w^D = 0 \quad \Rightarrow \\ \underbrace{-\frac{V_w}{V_L}}_{(a)} &= \underbrace{L_w^D}_{(b)} \end{aligned}$$

(a) Slope of the union indifference curve.
(b) Slope of the labour demand curve.

- In **Figure 7.3** the solution is in point M. The competitive market solution (attained in the absence of unions) would be C. Hence, there is too little employment (and too much unemployment) with a monopoly union.

Figure 7.3: Wage setting by the monopoly union



(A) Monopoly union model (3)

- We can rewrite the first-order condition:

$$V_w + V_L L_w^D = \frac{L}{N} u_w + \frac{1}{N} \left[u(w) - u(B) \right] L_w^D = 0$$
$$= \frac{L}{wN} \left[w u_w + \left[u(w) - u(B) \right] \frac{w L_w^D}{L} \right] = 0 \Rightarrow$$
$$\frac{u(w) - u(B)}{w u_w} = \frac{1}{\varepsilon_D} \qquad \text{(S1)}$$

where $\varepsilon_D \equiv -\frac{w}{L^D} \frac{\partial L^D}{\partial w}$ is the labour demand elasticity.

  - If ε_D is constant then productivity shocks [changes in A] have no effect on the optimal real wage. Rationale for horizontal real wage curve (provided the union is not fully employed).

(A) Monopoly union model (4)

- Continued.
  - A fully employed union (for which $L = N$) is interested only in raising the real wage: $V(w, L) = U(w)$ in that case. Positive productivity shocks translate into higher real wages.
  - If (indirect) utility is logarithmic, $U(x) \equiv \ln x$ then (S1) reduces to:

    $$w = e^{1/\varepsilon_D} B$$

    The wage is a markup over the unemployment benefit! $[e^{1/\varepsilon_D} > 1]$.
    - The higher is ε_D, the lower is the markup [less monopoly power of the union].
    - Lowering B lowers the wage and raises employment.

(B) Right-to-manage model (1)

- Firm and union bargain over the wage.
- Firm picks the employment level ("buyer's sovereignty").
- Generalized Nash bargaining.
- Formally, the wage bargain maximizes:

$$\max_{\{w\}} \Omega \equiv \lambda \ln \left(V(w, L) - \bar{V} \right) + (1 - \lambda) \ln \left(\pi(w, L) - \bar{\pi} \right)$$

$$\text{subject to } \; \pi_L(w, A, L, \bar{K}) = 0,$$

  - λ relative bargaining strength of the union.
  - $1 - \lambda$ relative bargaining strength of the firm.
  - $\bar{V}$ fall-back position of the union, e.g. $\bar{V} = U(B)$.
  - $\bar{\pi}$ fall-back position of the firm, e.g. $\bar{\pi} = \pi^{MIN}$ (to cover capital cost).
  - Constraint $\pi_L = 0$ because the firm will pick employment on labour demand.

(B) Right-to-manage model (2)

- By substituting labour demand we get:

$$\max_{\{w\}} \Omega \equiv \lambda \ln\left(V(w, L^D(w, A, \bar{K})) - \bar{V}\right) + (1-\lambda)\ln\left(\pi(w, L^D(w, A, \bar{K})) - \bar{\pi}\right)$$

- First-order condition:

$$\frac{d\Omega}{dw} = \lambda \overbrace{\frac{V_w + V_L L_w^D}{V - \bar{V}}}^{(a)} + (1-\lambda)\overbrace{\frac{\pi_w + \pi_L L_w^D}{\pi - \bar{\pi}}}^{(b)} = 0 \qquad \text{(S2)}$$

(a) This term can be simplified to:

$$V_w + V_L L_w^D = \frac{L}{wN}\left[w u_w - \varepsilon_D[u(w) - u(B)]\right]$$

(B) Right-to-manage model (3)

