

Lecture 5: Labour economics

Spring 2010

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Efficient contracts

- **Bargaining over the wage only and letting employers determine employment (right to manage) is not efficient.**
- **An efficient solution can be found by bargaining over both the wage and employment.**

$$\begin{aligned} \text{Max}_{w, L} \quad & [R(L) - wL]^{1-\gamma} [\nu(w) - \nu(\bar{w})]^\gamma L^\gamma \\ \text{s.t.} \quad & 0 \leq L \leq N \quad \text{and} \quad w \geq \bar{w} \end{aligned}$$

Interior solution

$$(1 - \gamma) \frac{R'(L) - w}{R(L) - wL} + \frac{\gamma}{L} = 0 \quad (\text{I})$$

$$-(1 - \gamma) \frac{L}{R(L) - wL} + \frac{\gamma \nu'(w)}{\nu(w) - \nu(\bar{w})} = 0 \quad (\text{II})$$

Eliminate γ between the two equations to get

$$w - R'(L) = \frac{\nu(w) - \nu(\bar{w})}{\nu'(w)} \quad (\text{III})$$

This is the equation of a contract curve (Pareto-efficient combinations of w, L) connecting tangency points of indifference and isoprofit curves.

The same equation would be obtained by maximising

$$L[\nu(w) - \nu(\bar{w})] \quad \text{s.t.} \quad \pi = \bar{\pi}$$

Differentiation of the contract curve equation gives:

$$\frac{dw}{dL} = \frac{R''(L)}{\nu''(w)[w - R'(L)]}$$

$\gamma = 0 \Rightarrow R'(L) = w$ according to (I)

$R'(L) = w \Rightarrow \nu(w) = \nu(\bar{w})$ and $w = \bar{w}$ according to (III)

Hence the contract curve starts on the labour demand schedule at $w = \bar{w}$

If $w > R'(L)$ and workers are risk averse, $\nu'' < 0$, and then $dw/dL > 0$.

$\gamma = 0$ gives the competitive level of employment $L = L(\bar{w})$

With $\gamma > 0$, the union uses its bargaining power to raise both the wage and employment over the competitive levels.

If workers are risk-neutral, then $\nu'' = 0$ and $\frac{dw}{dL} \rightarrow \infty$. Hence the contract curve is vertical. Employment is at the competitive level.

Overemployment if workers are risk-averse – “weak efficiency” as

$R'(L) < \bar{w}$ due to employment being higher than L_c defined by $R'(L_c) = \bar{w}$

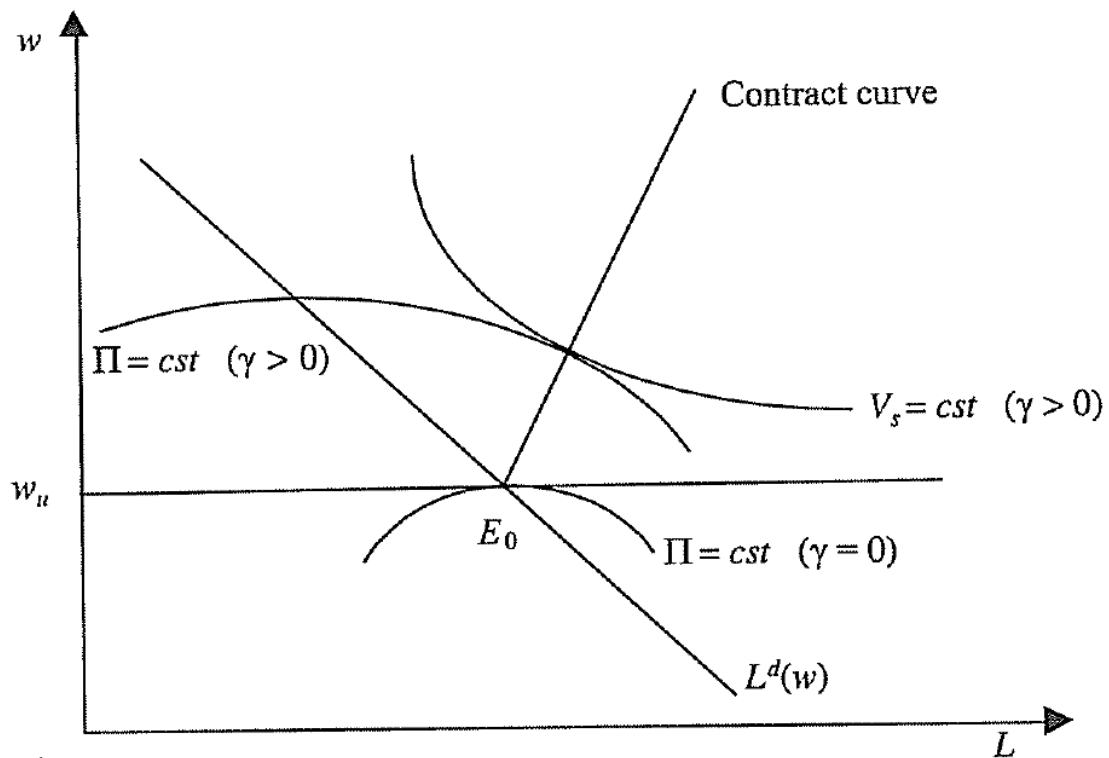


FIGURE 7.6

The model of bargaining over wages and employment.

