Topics for Today

1.) Finish Moen (1997)

2.) U.S. vs. European Unemployment
   - Ljungqvist + Sargent (1998, 2008)

Optimality

Workers Indifference Curve

1. $$\boxed{p(\theta_i) = \frac{rU - z}{w_i - rU}(r+s) = \theta_i\, q(\theta_i)}$$

Firms Zero-Profit Condition

2. $$\boxed{[r + q(\theta_i)]\, V(y_i, w, \theta_i) = q(\theta_i)\frac{y_i - w}{r+s} - c}$$

Differentiate 1. w.r.t. w

$$\frac{d\theta}{dw}\cdot q + \theta q' \frac{d\theta}{dw} = \frac{-(rU - z)}{(w - rU)^2}(r+s)$$

Define $\boxed{\eta = -\frac{\theta}{q} q'}$

$$q\frac{d\theta}{dw}(1-\eta) = \frac{-(rU - z)}{(w - rU)^2}(r+s)$$

Plug 1. into this,

3. $$\boxed{(1-\eta)\frac{d\theta}{dw} = \frac{-\theta}{w - rU}}$$

Now diff. 2. w.r.t. w, imposing envelope $V'=0$

$$q'\frac{d\theta}{dw}V = q'\frac{d\theta}{dw}\frac{y-w}{r+s} - \frac{q}{r+s}$$

$$\frac{d\theta}{dw}\left[q'\frac{y-w}{r+s} - q'V\right] = \frac{q(\theta)}{r+s}$$

$$q'\frac{d\theta}{dw}\left[\frac{y-w}{r+s} - V\right] = \frac{q(\theta)}{r+s}$$

Now sub in workers Indiff. Curve, 3.,

$$q'\left[\frac{-\theta}{w-rU}\frac{1}{1-\eta}\right]\left[\frac{y-w}{r+s} - V\right] = \frac{q}{r+s}$$

$$-\frac{q'\cdot\theta}{q}\left[\frac{1}{w-rU}\frac{1}{1-\eta}\right]\left(\frac{y-w}{r+s} - V\right) = \frac{1}{r+s}$$

$$\frac{\eta}{1-\eta}\left[\frac{1}{w-rU}\right]\left(\frac{y-w}{r+s} - V\right) = \frac{1}{r+s}$$

$$\frac{\eta}{1-\eta}\left[\frac{y-w-(r+s)V}{w-rU}\right] = 1$$

Finally, note from worker's Bellman Eqs.

$$w_i - r\mathcal{U} = (r+s)(E_i - \mathcal{U})$$

and from the firms Bellman Eqs.

$$(r+s)\left[\frac{y_i - w_i}{r+s} - V_i\right] = (r+s)\left[J_i - V_i\right]$$

Sub these in,

$$\frac{\eta_i}{1-\eta_i} = \frac{E_i - \mathcal{U}}{J_i - V_i}$$

Define $S_i = E_i - \mathcal{U} + J_i - V_i$

$$\Rightarrow \boxed{\begin{aligned} E_i - \mathcal{U} &= \eta_i S_i \\ J_i - V_i &= (1-\eta_i) S_i \end{aligned}} \Longrightarrow \text{Hosios !}$$

Planner's Problem

$$\max_{a,\hat{i},u_i} \int_0^\infty e^{-rt}\left\{\sum_{i=\hat{i}}^{n}\left(N_i y_i + z u_i - c v_i\right) - ak\right\}dt$$

Flow of new vacancies created

subject to

$$\dot{N}_i = v_i\, g\!\left(\frac{v_i}{u_i}\right) - sN_i \qquad i \geq \hat{i}$$

$$v_i = a f_i - v_i\, g\!\left(\frac{v_i}{u_i}\right) \qquad i \geq \hat{i}$$

$$\sum_{i=\hat{i}}^{n}\left(u_i + N_i\right) = 1$$

Current Value Hamiltonian

$$\begin{aligned}
H = {} & \sum N_i y_i + z\sum u_i - c\sum v_i - ak \\
& + \sum \lambda_i\left[v_i\, g\!\left(\frac{v_i}{u_i}\right) - sN_i\right] \\
& + \sum \gamma_i\left[a f_i - v_i\, g\!\left(\frac{v_i}{u_i}\right)\right] \\
& + \alpha\left[1 - \sum\left(u_i + N_i\right)\right]
\end{aligned}$$

Exercise

Show that with

$$\alpha = r\mathcal{U}$$

$$\gamma_i = rV_i$$

$$\lambda_i - \gamma_i = S_i = E_i - \mathcal{U} + J_i - V_i$$

The planner's (steady-state) FOCs match the market equilibrium conditions.

