Lecture 4: Labour economics

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The monopsony model

- **Barriers to free entry of firms**
- **Limited mobility of labour**
- **A monopsonist can hold down wages below the competitive wage**

Examples

- **Single-firm towns ("bruksorter")**
- **The labour-market for nurses**
  - **just one hospital in a region**
  - **cartel of regions ("landsting") earlier in Sweden**

<u>The basic monopsony model</u>

- **Labour supply $L^s(w) = G(w)$**
- **An employed person produces y**

<u>Decision problem of a monopsonist</u>

$$\underset{w}{\text{Max}} \quad \pi(w) = L^s(w)(y - w)$$

$$L_1^s(y - w) - L^s = 0$$

$$\frac{L_1^s}{L^s} w\left(\frac{y}{w} - 1\right) - 1 = 0$$

Define $\frac{\partial L^s}{\partial w} \cdot \frac{w}{L_s} = \eta_w^L =$ the elasticity of labour supply

Hence:

$$\eta_w^L \left[\frac{y}{w} - 1 \right] - 1 = 0$$

$$w = \frac{\eta_w^L}{\eta_w^L + 1} y$$

$\frac{\eta_w^L}{\eta_w^L + 1} < 1$ implies that $w < y$, i.e. that the monopsonist sets a lower wage than the competitive wage

The monopsonistic wage coincides with the competitive wage only if $\eta_w^L \to \infty$ in which case

$$w = \frac{\eta_w^L}{\eta_w^L + 1} = \frac{1}{1 + \dfrac{1}{\eta_w^L}}\, y \to y$$

- **Otherwise the monopsonist gains by lowering the wage below the competitive wage**
- **This reduces the labour supply and hence output and employment. But the loss from this is outweighed by the savings on the wage bill.**

<u>Isoprofit curve</u>

$$\pi = L(y - w) = \overline{\pi}$$

$$dL(y - w) - Ldw = 0$$

$$\frac{dL}{dw} = \frac{L}{y - w} \qquad \frac{dL}{dw} > 0 \text{ for } y > w$$

Profit maximisation at the tangency point between an isoprofit curve and the labour supply schedule

- **A minimum wage - if it is not too high – raises both the wage and employment in a monopsonistic market**
- **Non-monotonic relationship between minimum wage and employment in a monopsonistic market**

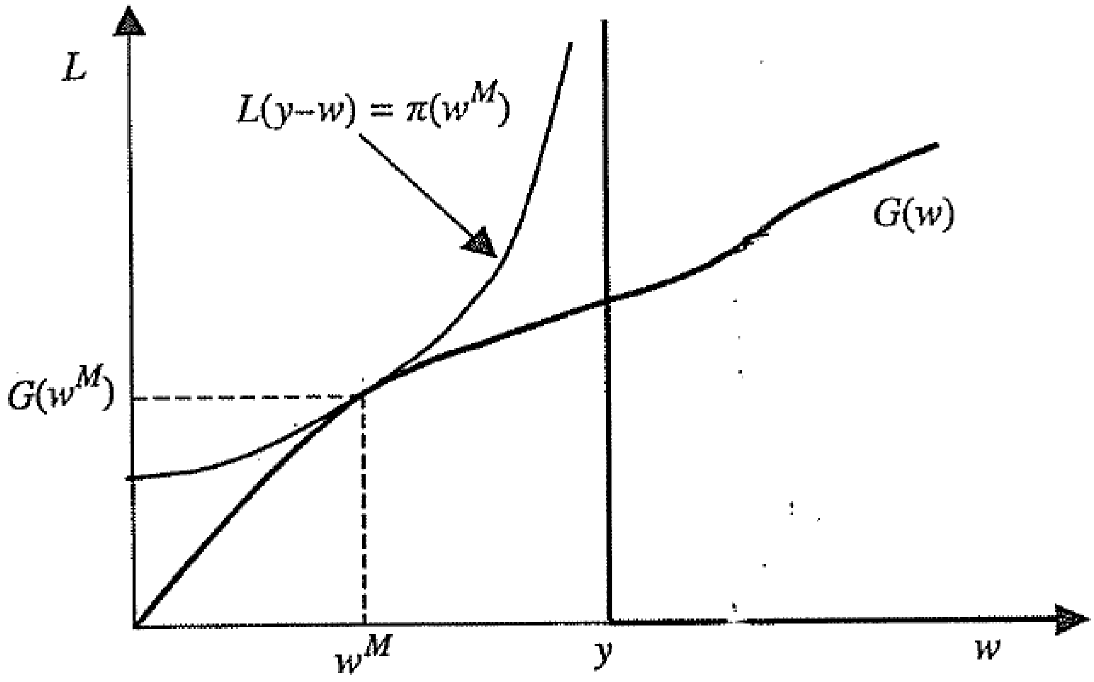


FIGURE 5.4
The monopsony model.