Strongly efficient contracts

- Efficiency gain for union if utility of employed and unemployed are equated
- Incentive to bargain with firm over unemployment benefit paid by the firm

Union objective

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

Firm profit

$$\pi = R(L) - wL - (N - L)b$$

$$\text{Max}_{w, b} L\nu(w) + (N - L)\nu(b + \bar{w})$$

$$\text{s.t. } \pi = \pi_0$$

$$\text{Max}_{w, b} L\nu(w) + (N - L)\nu(b + \bar{w}) + \lambda [R(L) - wL - (N - L)b]$$

FOC

$$L\nu'(w) - \lambda L = 0$$

$$(N - L)\nu'(b + \bar{w}) - \lambda(N - L) = 0$$

$$\nu'(w) = \lambda$$

$$\nu'(b + \bar{w}) = \lambda$$

Hence:

$$\nu'(w) = \nu'(b + \bar{w})$$

$$w = b + \bar{w}$$

- **Pareto efficiency requires a wage for the employed that is equal to the income as unemployed.**
- **The firm pays a benefit b to all unemployed.**
- **It pays a wage $\bar{w} + b$ to the employed.**
- **Employment does not matter to the union, since members are insured against unemployment.**

The bargaining problem

$$\text{Max}_b \quad [R(L^*) - \bar{w}L^* - bN]^{1-\gamma} [\nu(\bar{w} + b) - \nu(\bar{w})]^\gamma$$

FOC:

$$\frac{\nu(\bar{w} + b) - \nu(\bar{w})}{\nu'(\bar{w} + b)} = \frac{\gamma}{1 - \gamma} \frac{[R(L^*) - \bar{w}L^* - bN]}{N}$$

$$\text{with } w = \bar{w} + b$$

$$R'(L^*) = \bar{w}$$

- **Employment equals the competitive level**
- **Union members appropriate a share of the firm's profit without this having negative effects on employment**

Diagrammatical illustration

Indifference curves:

$$v_s = v(w)$$

$$v_1 dw = 0$$

$$\frac{v_1 dw}{dL} = 0$$

$$\frac{dw}{dL} = 0$$

The indifference curves are horizontal lines.

Isoprofit curve

$$\pi = R(L) - \bar{w}L - bN = R(L) - \bar{w}L - N(w - \bar{w})$$

$$d\pi = 0 = R'(L)dL - \bar{w}dL - Ndw$$

$$\frac{dw}{dL} = \frac{R'(L) - \bar{w}}{N}$$

- Tangency points between isoprofit curves and indifference curves give a vertical contract curve (at the competitive level of employment)
- Bargaining over wages, employment and unemployment benefits from firms is strongly efficient.