- Continued.
  (b) This term can be simplified to:

$$\pi_w + \pi_L L_w^D = \pi_w = -L,$$

- By substituting these terms into (S2) we get:

$$\frac{\lambda}{V-\bar{V}}[V_w + V_L L_w^D] = -\frac{1-\lambda}{\pi-\bar{\pi}}\pi_w \;\Rightarrow$$

$$\frac{L}{wN}\left[wu_w - \varepsilon_D[u(w)-u(B)]\right] = \frac{(1-\lambda)(V-\bar{V})}{\lambda(\pi-\bar{\pi})}L \;\Rightarrow$$

$$wu_w - \varepsilon_D\left[u(w)-u(B)\right] = \frac{(1-\lambda)wL}{\lambda(Y-wL-\bar{\pi})}\left[u(w)-u(B)\right]$$

(B) Right-to-manage model (4)

- We get:

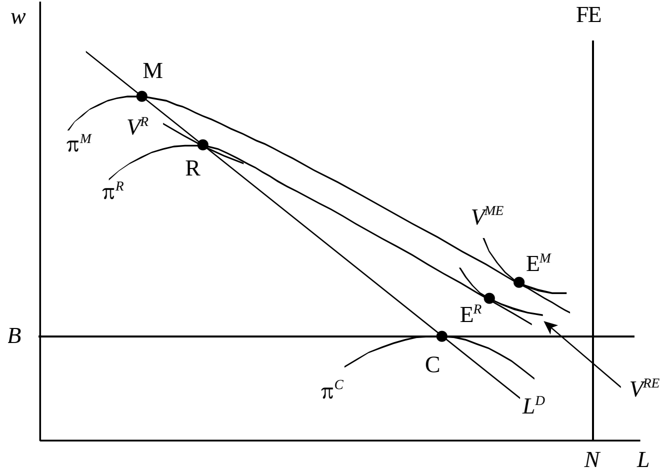
$$\frac{u(w)-u(B)}{wu_w}=\frac{1}{\varepsilon_D+\phi},\quad \phi\equiv\frac{(1-\lambda)\omega_L}{\lambda(1-\omega_L-\omega_\pi)}\geq 0$$

  - Normal case ($0<\lambda<1$): the RTM union sets a lower wage than a monopoly union [because the markup is smaller for the RTM union, i.e. $\frac{1}{\varepsilon_D+\phi}<\frac{1}{\varepsilon_D}$].
  - Corner case 1 ($\lambda=1$): if the union holds all the bargaining power then $\phi=0$ and the RTM solution is the monopoly union solution.
  - Corner case 2 ($\lambda=0$): if the firm holds all the bargaining power then $\phi\to\infty$ and the wage is set at the competitive level ($w=B$).

(B) Right-to-manage model (5)

- In **Figure 7.4** the RTM solution can lie anywhere between point M and C.
- A disturbing property of the RTM solution is that it leads to an *inefficient* outcome: through point R there is an iso-profit line π^R along which union utility can be increased. Point E^R is the efficient point.

Figure 7.4: Wage setting in the right-to-manage model



(C) Efficient bargaining model (1)

- Now the firm and the union bargain over the wage *and* the employment level to maximize:

$$\max_{\{w,L\}} \Omega \equiv \lambda \ln \left(V(w,L) - \bar{V} \right) + (1-\lambda) \ln \left(\pi(w,L) - \bar{\pi} \right)$$

- First-order conditions:

$$\frac{\partial \Omega}{\partial w} = \frac{\lambda}{V - \bar{V}} V_w + \frac{1-\lambda}{\pi - \bar{\pi}} \pi_w = 0$$
$$\frac{\partial \Omega}{\partial L} = \frac{\lambda}{V - \bar{V}} V_L + \frac{1-\lambda}{\pi - \bar{\pi}} \pi_L = 0$$