Sources of monopsony power

- **Workers must have limited mobility**
  - **transportation cost**
  - **qualifications that cannot be used elsewhere**
- **Entry costs must prevent entry of competitors**

Simple game-theoretic model for why the existence of entry costs can uphold a monopsony

N firms can enter
c is the entry cost
Each worker produces y

Stage 1: entry decision
Stage 2: wage decision

- **Solve the model backwards**
- **If only one firm it sets the monopsony wage**
  If there are $n > 1$ competitors, firm i sets its wage w_i so as to maximise its profit
  $\pi_i = L_i (y-w_i)$ taking the wages of other firms as given

Employment L_i in firm *i* depends on all wages (w_i, ……w_n) in the following way:

$L_i = L^s(w_i)$ if $w_i > w_j, \quad \forall j \neq i$

$L_i = (1/J)L^s(w_i)$ if *i* sets the highest wage together with *J*-1 other firms, $1 < J < n$

$L_i = 0$ if there exists one firm $j \neq i$ which sets $w_i < w_j$

- **All wages equal to *y* is a Nash equilibrium**
- **Then each firm has zero profits and cannot improve its profits**
  - **with a lower wage all labour disappears**
  - **with a higher wage it makes a loss**
- **No single firm can set $w_i < y$.**
  - **it would then make a profit**
  - **hence it would pay for a competitor to raise the wage above w_i and capture the whole labour supply**
  - **This is so-called <u>Bertrand competition</u>, which forces the wage up to the competitive level**

<u>Stage 1 decision</u>

- **Each firm knows that**
  (i) it will make zero profits with competitors present in the market
  (ii) it will make monopsony profits if it alone enters

- **Once a firm has entered it does not pay for any other firm to enter**
  - **profits will be zero**
  - **but an entry cost *c* has to be paid**
  - **the first firm (if possibilities to enter come sequentially) chooses to enter if $\pi(w^M) > c$.**

- **Extreme assumptions here regarding Bertrand competition but good illustration of how entry costs may give rise to monopsony and wage differences to other sectors unrelated to productivity.**

<u>Collective bargaining</u>

- **Common assumption for unions: identical members**
- ***N* identical members in the union's "labour pool"**
- **Indirect utility function for the individual, increasing in income**
- **Every member supplies one unit of labour if the real wage *w* exceeds the reservation wage $\overline{w}$ (= income of an unemployed person)**
- ***L* = Labour demand**
- **Same probability of getting a job for every union member = *L*/*N* if *L* < *N* and unity if *L* ≥ *N***
- **Probability of unemployment $(1 - \frac{L}{N})$ if *L* < *N* and zero if *L* ≥ *N*.**

<u>Union objective</u>

Maximise the expected utility of members

$$\nu_s = l\nu(w) + (1-l)\nu(\overline{w}) \qquad l = \text{Min}\,(1, L / N)$$

If *N* is exogenous, this is equivalent to maximising the unweighted sum of members' utilities:

$$L\nu(w) + (N-L)\nu(\overline{w})$$

If workers are risk-neutral so that $\nu(w) = w$ and $\nu(\overline{w}) = \overline{w}$, unions maximise the rent from unionisation:

$$lw + (1-l)(\overline{w}) = l(w-\overline{w}) + \overline{w}$$

If $\overline{w} = 0$, this is equivalent to maximising the wage bill: *lw*

Table 3.1

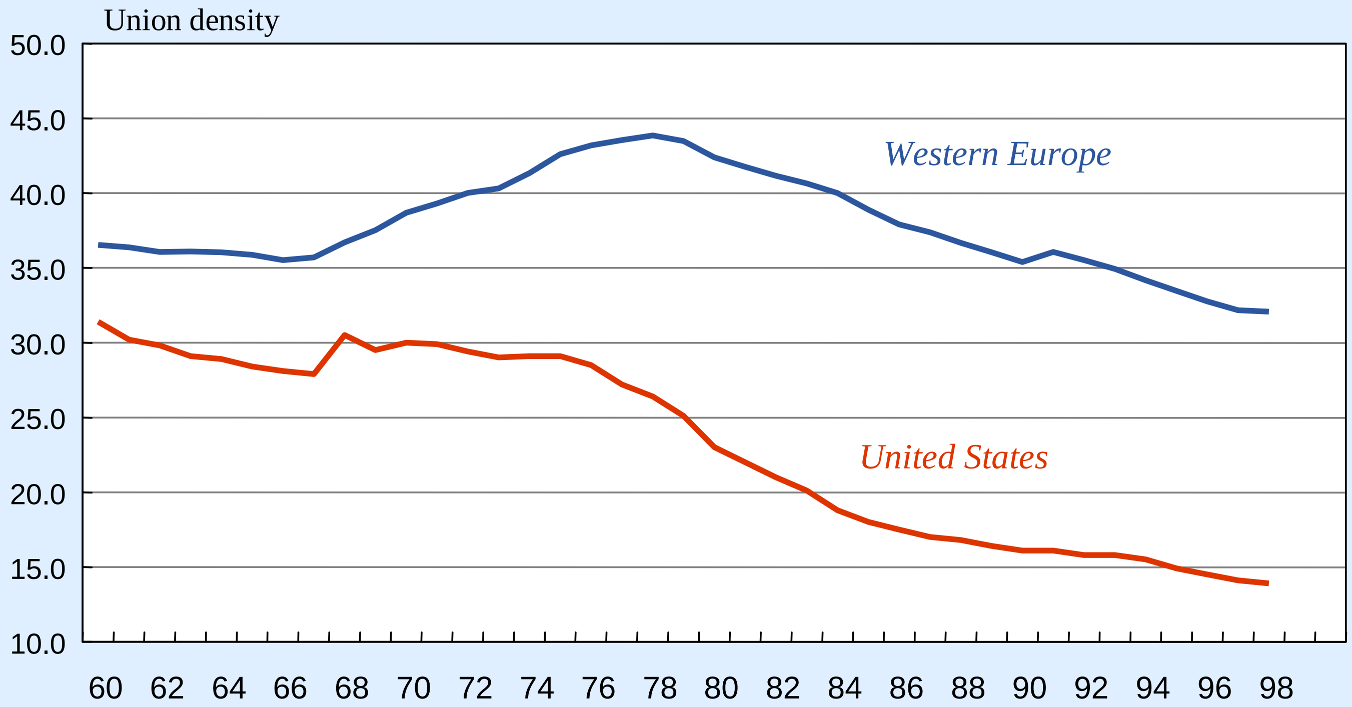
Coverage of collective agreements and unionisation[a)]

Country	Total economy (2001)		Market sector (mid 1990s)	
	Coverage	Unionisation	Coverage	Unionisation
Old EU member states				
Austria	98	40	97	34
Belgium	100	69	82	44
Denmark	85	88	52	68
Finland	90	79	67	65
France	90	9	75	< 4
Germany	67	30	80	25
Greece		32		
Ireland				43
Italy		35		36
Luxemburg	60	50		
Netherlands	78	27	79	19
Portugal	62	30	80	< 20
Spain	81	15	67	< 15
Sweden	94	79	72	77
UK[b)]	36	29	35	19
New EU member states				
Cyprus	65-70	70		
Czech Republic	25-30	30		
Estonia	29	15		
Hungary	34	20		
Latvia	< 20	30		
Lithuania	10-15	15		
Malta	60-70	65		
Poland	40	15		
Slovakia	48	40		
Slovenia	100	41		
Other countries				
Australia	22 (23)[c)]	23		
Canada	32	30[g)]		
Japan	21	22[h)]	21	24
New Zealand	45[d)]	22		
Norway	70-77[e)]	55[h)]	62	44
Switzerland	53[f)]	23[h)]	50	22
US	15	14[h)]	13	10

Notes: [a)] Coverage refers to the percentage of employees covered by collective agreements and unionisation to the percentage of employees with union membership; [b)] Figures do not include Northern Ireland; [c)] The parenthesis refers to the coverage of wage awards (see Section 1.1) and to 2000; [d)] 1997; [e)] 2000–01; [f)] 1994; [g)] 2000; [h)] 1996–98.

Fig. 3.1

UNIONISATION TRENDS IN WESTERN EUROPE AND THE UNITED STATES



Note: Union density (union membership relative to employment) for Western Europe is a weighted average of Austria, Belgium, Denmark, Finland, France, western Germany, Ireland, Italy, the Netherlands, Norway. Sweden, Switzerland and the United Kingdom.

Source: Ebbinghaus and Visser (2000).

Table 3.2

Bargaining levels

Country	National guidelines	Inter-sectoral level	Sectoral level	Enterprise level
Old EU member states				
Austria	Pattern bargaining		XXX	X
Belgium	Centrally agreed guidelines for wage increases with the government 2003–04	XXX	X	X
Denmark	Pattern bargaining	XX	XX	X
Finland	Tripartite national pay agreement 2003–04	XXX	XX	X
France			X	XX
Germany	Pattern bargaining		XXX	X
Greece	National general collective agreement 2002–03	XX	XXX	X
Ireland	Tripartite national pay agreement 2003–04	XXX	X	X
Italy	Social pacts with government 1993 and 1998 setting guidelines for the wage-bargaining process		XX	X
Luxemburg			XX	XX
Netherlands	Centrally agreed ceiling for wage increases with government 2003; tripartite national wage freeze 2004–05	XX	XXX	X
Portugal			XXX	X
Spain	Centrally agreed guidelines for wage increases 2003	XX	XXX	X
Sweden	Intersectoral agreements setting guidelines for the wage-bargaining process; pattern bargaining		XXX	XX
UK			X	XXX
New EU member states				
Cyprus			XXX	X
Czech Republic	Tripartite national agreements on minimum wages		X	XXX
Estonia	Tripartite national agreements on minimum wages		X	XXX
Hungary	National guidelines for wage increases agreed with government and tripartite national agreements on minimum wages	X	XX	XXX
Latvia	Tripartite national agreements on minimum wages	X	X	XXX
Lithuania			X	XXX
Malta				XXX
Poland	National guidelines for wage increases agreed with government and tripartite national agreements on minimum wages		X	XXX
Slovakia	Tripartite national agreements on minimum wages		XX	X
Slovenia	Tripartite national pay bargains	XXX	XX	X
Other countries				
Australia	National wage awards for minimum wages	X	XX	XXX
Japan	Pattern bargaining			XXX
New Zealand			X	XXX
Norway	Pattern bargaining; tripartite agreement on guidelines for wage increases 2003	XX	XXX	X
Switzerland			X	XX
US				XXX