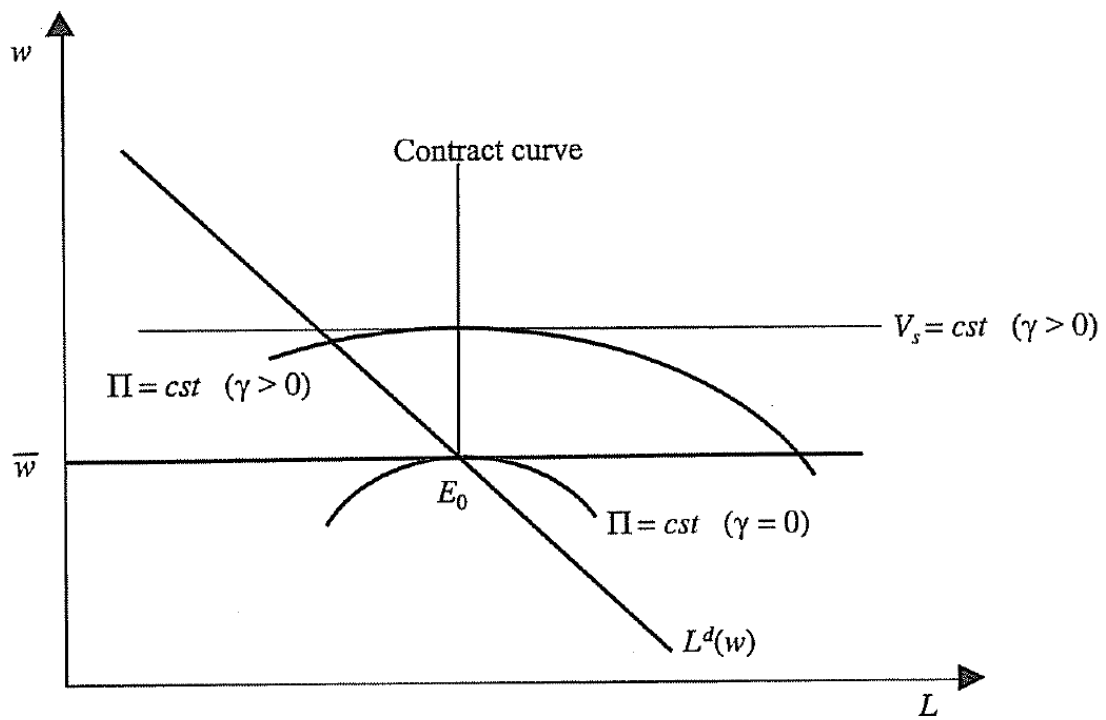


FIGURE 7.7
The strongly efficient bargaining model.

Collective bargaining and wage dispersion

- **Heterogeneous workers**
- **Collective bargaining reduces wage dispersion**
- **Two types of workers, indexed by $i = 1, 2$**
- **Revenue of the firm = $R(L_1, L_2)$**
- **Type -1 workers are more productive with a higher reservation wage $\bar{w}_1 > \bar{w}_2$**
- **N_i workers of type i in the firm's labour pool**
- **The union utility function**

$$v_s = \sum_{i=1}^2 L_i v(w_i) + (N_i - L_i) v(\bar{w}_i + b_i) \quad L_i \leq N_i$$

- **Strongly efficient bargaining over employment, wages and unemployment benefits**
- **Optimal contract implies $w_i = \bar{w}_i + b_i$**

Bargaining problem

$$\text{Max}_{b_1, b_2, L_1, L_2} \left[R(L_1, L_2) - \sum_{i=1}^2 (\bar{w}_i L_i + b_i N_i) \right]^{1-\gamma} \left[\sum_{i=1}^2 N_i \{ \nu(\bar{w}_i + b_i) - \nu(\bar{w}_i) \} \right]^\gamma$$

$$\text{s.t.} \quad 0 \leq L_i \leq N_i \quad i = 1, 2$$

FOCs

$$(11) \quad \frac{\partial R(L_1, L_2)}{\partial L_i} = \bar{w}_i$$

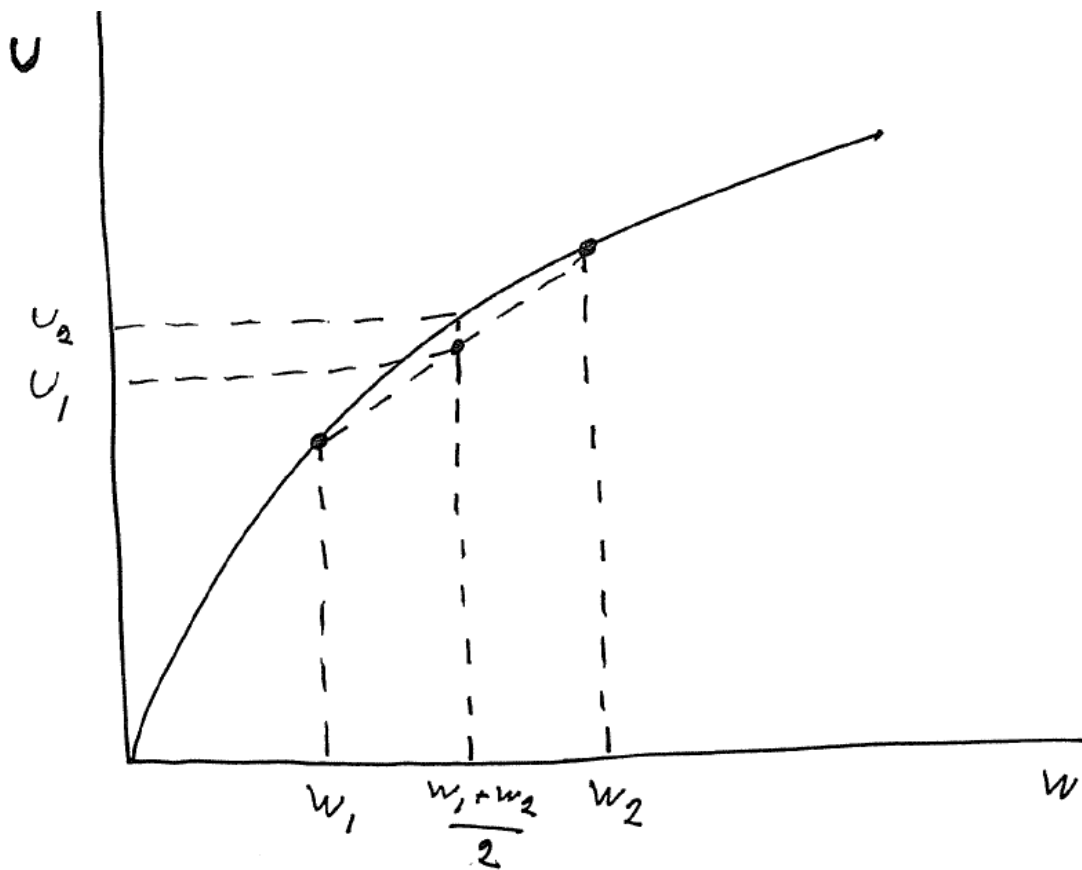
$$(12) \quad \nu'(\bar{w}_i + b_i) = \frac{1-\gamma}{\gamma} \frac{\left[\sum_{i=1}^2 N_i [\nu(\bar{w}_i + b_i) - \nu(\bar{w}_i)] \right]}{\left[R(L_1, L_2) - \sum_{i=1}^2 (\bar{w}_i L_i + b_i N_i) \right]}$$

