# Lecture 4: Labour Economics and Wage-Setting Theory

Spring 2017

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Literature: Chapter 7 Cahuc-Carcillo-Zylberberg: pp 401-413, 413-422 (recommended), 426-435. Chapter 12 Cahuc-Carcillo-Zylberberg: pp 793-795.

# <u>Topics</u>

- The monopsony model of wage setting and employment
- Collective bargaining

## 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

The basic monopsony model

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

# **Decision problem of a monopsonist**

$$\begin{aligned} \max_{w} \quad \pi(w) &= L^{s}(w)(y - w) \\ L^{s}_{1}(y - w) - L^{s} &= 0 \end{aligned}$$

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

Define  $\frac{\partial L}{\partial w} \cdot \frac{w}{L_s} = \eta_w^L$  = 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

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

- 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.

#### Isoprofit curve

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

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

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

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





# <u>Monopsony model with decreasing returns to scale (concave</u> production function F(L))

## Firm's profit:

 $\pi(w) = F[L^{S}(w)] - wL^{S}(w)$ 

## Profit maximization w.r.t. w:

$$\partial \pi(w) / \partial w = F' L^{S'} - w L^{S'} - L^{S} = 0$$

$$F' - w - L^{S'} / L^{S'} = 0$$

$$F' = w [1 + L^{S'} / (L^{S'} w)]$$

$$F' = w [1 + 1 / \eta_w^{L}]$$

 $\eta_w^L = L^S w/L^S = (\partial L^S / \partial w) (w/L^S) = Elasticity of labour supply$ 

## Labour is paid less than its marginal product



Employment and wage in 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

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

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<sub>i</sub>) taking the wages of other firms as given

Go r m{ o gpv' $L_i$ 'kp'ht o 'i'f gr gpf u'qp'cm'y ci gu'\* $w_i$ .'í í  $w_n$ +'kp''y g'' hqmqy kpi 'y c{<'

$$L_i = L^s * w_i + kh w_i > w_j, \quad \forall j' \tilde{\mathbf{N}} i$$

 $L_i = *31J L^{s'*} w_i + khi' ligvu' i g'j ki j guv' y ci g'i qi gyj gt 'j ki j J/3 qvj gt 'ht o u,$ 3'> J > 'h

 $L_i = 2$ 'kh'tj gt g'gz kuwi'qpg'ht o  $j'\tilde{N}i$  y j kej 'ugvu  $w_i < w_j$ 

- Cmiy ci gu'gs wentvq'y'ku'e'P cuj 'gs whildt kwo
- Vjgp'gcej 'hto 'jcu' | gtq'rtqhku'cpf 'ecppqv' lortqxg'ku'rtqhku
  - y kyj 'č'hqy gt 'y ci g'čmihcdqwt 'f kucrrgctu
  - y ký 'č'j ki j gt 'y ci g'kv'ð cngu'č'hquu
- Pq'thpi ng'ht o 'ecp'tgv' $w_i$ '>' $y_0$ 
  - kv'y qwaf 'vjgp'o cmg'c'rtqhkv
  - j gpeg'kv'y qwf 'r c{ 'hqt 'c 'eqo r gykyqt 'tq't c kug'tj g'y ci g'cdqxg' $w_i$  cpf 'ecr wt g'tj g'y j qug'icdqwt 'uwr r n{
  - Vj ku'ku'uq/ecngf '<u>Dgt vt cpf 'eqo r gvlsdap</u>.'y j kej 'hqt egu'tj g'y ci g wr 'tq'tj g'eqo r gvlsdag'igxgn

## **Stage 1 decision**

- 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  $\pi(wM) > c$ .
- 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.



#### FIGURE 7.3

Union density in the private sector as a whole, in construction and in manufacturing in the United States in 2012.

Note: Current Population Survey (CPS) Outgoing Rotation Group (ORG) Earnings Files. Sample includes employed wage and salary workers, ages 16 and older. Density = percentage of employed workers who are union members.



FIGURE 7.4 Collective bargaining coverage in the 2000s.

Source: Database on Institutional Characteristics of Trade Unions, Wage Setting, State (ICTWSS, for coverage). Years: average 2000–2010, or since 2000 to the latest available year.



#### FIGURE 7.5

Changes in union density in 13 OECD countries, 1880–2008. These smoothed series are obtained by fitting the observed union density for each country to time and time squared variables plus a post 1959 dummy (to take into account the switch to OECD data after this date).

Source: Donado and Wälde (2012) data set.



#### FIGURE 7.6

Coverage of collective agreements (as a proportion of all wage and salary earners in employment).