U.S. vs. European Unemployment

Basic Facts

1.) In the 1950s & 1960s European unemployment rates were generally lower than the U.S. unemployment rate.

2.) Since about 1980, European unemployment rates have been higher than in the U.S. (Now they are about the same, or even a little lower, but that's primarily a cyclical response to the recent recession, which was worse in the U.S.).

3.) Inflow rates into unemployment have been roughly constant over time, in both the U.S. and Europe.

4.) The average duration of unemployment has increased significantly in Europe.

5.) Unemployment Insurance (UI) is more generous in Europe. The relative generosity of European UI has been roughly constant.

6.) Employment Protection laws are stricter in Europe, in both periods.

Challenge: How to explain the time-series variation in relative unemployment rates, given that labor market policies haven't changed much?

L+S proposed explanation: The environment has changed. Workers now confront greater "turbulence".

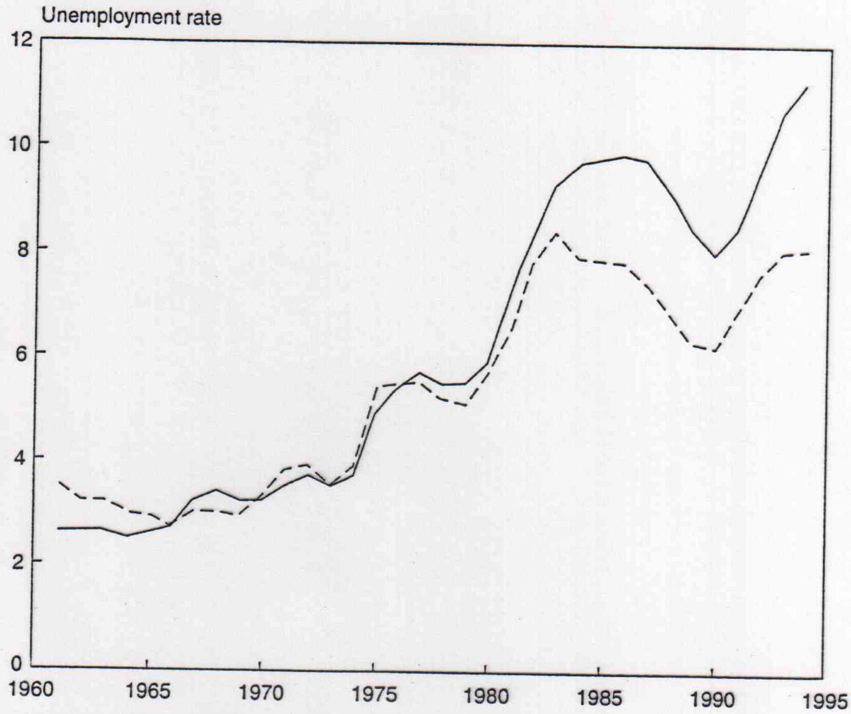

Figure 1. Unemployment rate in OECD as a percent of the labor force. The solid line is unemployment in the European OECD countries and the dashed line is unemployment in the total OECD. (Source: Data for 1961–1977 are from OECD [1984a], and data for 1978–1994 are from OECD [1995].)