- **Equation (11): Productive efficiency, i.e. the marginal productivity of each type of worker equals the reservation wage. This implies the competitive level of employment.**
- **Equation (12): RHS is independent of i . Hence the same wage for the two types of labour.**
- **Wage equality follows from the assumption of a utilitarian union and identical preferences.**

$$\frac{N_1}{N_1 + N_2} \nu(w_1) + \frac{N_2}{N_1 + N_2} \nu(w_2) \leq \nu \left[\frac{N_1}{N_1 + N_2} w_1 + \frac{N_2}{N_1 + N_2} w_2 \right]$$

Because of concavity the union is better off with a wage

$$\frac{N_1}{N_1 + N_2} w_1 + \frac{N_2}{N_1 + N_2} w_2 \text{ for everyone than with separate wages } w_1 \text{ and } w_2.$$



$$U_2 > U_1$$

Two-stage bargaining over employment (Manning 1987)

Stage 1: Bargaining over the wage

Stage 2: Bargaining over employment

Different bargaining strengths in the two negotiations

Bargaining over employment (given the wage)

$$\text{Max}_L \quad [R(L) - wL]^{1-\gamma_L} [\nu(w) - \nu(\bar{w})]^{\gamma_L} L^{\gamma_L} \quad \text{s.t. } 0 \leq L \leq N$$

The solution gives $L = L(\gamma_L, \bar{w}, w)$

Bargaining over the wage (takes the outcome of second-stage bargaining over employment into account)

$$\text{Max}_w \quad [R(L) - wL]^{1-\gamma} [\nu(w) - \nu(\bar{w})]^\gamma L^\gamma$$

$$\text{s.t. } L = \hat{L}(\gamma_L, \bar{w}, w) \quad \text{and} \quad w \geq \bar{w}$$

Different cases

- $\gamma_L = 0$ and $\gamma > 0$ gives the **right-to-manage model**
- $\gamma_L = \gamma$ gives **(weakly) efficient bargain model**
- **Otherwise solution on neither labour-demand schedule nor contract curve**

Motivations

- **Efficient bargaining is complex**
- **Wage bargaining precedes employment bargaining**
- **Wage bargaining is often at more centralised level**
- **Strongly efficient bargaining is improbable because of moral hazard problems: unemployed being fully insured will not search effectively for jobs**
 - **argument for partial insurance**
 - **individual firm (sector) offering full insurance would be swamped by labour inflow**
- **One does not find many examples of contracts with unemployment benefits paid by firms**
- **Unclear empirical results on right-to-manage model and (weakly efficient) bargaining**

Insiders and outsiders

- Unions negotiate on behalf of insiders (the already employed those with a strong affiliation to the labour market)
- Unions do not negotiate on behalf of outsiders (the unemployed in general or the long-term unemployed)

An insider-outsider model

- L_O insiders
- The firm decides on how many insiders $L_I \leq L_O$ it wants to retain.
- It also decides on how many outsiders L_E it wants to hire.
- Revenue function $R(L_I + L_E)$
- The firm's profit: $\pi = R(L_I + L_E) - w(L_I + L_E)$
- Employment of insiders, L_I , and of outsiders, L_E , is found by maximising profits s. t. $L_I \leq L_O$ and $L_E > 0$.
- Define w_O by $R'(L_O) = w_O$.
- Define \tilde{L} as the employment level such that $R'(\tilde{L}) = w$, where w is the current wage.

Labour demand

$$L_I = \tilde{L} \text{ and } L_E = 0 \text{ if } w \geq w_o$$

$$L_I = L_o \text{ and } L_E = \tilde{L} - L_o \text{ if } w \leq w_o$$

If $w \geq w_o$ we have $L_I = \tilde{L} < L_o$, so some insiders are fired.