Notes: XXX = dominating level
XX = important, but not dominating, level
X = existing level

Sources: *Industrial Relations in the EU Member States and Candidate Countries (2002), Collective Bargaining Coverage and Extension Procedures* (2002), individual Eiroline country reports. For New Zealand: Bray and Walsh (1998).

- **Assumption of identical union members is convenient and has microeconomic underpinnings**
- **But in reality members are heterogeneous**
- **Restrictive assumptions necessary for collective decision-making**
  - majority decisions
  - sincere voting: no attempts to influence voting by announcing intentions beforehand
  - voting on a single question
  - single-peaked preferences
  - then the <u>median-voter</u> theorem can be applied
- **Restrictive assumption for union decision-making**
  - **voting only about the wage**
- **Conflicts between union leadership and membership**
  - leadership may want to maximise union size
  - union size may increase with employment
  - boss-dominated unions show more wage restraint

Empirical studies of union goals

Stone-Geary utility function

$$\nu_s = (w - w_0)^{\theta} (L - L_0)^{1-\theta} \qquad \theta \in [0,1]$$

Special cases

θ = ½, w_0 = 0, L_0 = 0 ⇒ wage bill maximisation

θ = ½, w_0 = $\overline{w}$, L_0 = 0 ⇒ rent maximisation

Pencavel (1984) used Stone-Geary utility function

Decision problem

$$\max_{w} \quad \nu_s = (w - w_0)^{\theta} (L - L_0)^{1-\theta}$$

$$\text{s.t.} \qquad L = \alpha_0 + \alpha_1 (w / r_1) + \alpha_2 (r_2 / r_1) + \alpha_3 x + \alpha_4 D$$

r_1 = output price
r_2 = production cost
x = output
D = Dummy variable

FOC:

$$\frac{\theta}{\theta - 1} = \frac{\alpha_1 (w - w_0)}{r_1 (L - L_0)}$$

Estimation of labour demand function and FOC gives estimates of θ, w_0, L_0, α_0, α_1, α_2, α_3 and α_4.

- **Not rent or wage bill maximisation**
- **Different θ, but tendency for θ to be low**
- **w_0 and L_0 increase with the size of the union**

<u>Carruth and Oswald (1985)</u>

- **Rejection of risk neutrality (and wage bill and rent maximisation)**
- **CRRA =** $-w\nu''(w)/\nu'(w) \approx 0.8$
- **Risk neutrality implies** $-w\nu''(w)/\nu'(w) = -\mathrm{w}\cdot 0/1 = 0$
- $\dfrac{w^{1-\delta}}{1-\delta}$; δ is CRRA

Standard right-to-manage model

- **Bargaining about wages**
- **Employer determines employment unilaterally**

Union objective

$$\nu_s = l\nu(w) + (1-l)\nu(\overline{w}) \qquad l = \text{Min}\,(1, L/N)$$

Firm profit

$$\pi = R(L) - wL \qquad R' > 0, R'' < 0$$

Labour demand from profit maximisation

$$\frac{\partial \pi}{\partial L} = R'(L) - w = 0$$

$$w = R'(L)$$

$$L^d(w) = R'^{(-1)}(w)$$

In case of disagreement

- **Workers get the utility of unemployed persons**
- **Firms get zero profit**

γ denotes relative bargaining strength of the union: $0 < \gamma < 1$

Apply Nash bargaining solution

$$\underset{w}{\text{Max}} \quad (\nu_s - \nu_0)^{\gamma} (\pi - \pi_0)^{1-\gamma}$$