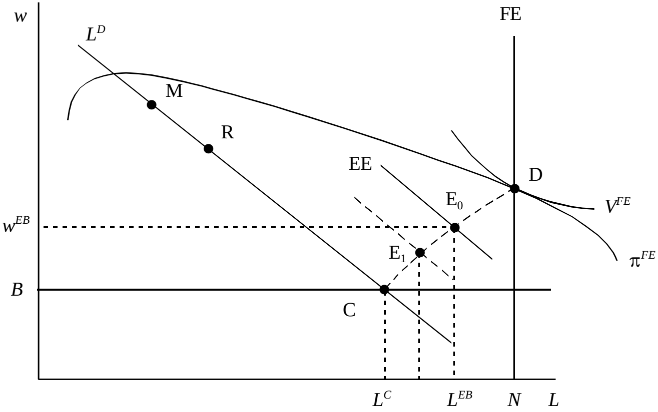
(C) Efficient bargaining model (2)

- Combining these conditions yields the *contract curve:*

$$
\begin{aligned}
-\frac{1-\lambda}{\pi-\bar{\pi}} &= \frac{\lambda}{V-\bar{V}}\frac{V_w}{\pi_w} = \frac{\lambda}{V-\bar{V}}\frac{V_L}{\pi_L} \\
\frac{V_L}{V_w} &= \frac{\pi_L}{\pi_w} \qquad \text{(S3)}
\end{aligned}
$$

  - Contract curve is all points of tangency between indifference curves of the firm and the union.
  - All points on the contract curve are efficient.
  - Except in point C all points on the contract curve are off the labour demand curve.
  - See **Figure 7.5** for an illustration.

Figure 7.5: Wages and employment under efficient bargaining



(C) Efficient bargaining model (3)

- To close the model we postulate a so-called *equity locus* or "fair share" rule. After repeated interactions in the past the firm and the union have decided on a target share (k) of the output that accrues to the union:

$$wL = kY, \qquad 0 < k < 1$$

- It follows that the firm gets:

$$\pi(w, L) = \underbrace{AF(L, \bar{K})}_{Y} - wL = (1-k)AF(L, \bar{K})$$

(C) Efficient bargaining model (4)

- The slope of the equity locus, $wL = kAF(L, \bar{K})$, is:

$$\left(\frac{dw}{dL}\right)_{EE} = \frac{kAF_L - w}{L} < 0$$

(Note: The solution lies to the right of the labour demand so $\pi_L \equiv AF_L - w < 0$. hence, a fortiori, $w > kAF_L$ (since $0 < k < 1$).)

- The equity locus shifts to the right if the union's share of the pie is increased:

$$\left(\frac{\partial L}{\partial k}\right)_{EE} = \frac{Y}{w - kAF_L} > 0$$

- In Figure 7.5 the equity locus is represented by the EE line. The initial equilibrium is at point E_0.

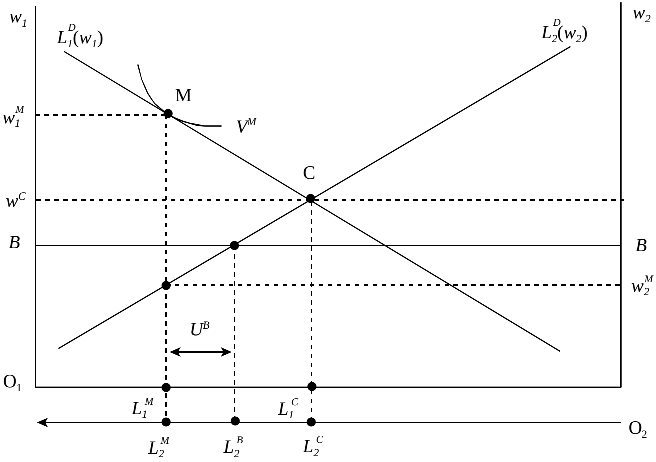
(C) Efficient bargaining model (5)

- Crucial features of the solution:
  - employment is higher than under the competitive solution! Profits are turned into jobs under efficient bargaining
  - Wage moderation [e.g. the Wassenaar Agreement] as modelled by $k \downarrow$ may actually be bad for employment! A lower k shifts the EE locus to the left so that the new equilibrium is at E_1. Effective bargaining power of the firm is increased and the equilibrium moves closer to the competitive solution C.
- Key problem with the efficient bargaining union is its spectacular lack of empirical support. The standard case appears to be the RTM model in the real world.