Wage bargaining

V_I = expected utility of an insider

$$V_I = \ell \nu(w) + (1 - \ell) \nu(\bar{w}) \quad \ell = \text{Min}(1, \tilde{L} / L_o)$$

\bar{w} = the reservation wage

$$\text{Max}_w \quad [\pi(w)]^{1-\gamma} \left\{ \ell [\nu(w) - \nu(\bar{w})] \right\}^\gamma$$

$$\text{with } \pi(w) = R(\tilde{L}) - w\tilde{L}$$

- Let w_1 be the solution when $\ell = \tilde{L} / L_o$ (interior solution with some unemployed insiders).
- The solution is the same as in the standard right-to-manage model but with $L_o = N$.

$$\frac{\nu(w_1) - \nu(\bar{w})}{w_1 \nu'(w_1)} = \frac{\gamma}{\gamma \eta_w^L + (1 - \gamma) \eta_w^\pi} \quad (10)$$

Solution with $\ell = 1$

- Set $\eta_w^L = 0$ in (10); employment of insiders cannot increase

$$\frac{\nu(w_2) - \nu(\bar{w})}{w_2 \nu'(w_2)} = \frac{\gamma}{(1 - \gamma) \eta_w^\pi}$$

Three possibilities

(i) if $w_1 \geq w_0$, then $w = w_1$ and $L_I = L_1$, $L_E = 0$ with
 $R'(L_1) = w_1$ (interior solution with unemployed insiders)

(ii) if $w_2 \leq w_0$, then $w = w_2$ and $L_I = L_0$, $L_I + L_E = L_2$, $L_E > 0$
 with $R'(L_2) = w_2$ (interior solution with employed outsiders)

(iii) if $w_1 \leq w_0 \leq w_2$, then $w = w_0$ and $L_I = L_0$, $L_E = 0$
 (corner solution with all insiders employed and no outsiders)

Conclusion

- **A fall in the number of insiders results in an unchanged wage or in an increase in the wage**
- **Explanation of the persistence of unemployment**
- **No incentive to reduce the wage as the union does not care about the unemployed**
- **Empirical research has had problems finding that a reduction in lagged employment has a positive effect on the wage.**