Source: Database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts, 1960–2010 (ICTWSS).

#### **Collective bargaining**

- 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  $L \ge N$ .

#### Union objective

#### Maximise the expected utility of members

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

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* 

# • 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
  - majority decisions
  - sincere voting: no attempts to influence voting by announcing intentions beforehand
  - voting on a single question
  - single-peaked preferences
  - then the median-voter 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

$$\boldsymbol{\theta} = \frac{1}{2}, \boldsymbol{w}_0 = \boldsymbol{0}, \boldsymbol{L}_0 = \boldsymbol{0} \Rightarrow \boldsymbol{\nu}_s = \boldsymbol{w}^{\frac{1}{2}} \boldsymbol{L}^{\frac{1}{2}} = \sqrt{\boldsymbol{w}} \boldsymbol{L},$$

#### i.e. wage bill maximisation

 $\theta = 1/2, w_0 = \overline{w}, L_0 = 0 \implies v_s = (w - \overline{w})^{1/2} L^{1/2} = \sqrt{(w - \overline{w})L}$ 

#### i.e. rent maximisation

#### Pencavel (1984) used Stone-Geary utility function

# **Decision problem**

$$\begin{aligned} & \underset{w}{\text{Max}} \quad \nu_{s} = (w - w_{0})^{\theta} (L - L_{0})^{1 - \theta} \\ & \text{s.t.} \quad L = \alpha_{0} + \alpha_{1} (w/r_{1}) + \alpha_{2} (r_{2}/r_{1}) + \alpha_{3} x + \alpha_{4} D \end{aligned}$$

 $r_1$  = 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 $\theta$ , $w_0$ , $L_0$ , $\alpha_0$ , $\alpha_1$ , $\alpha_2$ , $\alpha_3$ and $\alpha_4$ .

- 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

#### Carruth and Oswald (1985)

- Rejection of risk neutrality (and wage bill and rent maximisation)
- CRRA =  $-w\nu''(w)/\nu'(w) \approx 0.8$
- Risk neutrality implies  $-w\nu''(w)/\nu'(w) = -w \cdot 0/1 = 0$

• 
$$\frac{w^{1-\delta}}{1-\delta}$$
;  $\delta$  is CRRA

$$\delta = 0 \Rightarrow \frac{w^{1-\delta}}{1-\delta} = w$$

$$\delta = 1 \Leftrightarrow \nu(w) = lnw$$



#### Standard right-to-manage model

- Bargaining about wages
- Employer determines employment unilaterally

## Union objective

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

#### <u>Firm profit</u>

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

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

### Apply Nash bargaining solution

$$\max_{W} (\nu_{s} - \nu_{0})^{\gamma} (\pi - \pi_{0})^{1-\gamma}$$

 $\pi_{_0} = \text{Profit in case of disagreement}$  $\nu_{_0} = \text{union utility in case of disagreement}$ 

$$\pi_{0} = 0$$

$$\nu_{0} = \ell \nu(\overline{w}) + (1 - \ell)\nu(\overline{w}) = \nu(\overline{w})$$

$$\nu_{s} - \nu_{0} = \ell \nu(w) + (1 - \ell)\nu(\overline{w}) - \nu(\overline{w}) = \ell(\nu(w) - \nu(\overline{w})) =$$

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

$$\begin{aligned} & \underset{w}{\operatorname{Max}} \quad \left[ L^{\scriptscriptstyle D}(w) \right]^{\gamma} \left[ \nu(w) - \nu(\overline{w}) \right]^{\gamma} \left[ \pi(w) \right]^{1-\gamma} \\ & \text{with} \quad \pi(w) \ = \ R \Big[ L^{\scriptscriptstyle D}(w) \Big] - w L^{d}(w) \\ & \text{s.t.} \quad L^{d}(w) \ \le \ N \ \text{ and } \ w \ \ge \ \overline{w} \end{aligned}$$

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

FOC:

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

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

$$\phi(w,\overline{w},\eta_w^L,\eta_w^\pi,\gamma) = -\gamma \eta_w^L - (1-\gamma)\eta_w^\pi + \frac{\gamma w \nu'(w)}{\nu(w) - \nu(\overline{w})} = 0$$
(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  $\phi_{_{\scriptscriptstyle W}} < 0$ 

 $x = (\overline{w}, z_{L}, z_{\pi}, \gamma)$   $\phi_{w} dw + \phi_{x} dx = 0$   $\frac{dw}{dx} = -\frac{\phi_{x}}{\phi_{w}}$   $\phi_{w} < 0 \Rightarrow \operatorname{sgn} \frac{dw}{dx} = \operatorname{sgn} \phi_{x}$   $\phi_{\gamma} = -\eta_{w}^{L} + \eta_{w}^{\pi} + \frac{w\nu'(w)}{\nu(w) - \nu(\overline{w})}$ 

#### 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  $\phi_\gamma$  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

$$\phi_{\eta^L_{\rm W}} \ = -\gamma < 0$$

• An increase in the labour demand elasticity lowers the wage

$$\phi_{\eta^\pi_w} = -(1-\gamma) < 0$$

• An increase in the profit elasticity lowers the wage

## **Rewrite FOC:**

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

<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.