π_0 **= Profit in case of disagreement**

ν_0 **= union utility in case of disagreement**

$$\pi_0 = 0$$

$$\nu_0 = \ell\nu(\overline{w}) + (1-\ell)\nu(\overline{w}) = \nu(\overline{w})$$

$$\nu_s - \nu_0 = \ell\nu(w) + (1-\ell)\nu(\overline{w}) - \nu(\overline{w}) = \ell(\nu(w) - \nu(\overline{w})) =$$

$$= \frac{L^d}{N}\left[\nu(w) - \nu(\overline{w})\right]$$

$$\underset{w}{\text{Max}} \quad \left[L^D(w)\right]^{\gamma} \left[\nu(w) - \nu(\overline{w})\right]^{\gamma} \left[\pi(w)\right]^{1-\gamma}$$

with $\quad \pi(w) = R\left[L^D(w)\right] - wL^d(w)$

s.t. $\quad L^d(w) \leq N$ and $w \geq \overline{w}$

Solve by taking logs and then differentiate w.r.t. *w*

<u>FOC</u>:

$$\frac{\gamma}{L^d(w)}\frac{dL^d(w)}{dw} + \frac{\gamma \nu'(w)}{\nu(w) - \nu(\overline{w})} + \frac{(1-\gamma)}{\pi(w)}\frac{d\pi(w)}{dw} = 0$$

Note: Mistake in formula on page 394:

Second term should be

$$\frac{\gamma \nu'(w)}{\nu(w) - \nu(\overline{w})}$$

not

$$\frac{\gamma w \nu'(w)}{\nu(w) - \nu(\overline{w})}$$

Let $\eta_w^L = -(w/L)(dL/dw)$

$$\eta_w^\pi = -(w/\pi)(d\pi/dw)$$

Absolute values of wage elasticities of labour demand and profits

$$\text{Posit} \quad \eta_w^L = \eta_w^L(w, z_L) \qquad \partial\eta_w^L / \partial_L^z > 0$$

$$\eta_w^\pi = \eta_w^\pi(w, z_\pi) \qquad \partial\eta_w^\pi / \partial_\pi^z > 0$$

$$\phi(w, \overline{w}, z_L, z_\pi, \gamma) = -\gamma\eta_w^L - (1-\gamma)\eta_w^\pi + \frac{\gamma w \nu'(w)}{\nu(w) - \nu(\overline{w})} = 0$$

(1) (2) (3)

(1) Employment loss from wage increase
(2) Profit loss from wage increase
(3) Income gain for employed workers from wage increase

Monopoly union assumption

$$\gamma = 1 \Rightarrow \eta_w^L + \frac{w\nu'(w)}{\nu(w) - \nu(\overline{w})} = 0$$

- **Still interior solution**
- **Trade union balances income gain for employed workers against employment loss from wage increase**

SOC for a maximum is $\phi_w < 0$

$$x = (\overline{w}, z_L, z_\pi, \gamma)$$

$$\phi_w dw + \phi_x dx = 0$$

$$\frac{dw}{dx} = -\frac{\phi_x}{\phi_w}$$

$$\phi_w < 0 \Rightarrow \operatorname{sgn}\frac{dw}{dx} = \operatorname{sgn}\phi_x$$

$$\phi_\gamma = -\eta_w^L + \eta_w^\pi + \frac{w\nu'(w)}{\nu(w) - \nu(\overline{w})}$$

From FOC we can derive:

$$-\eta_w^L + \frac{w\nu'(w)}{\nu(w) - \nu(\overline{w})} = \frac{1-\gamma}{\gamma}\eta_w^\pi$$

Substitution into expression for ϕ_γ **gives**

$$\phi_\gamma = \eta_w^\pi + \frac{1-\gamma}{\gamma}\eta_w^\pi = \frac{\eta_w^\pi}{\gamma} > 0$$

$$\because \frac{dw}{d\gamma} > 0$$

- **Larger union bargaining power raises the wage**

$$\phi_{\overline{w}} = \frac{\gamma w \nu'(w)}{\left[\nu(w) - \nu(\overline{w})\right]^2} \cdot \frac{\partial \nu}{\partial \overline{w}} > 0$$

- **An income increase for a jobless person raises the wage**

$$\phi_{\eta_w^L} = -\gamma < 0$$

- **An increase in the labour demand elasticity lowers the wage**

$$\phi_{\eta_w^\pi} = -(1-\gamma) < 0$$

- **An increase in the profit elasticity lowers the wage**

<u>Rewrite FOC</u>:

$$\frac{\nu(w) - \nu(\overline{w})}{w\nu'(w)} = \frac{\gamma}{\gamma \eta_w^L + (1-\gamma)\eta_w^\pi} \equiv \mu_s$$