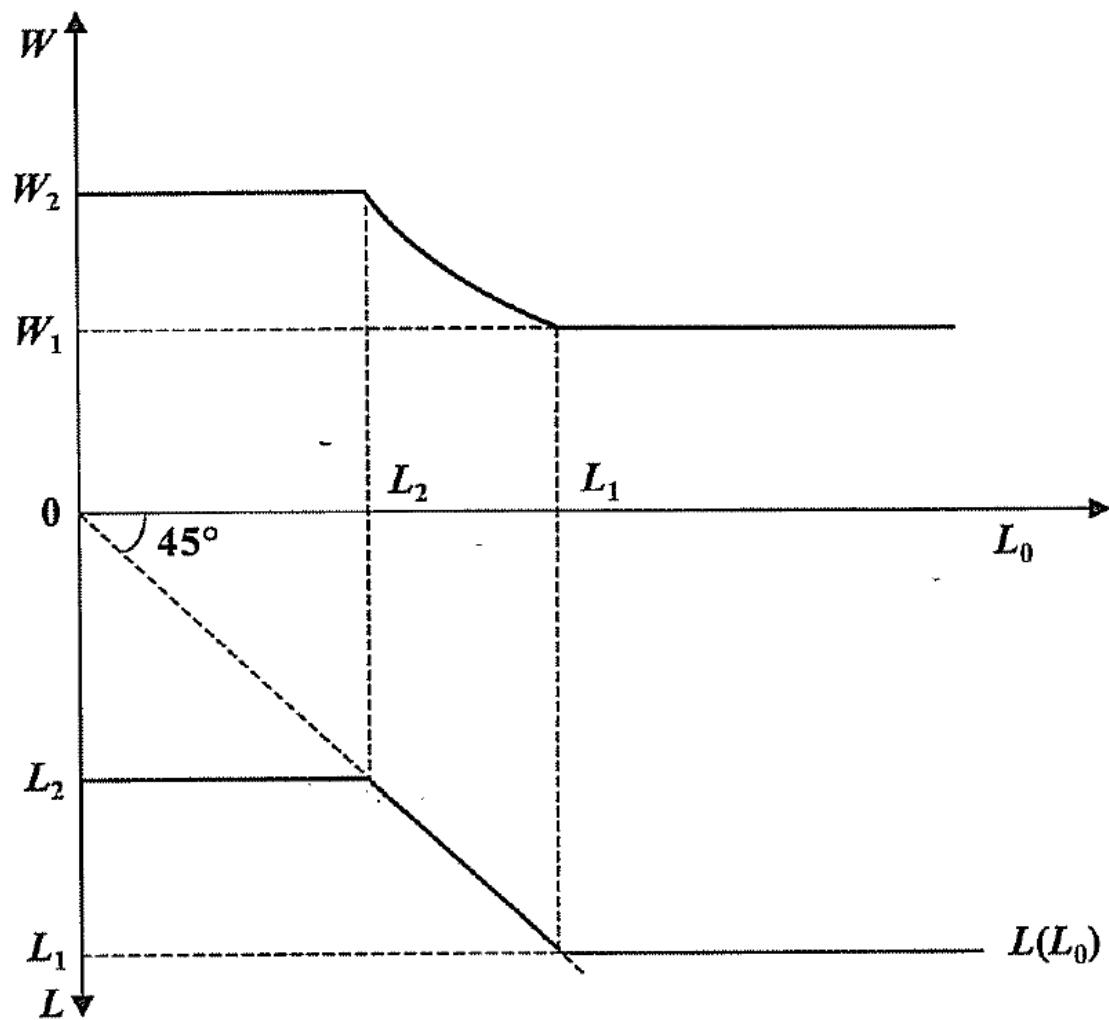


FIGURE 7.8

Wage and employment in the insiders/outsiders model.

Table 15

Regressions to explain log unemployment rate (%) (20 OECD countries, 1983–1988 and 1989–1994)^a

	Total unemployment (1)	Longterm unemployment (2)	Shortterm unemployment (3)
Total tax wedge (%)	0.027 (4.0)	0.023 (1.6)	0.028 (3.5)
Employment protection (1–20)	—	0.052 (1.4)	–0.061 (2.8)
Union density (%)	0.010 (2.3)	0.010 (1.0)	0.0031 (0.5)
Union coverage index (1–3)	0.38 (2.7)	0.83 (2.3)	0.45 (2.1)
Coordination (union + employer) (2–6)	–0.43 (6.1)	–0.54 (3.6)	–0.34 (3.8)
Replacement rate (%)	0.013 (3.4)	0.011 (1.3)	0.013 (2.6)
Benefit duration (years)	0.10 (2.2)	0.25 (2.7)	0.045 (0.8)
Active labor market policies ^b	–0.023 (3.3)	–0.039 (2.8)	–0.097 (1.2)
Owner occupation rate (%)	0.013 (2.6)	–0.0007 (0.1)	0.01 (2.7)
Change in inflation (% pts. p.a.)	–0.21 (2.2)	–0.30 (1.6)	–0.29 (2.7)
Dummy for 1989–1994	0.15 (1.5)	0.30 (1.8)	0.092 (1.0)
R ²	0.82	0.84	0.73
N (countries, time)	40 (20, 2)	38 (19, 2)	38 (19, 2)
Hausman test of the random effects of restriction (χ^2_{10})	6.35	4.52	6.86

^a Estimation is by GLS random effects (Balestra–Nerlove) using two time periods (1983–1988, 1989–1994). *t* ratios in parentheses. If we add the following variables, one at a time, to column (1), their coefficients are: payroll tax rate (%), 0.014 (0.5); employment protection, 0.011 (0.6); labor standards, 0.0011 (0.02); real interest rate (%), 0.040 (1.0); centralization, (centralization)², 0.048 (0.5), 0.0005(0.1). For the 1989–1994 values of the independent variables, see Tables 5–7, 10 and 14. The 1983–1988 values are available from the author on request. The dependent variables are in Table 1.

^b The variable is instrumented. Because the active labor market policies variable refers to percent of GDP normalized on *current* unemployment, this variable is highly endogenous. So we renormalized the current percent of GDP spent on active labor market measures on the average unemployment rate in 1977–1979 to create the instrument. Insofar as measurement errors in unemployment are serially uncorrelated, this will help with the endogeneity problem.

Table 16

Regressions to explain labor input measures (Table 2) (20 OECD countries, 1983–1988 and 1989–1994)^a