## Union indifference curves in w, L-space

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

$$\frac{dw}{dL} = \left| \frac{1}{U = const} \right|_{U=const} = -\frac{\left[ \nu(w) - \nu(\overline{w}) \right]}{L\nu'(w)} \leq 0$$

$$\frac{d^2 w}{dL^2} = \left| \frac{1}{U = const} \right|_{L^2 \left[ \nu'(w) \right]^2} = \left\{ 2\nu'(w) - \nu''(w) \frac{\left[\nu(w) - \nu(\overline{w})\right]}{\nu'(w)} \right\} \ge 0$$

## Union indifference curves are negatively sloped and convex.





# Isoprofit curves

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

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

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

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

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



• 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

$$\frac{d^2 w}{dL^2} \bigg|_{\pi=\overline{\pi}} = \frac{R''(L)}{L} < 0.$$

Isoprofit curves are concave there, which imply maxima.

#### **General FOC:**

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

- If η<sup>L</sup><sub>w</sub>, η<sup>π</sup><sub>w</sub>, γ and 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  $\eta_w^L$  and  $\eta_w^{\pi}$  will occur if the revenue function is Cobb-Douglas.

# Simplified model

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

# Profit maximisation gives:

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

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

# Then:

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

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

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  $w = \frac{\overline{w}}{\alpha}$ 

We have:

$$\eta_{\rm w}^{\rm L} = \frac{1}{1-\alpha}$$

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

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

Then:

$$w = m [\ell w + (1 - \ell)] b$$
$$w = \frac{m(1 - \ell)}{1 - m\ell} b$$
(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:

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

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

It shifts upwards if:

- (1) γ**↑**
- (2) *b*↑
- 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.



# **Empirical studies**

- Few studies of relation between unemployment benefit and real wage
- Theoretical model: elasticity of the real wage w.r.t. unemployment benefit = 1
  - Forslund, Gottfries and Westermark (2008): 0.28-0.52
  - Bennmarker, Calmfors and Larsson (2013): 0.1-0.2
- Elasticity of real wage w.r.t. unemployment according to Blanchflower and Oswald: 0.1
- Not so popular to estimate wage setting curves
  - reverse causality
  - instead reduced-form unemployment equations

Key question: How is the unemployment benefit determined?

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

Constant replacement rate:

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

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

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

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

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

- 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.



	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 policiesb	-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 <sup>2</sup>	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 $(\chi_{10}^2)$	6.35	4.52	6.86

Table 15 Regressions to explain log unemployment rate (%) (20 OECD countries, 1983–1988 and 1989–1994)<sup>a</sup>

<sup>a</sup> 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)<sup>2</sup>, 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.

<sup>b</sup> 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)<sup>a</sup>

	Employment/populat	Total hours/ population (index)		
	Whole working age population (1)	Males aged 25–54 (2)	(3)	
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)			4.08 (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 <sup>b</sup>	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)	
2 0.80		0.64	0.51	
N (countries, time)	(20, 2)	(20, 2)	(20, 2)	

<sup>a</sup> 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.
<sup>b</sup> Active labor market policies are instrumented as in Table 15.