<u>No bargaining power for union:</u> $\gamma = 0$

Hence: $\nu(w) = \nu(\overline{w})$

$$w = \overline{w}$$

- **Employed workers only get a wage equal to the income of the unemployed**

<u>No bargaining power for the employer:</u> $\gamma = 1$

$$\frac{\nu(w) - \nu(\overline{w})}{w\nu'(w)} = \frac{1}{\eta_w^L}$$

- **The mark-up factor only depends on the elasticity of labour demand.**

<u>Union indifference curves in *w*, *L*-space</u>

$$\overline{U} = L\left[\nu(w) - \nu(\overline{w})\right]$$

$$0 = L\nu'(w)dw + dL\left[\nu(w) - \nu(\overline{w})\right]$$

$$\left.\frac{dw}{dL} = \right|_{\overline{U}=const} = -\frac{\left[\nu(w) - \nu(\overline{w})\right]}{L\nu'(w)} \leq 0$$

$$\left.\frac{d^2w}{dL^2} = \right|_{\overline{U}=const} = \frac{\left[\nu(w)-\nu(\overline{w})\right]}{L^2\left[\nu'(w)\right]^2}\left\{2\nu'(w) - \nu''(w)\frac{\left[\nu(w)-\nu(\overline{w})\right]}{\nu'(w)}\right\} \geq 0$$

Union indifference curves are negatively sloped and convex.

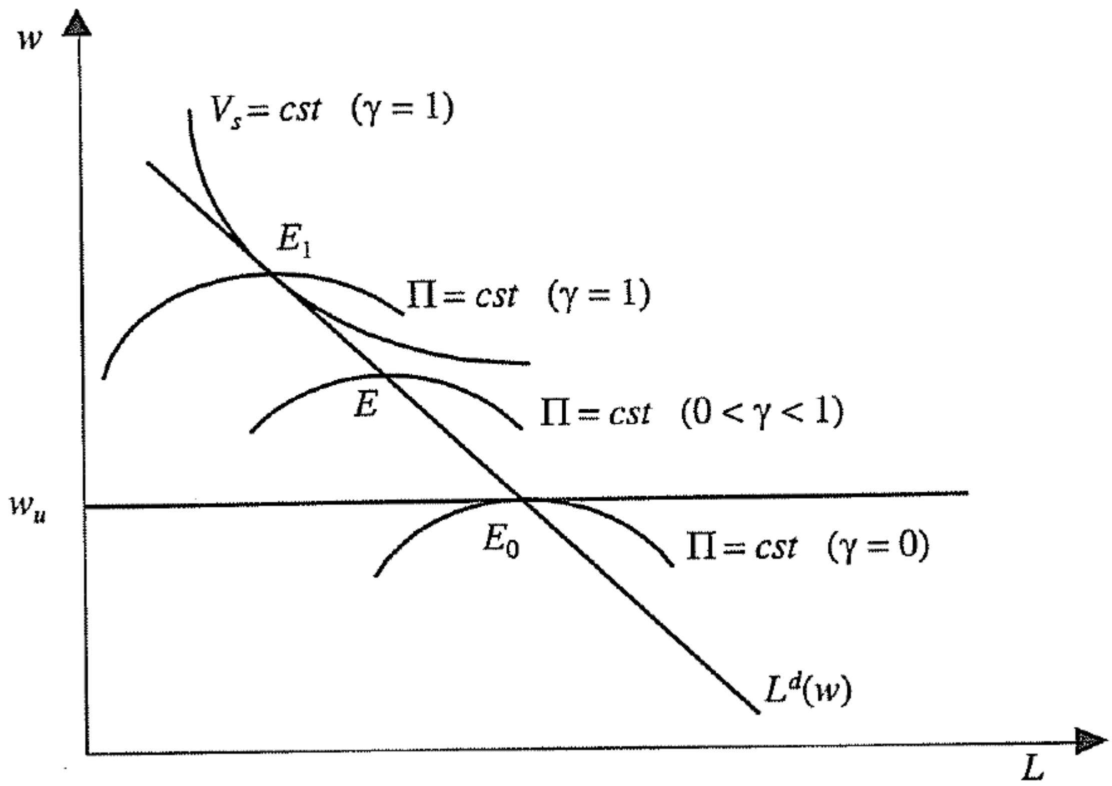


FIGURE 7.5
The right-to-manage model.

Isoprofit curves

$$\overline{\pi} \;=\; R(L) \;-\; wL$$

$$R'(L)dL \;-\; wdL \;-\; Ldw \;=\; 0$$

$$\left.\frac{dw}{dL}\right|_{\pi=\overline{\pi}} = \frac{R'(L)-w}{L}$$

$$d\left[\left.\frac{dw}{dL}\right|_{\pi=\overline{\pi}}\right] = \frac{L\left[R''(L)dL-dw\right] \;-\; dL\left[R'(L)-w\right]}{L^2} =$$

$$\left.\frac{d^2w}{dL^2}\right|_{\pi=\overline{\pi}} = \frac{LR''(L)}{L^2} - \frac{\frac{dw}{dL}}{L^2} - \frac{\left[R'(L)-w\right]}{L^2}$$