Unions in a two-sector setting

- Dual labour market idea: labour is homogeneous but there are two sectors in the economy:
  - *Primary sector*: unionized (monopoly union). Here is where the good jobs are found.
  - *Secondary sector*: competitive. Here is where the poor jobs are found.
- In **Figure 7.6** we can see how the union in the primary sector affects working conditions in the secondary sector.
  - If there is no unemployment benefit ($B = 0$): full employment and wage disparity, $w_1^M \gg w_2^C$ as the union keeps secondary sector workers out of the primary sector.
  - If there are unemployment benefits ($B > 0$): there will also be unemployment now in the secondary sector.

Figure 7.6: Unemployment in a two-sector model



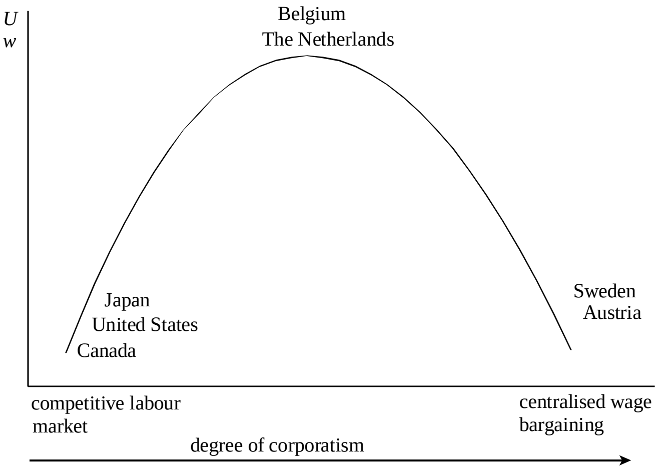
Corporatism

Key idea: it is best for unemployment to have either many very small and weak unions (as in the US, Japan, and Canada) or to have few large and strong unions (as in Sweden, and Austria). Avoid the intermediate case. Reasons:

- Weak unions do not impose much damage.
- Strong unions internalize the external effects of high wage claims [high wages → high unemployment → (in a welfare state) high unemployment benefits → high taxes on working population → low after-tax wage for workers].

- Intermediate case: unions large enough to do damage but not large enough to internalize the government budget constraint!
- In Figure 7.7 unemployment and wages are related to the degree of corporatism. Calmfors and Driffill found some empirical support for the hypothesis. This seems to have collapsed in recent years [see data on Sweden: welfare state collapsed under own weight?].

Figure 7.7: Unemployment, real wages, and corporatism



Modelling unemployment persistence (1)

- Up to now we have assumed that the number of union members is fixed.
- The membership rule may be a source of hysteresis (insiders versus outsiders).
- Simple model (all variables are in logarithms).
- The demand for firm i's product is:

$$y_i = (m - p) - a(p_i - p), \quad a > 1$$

  - y_i is output.
  - m is money supply (index for aggregate output).
  - p is aggregate price index.
  - p_i is the price charged by firm i (if $p_i > p$ then the firm's output falls).

Modelling unemployment persistence (2)

- Production function (only labour, l_i):

$$y_i = l_i$$

- Perfect competition (price equals marginal cost):

$$p_i = w_i$$

where w_i is the wage paid by firm i.

- Labour demand is:

$$l_i = (m - p) - a(w_i - w) \tag{S4}$$

where w is an index of aggregate nominal wages.