Baseline         with AHR spin         with Vor         or tow         components         with IA PL spin         with Vor         or tow         or tow <thor th="" tow<=""> <thor th="" tow<="">         or tow&lt;</thor></thor>		1	2	3	4	5	6	7
[6.28]***       [6.79]***       [4.22]***       [4.16]***       [4.16]***       [3.1]***         Tax wedge       0.28       0.27       0.27       0.24       0.24       0.24       0.24       0.24       0.04       0.		Baseline	with ARR split into two	with EPL split into two	with tax wedge derived from	with separate labour and consumption	with standard macroeconomic	= 6 with labour demand shoc
Tax wedge       0.22       0.27       0.27       0.24       0.24       0.24       0.         Inion density       [10,96]***       [11,11]***       [4,49]***       [7,73]***       [6,6]         Inion density       [1,57]       [1,89]*       [1,64]       [0,56]       [0,49]       [1,48]       [2         EPL       -0.31       -0.20       0.03       0.01       -0.61       -0.0         [0.98]       [0.55]       [0.08]       [0.02]       [-1,52]       [-1,17]**       [2.25]**       [3,17]**         PMR       0.60       0.67       0.73       0.50       0.50       0.54       0.0         Ipt orporatism       -1.42       -1.09       -3.92       -2.06       -2.09       -1.42       -1.         [3.52]***       [3.34]***       [4.89]***       [2.49]***       [2.30]***       [4.89]***       [-2.90]**       [-3.90]***       [4.89]***       [-2.90]***       [-3.90]***       [4.89]***       [-2.90]***       [-3.90]***       [-3.90]***       [-4.89]***       [-5.90]***       [-3.90]***       [-3.90]***       [11.80]****       [1.60]***       [-4.89]***       [-5.80]***       [-5.80]***       [-5.80]***       [-5.80]***       [-5.80]***       [-5.80]***       [-5.80]**	Average replacement rate (ARR)							0.09
[9,75]***       [10.96]***       [11.14]***       [4.49]***       [7.73]***       [6.         Union density       -0.03       -0.03       -0.02       -0.01       0.04       0.0         [11.57]       [1.89]*       [1.61]       [0.55]       [0.08]       [0.02]       [-1.52]       [-1.         PMR       0.60       0.67       0.73       0.50       0.50       0.54       0.         [16] corporatism       -1.42       -1.9       -1.32       [2.17]**       [2.17]**       [2.25]***       [3.57]***       [3.52]***       [3.94]***       [4.89]***       [-2.90]**       [-3.9       -2.06       -2.00       -1.42       -1.         [14.00]***       [14.2]***       [3.94]***       [4.89]***       [-2.90]**       [-3.9       -2.66       -2.09       -1.42       -1.3         [14.00]***       [14.2]***       [3.94]***       [4.89]***       [-2.90]**       [-3.9       -2.64       -2.90]**       [-3.9       -2.64       -2.90]**       [-3.9]**       [-4.89]***       [-2.90]**       [-3.9]**       [-4.89]***       [-5.9]**       [-3.9]**       [-3.9]***       [-3.9]***       [-4.89]***       [-5.8]**       [-5.8]**       [-5.8]***       [-5.8]***       [-5.8]***       [-5.8]***						[4.16]***		[3.35]**
Union density       -0.03       -0.03       -0.03       -0.02       -0.01       10.04       10.49         [1.57]       [1.89]*       [1.64]       [0.56]       [0.49]       [1.48]       [2.         [0.98]       [0.55]       [0.08]       [0.02]       [-1.52]       <	Tax wedge							0.22
[1.57]       [1.89]*       [1.64]       [0.56]       [0.49]       [1.48]       [2.         EPL       -0.31       -0.20       0.03       0.01       -0.61       -0.01         PMR       0.60       0.67       0.73       0.50       0.53       0.54       0.02         PMR       0.60       0.67       0.73       0.50       0.54       0.54       0.02         [140]***       [3.52]***       [2.17]**       [2.25]**       [3.83]***       [-2.90]**       [-3.90]       -1.42       -1.1         [140]***       [14.0]***       [14.89]***       [2.89]***       [2.83]***       [2.30]**       [-3.90]       -1.42       -1.1         [1400]***       [14.0]***       [13.93]***       [13.93]***       [14.0]***       [14.0]***       [-3.90]**       [-3.90]**       [-3.90]****       [-3.90]***       [-3.90]****								[6.40]**
EPL       -0.31       -0.20       0.03       0.01       -0.61       -0.61         [0.98]       [0.55]       [0.08]       [0.02]       [-1.52]       [-1.         PMR       0.60       0.67       0.73       0.50       0.50       0.54       0.         [2.98]***       [3.29]***       [3.52]***       [2.17]**       [2.17]**       [2.25]**       [3.         High corporatism       -1.42       -1.09       -1.39       -2.06       -2.09       -1.42       -1.         [3.57]***       [2.88]***       [3.94]***       [4.89]***       [-2.90]**       [-3.         Output gap       -0.48       -0.47       -0.54       -0.54       -0.54         [1.40]***       [14.21]***       [13.99]***       [11.89]***       [-2.90]**       [-3.         Benefit duration       2.64       -1.28       -1.2	Union density							0.06