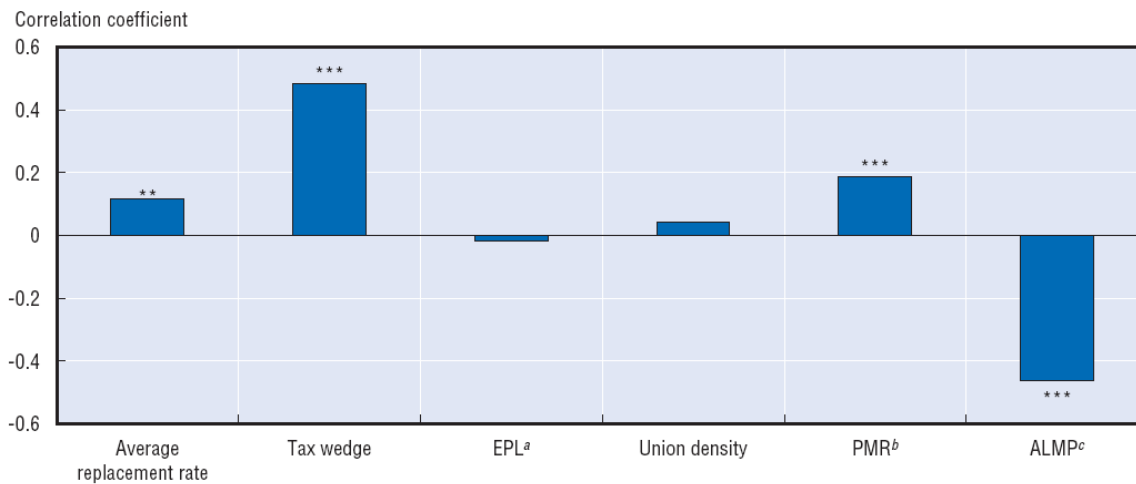
	Employment/population ratio (%)		Total hours/ population (index)
	Whole working age population (1)	Males aged 25–54 (2)	
Total tax wedge (%)	−0.24 (2.0)	−0.15 (2.0)	−0.26 (1.6)
Employment protection (1–20)	−0.79 (2.7)	0.037(0.2)	−0.64 (1.6)
Union density (%)	−0.012 (0.1)	−0.058 (1.0)	−0.15 (1.3)
Union coverage index (1–3)	−2.40 (1.0)	−2.00 (1.2)	−2.97 (1.0)
Coordination (union + employer) (2–6)	4.75 (4.0)	2.39 (3.2)	4.08 (2.5)
Replacement rate (%)	−0.067 (1.0)	−0.065 (1.5)	−0.057 (0.6)
Benefit duration (years)	−1.06 (1.8)	−0.57 (1.4)	−0.23 (0.3)
Active labor market policies ^b	0.10 (1.0)	0.036 (0.5)	−0.036 (0.3)
Owner occupation rate (%)	−0.19 (2.7)	−0.11 (2.3)	−0.066 (0.8)
Change in inflation (% pts. p.a.)	−1.21 (1.3)	−0.50 (0.7)	−1.69 (1.6)
Dummy for 1990–1994	3.16 (3.7)	−1.29 (1.9)	0.48 (0.5)
R ²	0.80	0.64	0.51
N (countries, time)	(20, 2)	(20, 2)	(20, 2)

^a Variables and definitions are in Tables 2 (Cols. 5–7), 5–7 and 10. Estimation is by GLS random effects using two time periods (1983–1988, 1990–1994). *t* ratios in parentheses.

^b Active labor market policies are instrumented as in Table 15.

Figure 7.1. **Correlations between the unemployment rate and selected institutions and policies**

Variables purged from both country and time fixed effects, 1982-2003



ALMP: Active labour market programmes. EPL: Employment protection legislation. PMR: Product market regulation. ***, **, *, statistically significant at 1%, 5% and 10% levels, respectively.

a) Index of stringency of the employment protection legislation.

b) Index of stringency of anti-competitive product market regulation.

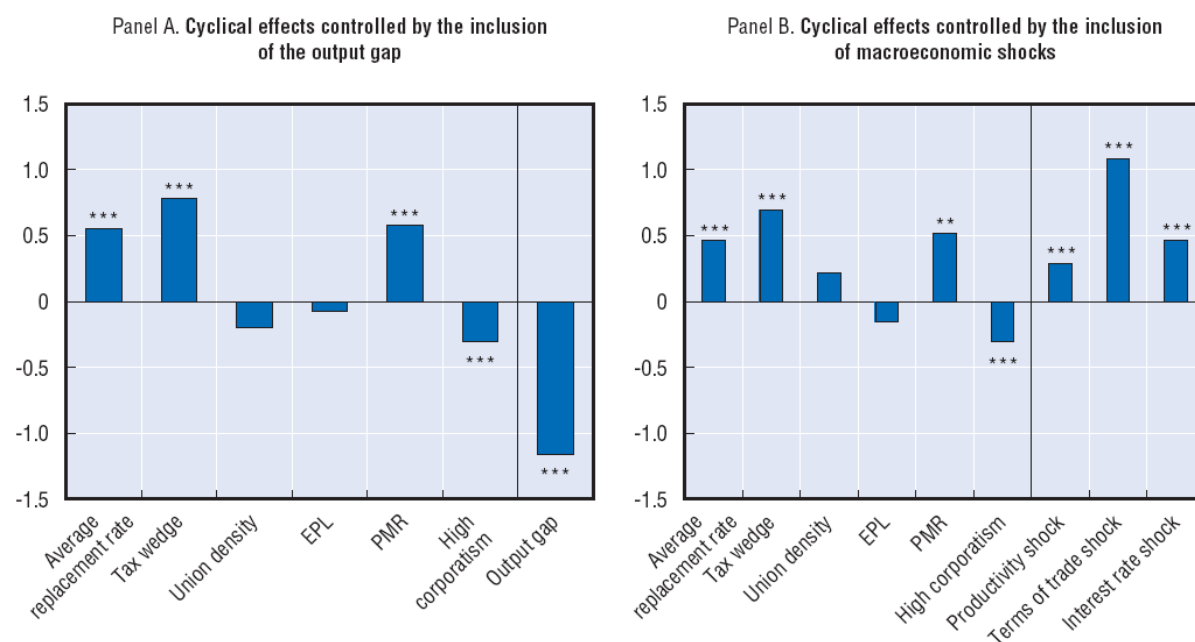
c) Average ALMP expenditures per unemployed person as a percentage of GDP per capita.