Substitute $\dfrac{R'(L)-w}{L}$ for $\dfrac{dw}{dL}$:

$$\left.\frac{d^2w}{dL^2}\right|_{\pi=\overline{\pi}} = \frac{LR''(L)}{L^2} - \frac{R'(L)-w}{L^2} - \frac{R'(L)-w}{L_2}$$

$$= \frac{LR''(L) - 2\left[R'(L)-w\right]}{L^2}$$

- **Choosing *L* to maximise profit implies R′(*L*) = *w*. Hence isoprofit curve is horizontal where it intersects the labour demand schedule.**
- **At intersection with labour demand schedule, *R′*(*L*) =*w*.**

Hence $\left.\dfrac{d^2w}{dL^2}\right|_{\pi=\overline{\pi}} = \dfrac{R''(L)}{L} < 0.$

Isoprofit curves are concave there, which imply maxima.

<u>General FOC</u>:

$$-\gamma\eta_w^L \;-\; (1-\lambda)\eta_w^\pi \;+\; \frac{\gamma w \nu'(w)}{\nu(w)-\nu(\overline{w})} \;=\; 0 \qquad \textbf{(A)}$$

- **If** η_w^L**,** η_w^π**,** γ and $\overline{w}$ **are constants, then the real wage *w* is constant as well. It will not be affected by an iso-elastic shift of the labour demand schedule (for example because of a productivity shock).**

- **Constant** η_w^L and η_w^π **will occur if the revenue function is Cobb-Douglas.**

<u>Simplified model</u>

$$\pi = R(L) - wL = \frac{AL^{\alpha}}{\alpha} - wL \qquad \alpha \in (0, 1)$$

Profit maximisation gives:

$$\frac{\partial \pi}{\partial L} = AL^{\alpha-1} - w = 0$$

$$L = \left(\frac{w}{A}\right)^{\frac{1}{\alpha-1}}$$

Then:

$$\pi = \frac{A}{\alpha} \cdot \left(\frac{w}{A}\right)^{\frac{\alpha}{\alpha-1}} - w \cdot \left(\frac{w}{A}\right)^{\frac{1}{\alpha-1}}$$

$$\pi = w^{\frac{\alpha}{\alpha-1}} \cdot \frac{1\text{-}\alpha}{\alpha} A^{\frac{1}{\alpha-1}}$$

Hence:

$$\eta_w^L \;=\; -\frac{\partial L}{\partial w}\cdot\frac{L}{w} \;=\; \frac{1}{1-\alpha}$$

$$\eta_w^\pi \;=\; -\frac{\partial L}{\partial w}\cdot\frac{w}{\pi} \;=\; \frac{\alpha}{1-\alpha}$$

Also assume that $\nu(w) \;=\; w$ and $\nu(\overline{w}) \;=\overline{w}$

Then $\nu\,'(w) \;=\; 1$

FOC (A) then becomes:

$$-\gamma \;\cdot\; \frac{1}{1-\alpha} \;-\; (1-\gamma)\frac{\alpha}{1-\alpha} \;+\; \frac{\gamma w}{w-\overline{w}} \;=\; 0$$

Solving for w gives:

$$w = \frac{\gamma+\alpha(1-\gamma)}{\alpha}\,\overline{w}$$

The wage is set as a mark-up on the income of an unemployed, since $\gamma + \alpha(1-\gamma) > \alpha \Leftrightarrow \gamma(1-\alpha) > 0$, which must hold.

Especially simple form in monopoly-union case, i.e. if $\gamma = 1$

Then $w = \dfrac{\overline{w}}{\alpha}$

We have:

$$\eta_w^L = \frac{1}{1-\alpha}$$

Hence:

$$1 - \alpha = \frac{1}{\eta_w^L}$$

$$\alpha = 1 - \frac{1}{\eta_w^L} = \frac{\eta_w^L - 1}{\eta_w^L}$$

Thus:

$$w = \left[1 - \frac{1}{\eta_w^L}\right]^{-1} \overline{w}$$

$$w = \frac{\eta_w^L}{\eta_w^L - 1}\overline{w}$$

Analogy to monopoly price setting with price as a mark-up over marginal cost

$\eta_w^L > 1$ **is always the case with Cobb-Douglas production function,**

as $\eta_w^L = \dfrac{1}{1-\alpha}$ **and** $0 < \alpha < 1$**.**

General equilibrium model

$$w_i = \frac{\gamma + \alpha(1-\gamma)}{\alpha}\overline{w}$$

- **Assume mobility in the labour market. An unemployed in a given firm (labour pool) can either find a job in another firm (labour pool) or become unemployed.**
- **Symmetric economy with a large number of firms.**
- **Look at wage-setting in firm *i*.**
- **Probability of getting a job in another firm = *l* = the economy-wide employment rate = employment/labour force.**
- **Probability of not finding a job elsewhere = 1-*l*.**
- **A worker who finds a job elsewhere receives the wage *w*.**
- **If unemployed, the worker receives the unemployment benefit *b*.**