[0.98]         [0.55]         [0.08]         [0.02]         [-1.52]         [-1.           PMR         0.60         0.67         0.73         0.50         0.50         0.54         0.           High corporatism         -1.42         -1.09         -1.39         -2.06         -2.09         -1.42         -1.           [3.57]***         [2.88]***         [3.94]***         [4.80]***         [4.89]***         [-2.90]**         [-3.           Output gap         -0.48         -0.47         -0.54         -0.54         -0.54           [14.00]***         [14.21]***         [13.99]***         [11.89]***         [11.60]***         [-3.           Benefit duration         2.64         -0.74         -0.54         -0.54         -0.54           [2.69]***         -0.45         -0.45         -0.45         -0.45         -0.45           EPL regular         1.28         -0.25         -0.45         -0.				[1.64]				[2.33]**
PMR         0.60         0.67         0.73         0.50         0.50         0.51	EPL	-0.31	-0.20		0.03	0.01	-0.61	-0.51
[2.98]***       [3.29]***       [2.17]**       [2.17]**       [2.25]**       [3.         High corporatism       -1.42       -1.09       -1.39       -2.06       -2.09       -1.42       -1.12         [3.77]***       [2.88]***       [3.94]***       [1.40]***       [4.89]***       [-4.89]***       [-4.90]***       [-4.90]***       [-4.90]***       [-4.90]***       [-5.34]       -0.42       -0.42       -0.43       -0.54       -0.56       -0.56       -0.56		[0.98]	[0.55]		[0.08]	[0.02]	[-1.52]	[-1.22]
[2.8]***       [3.2]***       [2.17]**       [2.17]**       [2.25]**       [3.1]**         High corporatism       -1.42       -1.09       -1.39       -2.06       -2.09       -1.42       -1.12         [1.57]***       [2.83]***       [3.94]***       [4.80]***       [4.80]***       [4.80]***       [-2.09]**       [-3.29]***       [-3.29]***       [-3.29]***       [-3.29]***       [-3.29]***       [-3.29]***       [-3.29]***       [-3.29]***       [-3.29]***       [-3.29]***       [-3.29]***       [-3.29]***       [-3.29]***       [-3.29]***       [-3.29]***       [-3.29]***       [-3.29]***       [-3.29]*** <td>PMR</td> <td>0.60</td> <td>0.67</td> <td>0.73</td> <td>0.50</td> <td>0.50</td> <td>0.54</td> <td>0.79</td>	PMR	0.60	0.67	0.73	0.50	0.50	0.54	0.79
High corporatism       -1,42       -1,09       -2,06       -2,09       -1,42       -1,12         (1,39,7)***       (2,88)***       (3,94)***       (4,80)****       (2,89)***       (-2,90)**       (-3,00)***         (14,00)***       (14,00)***       (14,80)****       (14,80)****       (14,80)****       (14,80)***       (14,80)***       (14,80)***       (14,80)***       (14,80)***       (11,80)****       (11,80)***       (11,80)***       (11,80)****       (11,80)****       (11,80)****       (11,80)****       (11,80)****       (11,80)****       (11,80)****		[2.98]***	[3.29]***	[3.52]***	[2.17]**		[2.25]**	[3.28]**
[3.57]***       [2.88]***       [3.94]***       [4.80]***       [4.89]***       [-2.90]**       [-3.         Output gap       -0.48       -0.47       -0.54       -0.54       -0.54         [14.00]***       [11.39]***       [11.89]***       [1.60]***       [1.60]***         RR 1st year       0.09       [11.89]***       [1.60]***       [1.60]***         Benefit duration       2.64       -       -       -         [2.03]**       0.09       -       -       -       -         Benefit duration       2.64       -	High corporatism							-1.58
Output gap         -0.48         -0.7         -0.54         -0.54           [14.00]***         [14.21]***         [13.99]***         [11.89]***         [11.60]***           RR 1st year         0.09								[-3.26]**
[14.00]***       [14.21]***       [11.89]***       [11.60]***         RR 1st year       0.09	Output gap						[ 2.00]	[ 0.20]
RR 1st year     0.09     1     1       Benefit duration     2.64     1       [2.03]**     0.09     1       (RR 1st)*(duration)     0.09     1       [2.69]***     1.28     1       EPL regular     1.28     1       [2.69]***     1.21     1       EPL temporary     -0.45     1       (EPL regular)* (EPL temporary)     -0.28     1       (EPL regular)* (EPL temporary)     -0.28     1       Labour tax rate     0.25     1       Consumption tax rate     0.21     1       Macreeconomic shocks     -1.28.1     -8.2       Productivity shock     -1.28.1     -8.2       Interest rate shock     0.22     0.2       Interest rate shock     0.22     0.2       Country dummies     Yes     Yes     Yes       Yes     Yes     Yes     Yes     Yes       Time dummiss     Yes     Yes     Yes     Yes       Yes     Yes     Yes     Yes     Yes       Observations     434     434     3398     3384     419	output gap							
Image:	DD 1st year	[14.00]		[13.99]	[11.09]	[11.00]		