Modelling unemployment persistence (3)

- Firm i has a given number n_i^* of so-called "attached workers" [insiders].
  - Only the interests of the insiders count in the wage negotiations.
  - Only if all insiders are hired is the firm allowed to hire outsiders ["unattached" workers].
  - Group of insiders has the power to set the wage unilaterally. By assumption they set w_i such that all insiders are expected to get a job [compare Fischer (1977)]:

$$w_i \text{ such that } E(l_i) = n_i^* \quad \text{(S5)}$$

- From (S4) and (S5) we get:

$$E(l_i) = E(m) - E(w) - a(w_i - E(w)) = n_i^*$$

Modelling unemployment persistence (4)

- If all firms are identical and have the same number of insiders then they will face the same nominal wage, i.e. $w_i = w$ and thus $E(w) = E(w_i) = w_i$ also. It follows that:

$$n_i^* = E(m) - w$$

- By substituting this expression into labour demand we get:

$$\begin{aligned} l_i &= m - w - a(w_i - w) = m - E(m) + n_i^* \quad \Rightarrow \\ l &= (m - E(m)) + n^*, \end{aligned}$$

  where we now drop the firm index i because all firms are the same.
  - Employment is equal to the membership ($l = n^*$) if the money supply is estimated correctly.
  - With a negative money surprise ($m < Em$) demand is lower than expected and some insiders lose their job ($l < n^*$).
  - With a positive money surprise ($m > Em$) demand is higher than expected and some outsiders are hired ($l > n^*$).

Modelling unemployment persistence (5)

- Assume the following membership rule: unemployed insiders in period t will become outsiders in period $t+1$:

$$n_i^* = l_i(-1)$$

- This yields:

$$l = (m - E(m)) + l(-1)$$

- For a constant work force per firm $\bar{n} \equiv l + U$:

$$U = -(m - E(m)) + U(-1),$$

where U is the unemployment rate. (Note: In levels, the unemployment rate is given by $U \equiv (\bar{N} - L)/\bar{N} = 1 - (L/\bar{N}) \approx -\ln(L/\bar{N}) = \bar{n} - l$, where the approximation is valid for small unemployment rates.)

Modelling unemployment persistence (6)

- There is a strong hysteresis effect! Log employment and the unemployment rate feature a unit root.
  This means that a temporary shock has a permanent effect on l and U: $(m - E(m)) \downarrow \rightarrow l \downarrow \rightarrow$ (in the next period) $m = E(m)$ again (temporary shock) but also $n^* = l(-1)$ lower than before. Hence, former (employed) insiders are turned into (unemployed) outsiders!
- Problem with the model: strict hysteresis (unit root) rejected by the data. Recall the regressions in Chapter 6: $U(-1)$ has a near unity coefficient [near hysteresis and slow convergence].

Modelling near-hysteresis (1)

- The unemployment rate plays a role in the wage bargaining process:
  - Fear effect: if U is high it may not be easy to locate another job. This makes insiders more modest.
  - Threat effect: if U is high then the firm has an effective stick against its insiders ["For you ten others"].
- Sketch of the model.
  - Labour demand:

    $$l = -w + \varepsilon$$

    where ε is a stochastic shock.
  - If left to themselves, insiders would set the wage set such that they all expect to have a job:

    $$w^{*} = -l(-1)$$

Modelling near-hysteresis (2)

- Continued.
    - the actual wage is assumed to be:

$$w = aw^* + (1-a)w_R - b(\underbrace{\bar{n} - l}_{U}),$$

    where $0 \leq a \leq 1$ and $b \geq 0$.
        - a is the bargaining strength of insiders.
        - w_R is the reservation wage ("outsider's option").
        - b captures the effect of unemployment on the wage rate.
    - By simple substitutions we obtain:

$$U = \frac{a}{1+b}U(-1) + \frac{1-a}{1+b}w_R + \frac{1-a}{1+b}\bar{n} - \frac{1}{1+b}\varepsilon$$

    Features:
        - Near hysteresis provided a close to unity and b not too large.
        - Little persistence if b is large.

Punchlines

- We have discussed the three major models of union behaviour.
- In the first two models unions cause unemployment. In the third model the union turns profits into jobs.
- In a two-sector setting unions in the primary sector will make things more miserable for workers in the secondary sector.
- Union models can explain (near) hysteresis.
- Tax effects in union models are very similar to the ones obtained in the efficiency wage model.
- Unions can "hold up" the capital stock. Firms may under-invest as a result [dynamic inconsistency problem to be encountered in Chapter 9].