$\overline{w}$ **= the expected income if not employed in firm *i* = alternative income**

$$\overline{w} = \ell w + (1-\ell)b$$

Hence:

$$w_i = \frac{\gamma + \alpha(1-\gamma)}{\alpha}\left[\ell w + (1-\ell)b\right]$$

In a symmetric equlibrium $w_i = w$

Denote the mark-up factor $\dfrac{\gamma + \alpha(1-\gamma)}{\alpha} = m$

Then:

$$w = m\left[\ell w + (1-\ell)\right]b$$

$$w = \frac{m(1-\ell)}{1-m\ell}b \qquad \text{(B)}$$

- **The wage is still a mark-up over the unemployment benefit as**

  $$m(1-\ell) > 1-m\ell \Leftrightarrow m > 1$$

- **The overall wage in the economy, *w*, is positively related to employment as:**

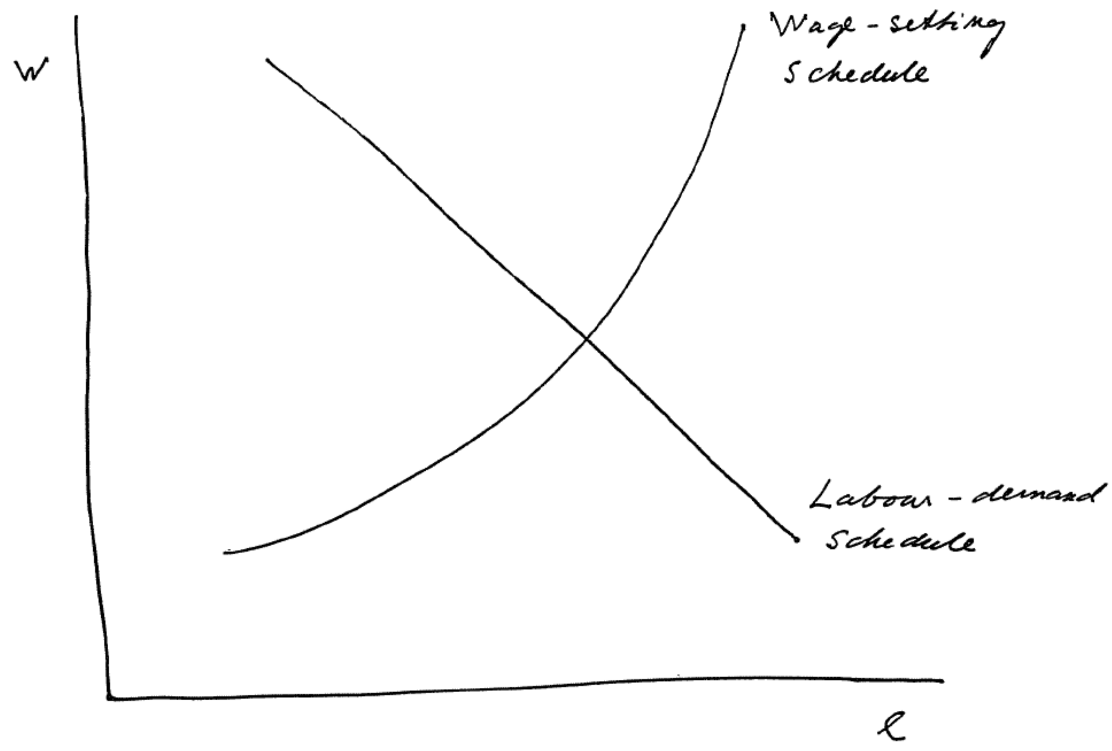
  $$\frac{\partial w}{\partial \ell} = \frac{m(m-1)}{(1-m\ell)^2} > 0$$

$w = f(l)$ is called a <u>wage-setting schedule</u>

It shifts upwards if:

(1) $\gamma\uparrow$
(2) $b\uparrow$

- **Equilibrium employment is given by intersection between the wage-setting schedule and the labour-demand schedule.**
- **Shift of labour-demand schedule affects the equilibrium employment rate.**



<u>Key question</u>: How is the unemployment benefit determined?

1. **Constant in real terms**
2. **Constant replacement rate *r*, so that *b* = *rw***

<u>Constant replacement rate</u>:

$$w = \frac{m(1-\ell)}{1-m\ell} b$$

$$w = \frac{m(1-\ell)}{1-m\ell} rw$$

$$1 = \frac{m(1-\ell)}{1-m\ell} r$$

$$\ell = \frac{1-rm}{m(1-r)}$$

$$\frac{\partial \ell}{\partial r} = \frac{m(1-m)}{(m-r)^2} < 0$$

- **Vertical wage-setting schedule determined by labour-market institutions only (here *r* and γ)**
- **An increase in the replacement rate reduces the employment rate**
- **Shifts in labour demand have no effect on the equilibrium employment rate.**