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 [1.21]         -           Consumption tax rate         0.21 [1.21]         -           Macreeconomic shocks         -         -           Productivity shock         -         -           11.84         .         .         -           11.821         -         -         -           11.81         .         .         .         .           11.81         .	RR ISLyear							
[2.03]**       0.09         0.09       0.09         [2.68]***       [2.69]**         EPL regular       1.28         [2.49]**       -0.45         [2.16]**       -0.45         [2.16]**       -0.25         [2.16]**       0.25         [4.82]***       0.21         Consumption tax rate       0.21         Macreeconomic shocks       -12.81       -8.2         Productivity shock       -12.81       -8.2         [1.92]*       19.40       19.         Interest rate shock       0.22       0.         [2.72]***       [2.72]***       [2.72]***         [2.61]**       -12.81       -8.2         [1.92]*       -12.81       -8.2         [1.92]*       -12.81       -8.2         [1.92]*       -12.81       -8.2         [1.92]*       -12.81       -8.2         [1.92]*       -12.81       -12.81         [2.72]***       [2.22]***       -12.81         [3.10]*       -12.81       -12.81         [4.64]***       -12.81       -12.81         [5.10]**       -12.21       -12.21         [6.45]***       19.40	B (1) 1							
(RR 1st)*(duration)       0.09         [2.69]***       [2.69]***         EPL regular       [2.49]**         [2.16]**       [2.16]**         (EPL regular)*(EPL temporary)       -0.45         [2.16]**       [2.16]**         (EPL regular)*(EPL temporary)       -0.28         [1.21]       [4.82]***         Labour tax rate       0.25         rate       [4.82]***         Consumption tax rate       0.21         Productivity shock       -12.81       -8.         Productivity shock       -12.81       -8.         [-3.34]***       [-3.34]***       [-3.34]***         Labour damand shock       .0.22       0.         [2.60]*/100000000000000000000000000000000000	Benefit duration							
[2.69]***         EPL regular       1.28         [2.49]**       -0.45         [2.49]**       -0.45         [2.16]**       (EPL regular)* (EPL temporary)         -0.28       [1.21]         Labour tax rate       0.25         [4.82]***       0.21         Consumption tax rate       0.21         Productivity shock       -12.81       -8.2         Productivity shock       -13.34]***       [6.45]***         Interest rate shock       19.40       19.         Interest rate shock       .12.81       -8.2         Country dummies       Yes       Yes       11.         Country dummies       Yes       Yes       Yes       Yes         Ves       Yes       Yes       Yes       Yes       Yes       Yes         Observations       434       434       338       338       419       33								
EPL regular     1.28       [2.49]**     [2.49]**       EPL temporary     -0.45       [2.16]**     [2.16]**       (EPL regular)* (EPL temporary)     -0.28       [1.21]     0.25       Labour tax rate     0.21       [4.82]***     0.21       Consumption tax rate     0.21       Productivity shock     -12.81     -6.28       Productivity shock     -13.4]***     [6.45]***       Interest rate shock     19.40     19.       Interest rate shock     0.22     0.       [2.72]***     [2.72]***     [2.72]***       [2.10]     [2.72]***     [2.72]***       [2.10]     19.40     19.       [10]     19.40     19.       [10]     [2.72]***     [2.72]***       [2.10]     (2.72]***     [2.72]***       [2.10]     19.40     19.       [2.10]     (2.72]***     [3.       Country dummies     Yes     Yes     Yes       Yes     Yes     Yes     Yes     Yes       Yes     Yes     Yes     Yes     Yes       Yes     Yes     Yes     Yes     Yes     Yes       Yes     Yes     Yes     Yes     Yes     Yes	(RR 1st)*(duration)							
[2.49]**         EPL temporary       -0.45         [2.16]**         (EPL regular)*(EPL temporary)       -0.28         [1.21]       -0.25         Labour tax rate       0.25         Consumption tax rate       0.21         Terms of trade shock       -12.81       -9.8         Productivity shock       -12.81       -9.8         Interest rate shock       19.40       19.         Labour damand shock       -12.81       -9.8         Country dummies       Yes       Yes       Yes       Yes         Yes       Yes       Yes       Yes       Yes       Yes         Yes       Yes       Yes       Yes       Yes       Yes       Yes         Observations       434       434       398       398       419       3			[2.69]***					
EPL temporary       -0.45         [2.16]**       [2.16]**         (EPL regular)* (EPL temporary)       -0.28         [1.21]       -0.25         Labour tax rate       0.25         (GRUE)       [4.82]***         Consumption tax rate       0.21         Macreeconomic shocks       -12.81       -8.2         Productivity shock       -12.81       -8.4         Terms of trade shock       -13.41***       [6.45]***         Interest rate shock       0.22       0.2         Labour demand shock       -2.28       -1.1         Country dummies       Yes       Yes       Yes         Yes       Yes       Yes       Yes       Yes         Yes       Yes       Yes       Yes       Yes         Yes       Yes       Yes       Yes       Yes       Yes         Yes       Yes       Yes       Yes       Yes       Yes       Yes         Yes       Yes       Yes       Yes       Yes       Yes       Yes       Yes	EPL regular			1.28				