Source: OECD estimates.

Statlink: <http://dx.doi.org/10.1787/837846658514>

Figure 7.2. Unemployment benefits, tax wedges, product market competition and the structure of collective bargaining significantly affect unemployment

Percentage-point impact of one standard deviation increases in policies or macroeconomic shocks,^a
baseline model, 1982-2003



EPL: Employment protection legislation. PMR: Product market regulation.

***, **, *, statistically significant at 1%, 5% and 10% levels, respectively.

- a) For each policy or adverse macroeconomic shock, the figure shows the estimated effect on the unemployment rate of a one standard deviation from the sample average for a country where all other variables are equal to the sample average. Standard deviations are computed using time-series variation only (that is, netting out cross-sectional variation). Magnitudes of policy and output gap increases as well as adverse macroeconomic shocks are set as follows: average replacement rate, 4.7 percentage points; tax wedge, 2.8 percentage points; union density, 6.0 percentage points; EPL, 0.3 unit of the synthetic indicator; PMR, 1.0 unit of the synthetic indicator; high corporatism, 1/5 of the value of the dummy variable; output gap, 2.4 percentage points; total factor productivity negative deviation from its trend, obtained through an Hodrick-Prescott filter, 2.2 percentage points; deterioration in the terms of trade, 5.6 percentage points; and increase in the long-run interest rate, 2.1 percentage points. In the case of policy variables, these changes can be considered to correspond to the size of “historically typical” policy reforms. For example, the figure shows that a “historically typical” reform of the unemployment insurance would reduce the unemployment rate by about 0.5 percentage point in the average OECD country.

Source: OECD estimates (see Table 7.A1.1, Columns 1 and 6).

Table 7.A1.1. **Baseline unemployment rate equations, 1982-2003**

	1	2	3	4	5	6	7
	Baseline	= 1 with ARR split into two components	= 1 with EPL split into two components	= 1 with tax wedge derived from national accounts	= 4 with separate labour and consumption tax rates	= 1 with standard macroeconomic shocks	= 6 with labour demand shock
Average replacement rate (ARR)	0.12 [6.28]***		0.12 [6.79]***	0.08 [4.22]***	0.09 [4.16]***	0.10 [4.14]***	0.09 [3.35]***
Tax wedge	0.28 [9.75]***	0.27 [10.96]***	0.27 [11.14]***	0.24 [4.49]***		0.24 [7.73]***	0.22 [6.40]***
Union density	-0.03 [1.57]	-0.03 [1.89]*	-0.03 [1.64]	-0.02 [0.56]	-0.01 [0.49]	0.04 [1.48]	0.06 [2.33]**
EPL	-0.31 [0.98]	-0.20 [0.55]		0.03 [0.08]	0.01 [0.02]	-0.61 [-1.52]	-0.51 [-1.22]
PMR	0.60 [2.98]***	0.67 [3.29]***	0.73 [3.52]***	0.50 [2.17]**	0.50 [2.17]**	0.54 [2.25]**	0.79 [3.28]***
High corporatism	-1.42 [3.57]***	-1.09 [2.88]***	-1.39 [3.94]***	-2.06 [4.80]***	-2.09 [4.89]***	-1.42 [-2.90]**	-1.58 [-3.26]***
Output gap	-0.48 [14.00]***	-0.48 [14.21]***	-0.47 [13.99]***	-0.54 [11.89]***	-0.54 [11.60]***		
RR 1st year		0.09 [7.37]***					
Benefit duration		2.64 [2.03]**					
(RR 1st)*(duration)		0.09 [2.69]***					
EPL regular			1.28 [2.49]**				
EPL temporary			-0.45 [2.16]**				
(EPL regular)*(EPL temporary)			-0.28 [1.21]				
Labour tax rate					0.25 [4.82]***		
Consumption tax rate					0.21 [1.92]*		
Macroeconomic shocks							
Productivity shock						-12.81 [-3.34]***	-8.87 [-2.33]**
Terms of trade shock						19.40 [6.45]***	19.09 [6.09]***
Interest rate shock						0.22 [2.72]***	0.19 [2.44]**
Labour demand shock							11.79 [3.91]***
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	434	434	434	398	398	419	397
R-squared	0.98	0.92	0.92	0.98	0.98	0.98	0.98

***, **, *, statistically significant at 1%, 5% and 10% levels, respectively.

EPL: Employment protection legislation. PMR: Product market regulation. RR: Replacement rate.

OLS estimators. Absolute value of robust t-statistics in brackets.

Source: OECD estimates.