[2.16]**           (EPL regular)* (EPL temporary)         -0.28           [1.21]         0.25           Labour tax rate         0.21           Consumption tax rate         0.21           Macroeconomic shocks         -12.81         -8.           Productivity shock         -12.81         -8.           [-3.34]***         [-2.28]         [-3.34]***           Interest rate shock         19.40         19.40           [Interest rate shock         0.22         0.           [2.72]***         [2.20]         [2.72]***           [2.3000 demand shock         11.         [2.72]***           Country dummies         Yes         Yes         Yes         Yes         Yes         Yes           Yes         Yes         Yes         Yes         Yes         Yes         Yes         Yes         Yes           Country dummies         Yes         Yes         Yes         Yes         Yes         Yes         Yes         Yes           Vibervations         434         434         338         338         419         3				[2.49]**				
[2.16]**           (EPL regular)* (EPL temporary)         -0.28           [1.21]         0.25           Labour tax rate         0.21           Consumption tax rate         0.21           Macroeconomic shocks         -12.81         -8.           Productivity shock         -12.81         -8.           [-3.34]***         [-2.28]         [-3.34]***           Interest rate shock         19.40         19.40           [Interest rate shock         0.22         0.           [2.72]***         [2.20]         [2.72]***           [2.3000 demand shock         11.         [2.72]***           Country dummies         Yes         Yes         Yes         Yes         Yes         Yes           Yes         Yes         Yes         Yes         Yes         Yes         Yes         Yes         Yes           Country dummies         Yes         Yes         Yes         Yes         Yes         Yes         Yes         Yes           Vibervations         434         434         338         338         419         3	EPL temporary			-0.45				
(EPL regular)* (EPL temporary)         -0.28 [1.21]           Labour tax rate         0.25           [4.82]***         [4.82]***           Consumption tax rate         0.21           Intersection and shocks         -12.81         -8.8           Productivity shock         -12.81         -8.8           Interest rate shock         19.40         19.           Interest rate shock         0.22         0.           Interest rate shock         11.         12.5           Interest rate shock         12.5         13.5           Interest rate shoc								
Item         [1,21]           Labour tax rate         0,25           [4,82]***         0,21           Consumption tax rate         0,21           Macroeconomic shocks         [1,92]*           Productivity shock         -12.81         -8.           [4,64]***         [6,645]***         [6,645]***           Interest rate shock         0,22         0.           [14,645]***         [6,645]***         [6,645]***           [15,10]         (22,20)         [2,72]***         [2,22]           Labour demand shock         [2,72]***         [2,2]         [3,10]           Country dummies         Yes         Yes         Yes         Yes           Yes         Yes         Yes         Yes         Yes         Yes           Observations         434         434         338         338         419         3	(EPL regular)*(EPL temporary)							
Labour tax rate         0.25           Consumption tax rate         [4.82]***           0.21         [1.92]*           Macroeconomic shocks        12.81         -8.           Productivity shock         [-3.34]***         [-2.21]**           Terms of trade shock         19.40         19.40         19.40           Interest rate shock         0.22         0.         [2.72]***         [2.22]           Country dummies         Yes         Yes         Yes         Yes         Yes         Yes           Country dummies         Yes         Yes         Yes         Yes         Yes         Yes         Yes         Yes           Time dummies         Yes         Yes         Yes         Yes         Yes         Yes         Yes         Yes           Yes	(Er Erogana) (Er Eromponal)							
[4.82]***           [4.82]***           Consumption tax rate         (1.92]**           Macreeconomic shocks           Productivity shock         -12.81         -8.           [-3.34]***         [-6.         -12.81         -8.           Terms of trade shock         19.40         19.         19.           Interest rate shock         0.22         0.         (6.45)***         [6.           Labour demand shock         (2.72)***         [2.         Labour demand shock         11.           Country dummies         Yes         Yes         Yes         Yes         Yes         Yes           Time dummies         Yes         <	Labour tay rate			[1.21]		0.25		
Consumption tax rate         0.21 [1.92]*           Macroeconomic shocks	Labour tax rate							
In sequence on omice shocks         -12.81         -8.           Productivity shock         -13.34]***         [-2.           Terms of trade shock         19.40         19.40         19.40           Interest rate shock         0.22         0.         0.         2.22         0.           Labour demand shock         (2.72)***         [2.         1. <t< td=""><td>O</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	O							
Macroeconomic shocks         -12.81         -8.           Productivity shock         -12.81         -8.         [-3.34]***         [-2.21]           Terms of trade shock         19.40         19.         19.         [-6.45]***         [6.45]***         [6.           Interest rate shock         0.22         0.         0.22         0.         12.         [2.72]***         [2.         Labour demand shock         11.         12.         [2.72]***         [2.         [2.         13.	Consumption tax rate							
Productivity shock        12.81        8.           [-3.34]***         [-2.2         0.           [6.45]***         [6.45]***         [6.45]***           Interest rate shock         0.22         0.           [2.72]***         [2.72]***         [7.2           Labour demand shock         11.         [3.           Country dummies         Yes         Yes         Yes         Yes         Yes           Time dummiss         Yes						[1.92]*		
[-3.34]***         [-2.           Terms of trade shock         19.40         19.           Interest rate shock         0.22         0.           [6.45]***         [6.20]         10.           Labour demand shock         11.         [3.           Country dummies         Yes	Macroeconomic shocks							
[-3.34]***         [-2.           Terms of trade shock         19.40         19.           Interest rate shock         0.22         0.           [6.45]***         [6.20]         10.           Labour demand shock         11.         13.           Country dummies         Yes         Yes         Yes         Yes         Yes         Yes           Country dummies         Yes	Productivity shock						-12.81	-8.87
Terms of trade shock         19.40 <sup>°</sup> 19.3           [6.45]***         [6.6]         [6.45]***         [6.6]           Interest rate shock         0.22         0.         [2.72]***         [2.           Labour demand shock         [2.72]***         [2.         [2.         [3.         [3.           Country dummies         Yes         Yes<	rioduotinty shock							[-2.33]**
[6.45]***         [6.           Interest rate shock         0.22         0.           (2.72]***         [2.           Labour demand shock         11.           Country dummies         Yes         Yes         Yes         Yes         Yes           Time dummies         Yes	Terms of trade shock							19.09
Interest rate shock         0.22         0.           [2,72]***         [2,22]***         [2,27]***         [2,72]***           Labour demand shock         11.         [3:           Country dummies         Yes         Yes         Yes         Yes         Yes         Yes           Time dummies         Yes         Y								
[2.72]***         [2.72]***         [2.72]***         [2.72]***         [2.72]***         [2.72]***         [2.72]***         [2.72]***         [2.72]***         [2.72]***         [2.72]***         [2.72]***         [2.72]***         [3.72]*** <t< td=""><td rowspan="2">Interest rate shock</td><td></td><td></td><td></td><td></td><td></td><td></td><td>[6.09]**</td></t<>	Interest rate shock							[6.09]**
Labour demand shock         11.           Country dummies         Yes         Yes         Yes         Yes         Yes         Y           Time dummies         Yes         <								0.19
[3: Country dummies Yes Yes Yes Yes Yes Yes Y Time dummies Yes Yes Yes Yes Yes Yes Yes Y Observations 434 434 434 398 398 419 3							[2.72]***	[2.44]**
Country dummies         Yes         Yes         Yes         Yes         Yes         Y           Time dummies         Yes         Yes         Yes         Yes         Yes         Yes         Y           Observations         434         434         398         398         419         3	Labour demand shock							11.79
Time dummies         Yes         Yes <thyes< th=""> <thyes< th=""> <thy< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>[3.91]**</td></thy<></thyes<></thyes<>								[3.91]**
Observations 434 434 434 398 398 419 3								Yes
							Yes	Yes
R-squared 0.98 0.92 0.92 0.98 0.98 0.98 0.98	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.		ant at 1% E	4 and 10% los	rale respectiv	rolu			

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