Table 1. Unemployment and Long-Term Unemployment in OECD

	Unemployment (%)			Long-term unemployment of 6 months and over (% of total unemployment)			Long-term unemployment of 1 year and over (% of total unemployment)			
	1974–1979[a]	*1980–1989*[a]	*1995*[b]	*1979*[c]	*1989*[d]	*1995*[e]	*1970*[f]	*1979*[c]	*1989*[d]	*1995*[e]
Belgium	6.3	10.8	13.0	74.9	87.5	77.7	...	58.0	76.3	62.4
France	4.5	9.0	11.6	55.1	63.7	68.9	22.0	30.3	43.9	45.6
Germany[g]	3.2	5.9	9.4	39.9	66.7	65.4	8.8	19.9	49.0	48.3
Netherlands	4.9	9.7	7.1	49.3	66.1	74.4	12.2	27.1	49.9	43.2
Spain	5.2	17.5	22.9	51.6	72.7	72.2	...	27.5	58.5	56.5
Sweden	1.9	2.5	7.7	19.6	18.4	35.2	...	6.8	6.5	15.7
United Kingdom	5.0	10.0	8.2	39.7	57.2	60.7	17.6	24.5	40.8	43.5
United States	6.7	7.2	5.6	8.8	9.9	17.3	...	4.2	5.7	9.7
OECD Europe	4.7	9.2	10.3	...	...	...	...	31.5	52.8	...
Total OECD	4.9	7.3	7.6	...	...	...	...	26.6	33.7	...

[a] Unemployment in 1974–1979 and 1980–1989 is from OECD, Employment Outlook (1991), Table 2.7.

[b] Unemployment in 1995 is from OECD, Employment Outlook (1996), Table 1.3.

[c] Long-term unemployment in 1979 is from OECD, Employment Outlook (1984b), Table H; except for the OECD aggregate figures, which are averages for 1979 and 1980 from OECD, Employment Outlook (1991), Table 2.7.

[d] Long-term unemployment in 1989 is from OECD, Employment Outlook (1992a), Table N; except for the OECD aggregate figures that are from OECD, Employment Outlook (1991), Table 2.7.

[e] Long-term unemployment in 1995 is from OECD, Employment Outlook (1996), Table Q.

[f] Long-term unemployment in 1970 is from OECD, Employment Outlook (1983), Table 24.

[g] Except for year 1995, data refer to former West Germany only.

Table 2. Net Unemployment Benefit Replacement Rates[a] in 1994 for Single-Earner Households by Duration Categories and Family Circumstances

	Single			With dependent spouse		
	1st year	*2nd and 3rd years*	*4th and 5th years*	*1st year*	*2nd and 3rd years*	*4th and 5th years*
Belgium	79	55	55	70	64	64
France	79	63	61	80	62	60
Germany	66	63	63	74	72	72
Netherlands	79	78	73	90	88	85
Spain	69	54	32	70	55	39
Sweden[b]	81	76	75	81	100	101
United Kingdom[b]	64	64	64	75	74	74
United States	34	9	9	38	14	14

Source: Martin (1996, table 2).

[a] Benefit entitlement on a net-of-tax and housing benefit basis as a percentage of net-of-tax earnings.

[b] Data for Sweden and the United Kingdom refer to 1995.

Ljungquist + Sargent (JPE, 1998)

- L+S basically use a McCall search model, with the following extra bells + whistles:

1.) Endogenous search intensity.

2.) Random human capital appreciation + depreciation.

3.) UI based on prior labor market experience.

4.) Labor market "turbulence".

Assumptions

1.) In period t+1, an unemployed worker receives an offer drawn from an exogenous c.d.f. $F(\cdot)$ with probability $\pi(s_t)$, which depends on search intensity, s_t, chosen at time-t at cost $c(s_t)$.

2.) Earnings are the product of wages + skill level. Skill accumulates or depreciates stochastically, at rates depending on whether the worker is employed or unemployed. Work experience leads to skill accumulation, while unemployment causes them to depreciate.

3.) Unemployment compensation is based on a worker's most recent earnings. If you quit, you don't get UI. If you turn down a job with a wage "close to" your previous wage, you lose your UI.

4.) Workers are risk neutral and face constant probabilities of death, α, and of being fired, λ. When fired, a worker loses a random fraction of his existing human capital/skill.

Notation

$V(w,h)$ = Beginning of period value function for employed worker with current wage, w, and skill level h.

$V_0(h)$ = Value function for unemployed worker who is not eligible for UI

$V_1(I,h)$ = Value function for unemployed worker who is currently eligible for UI, with past earnings I and current skill level h.

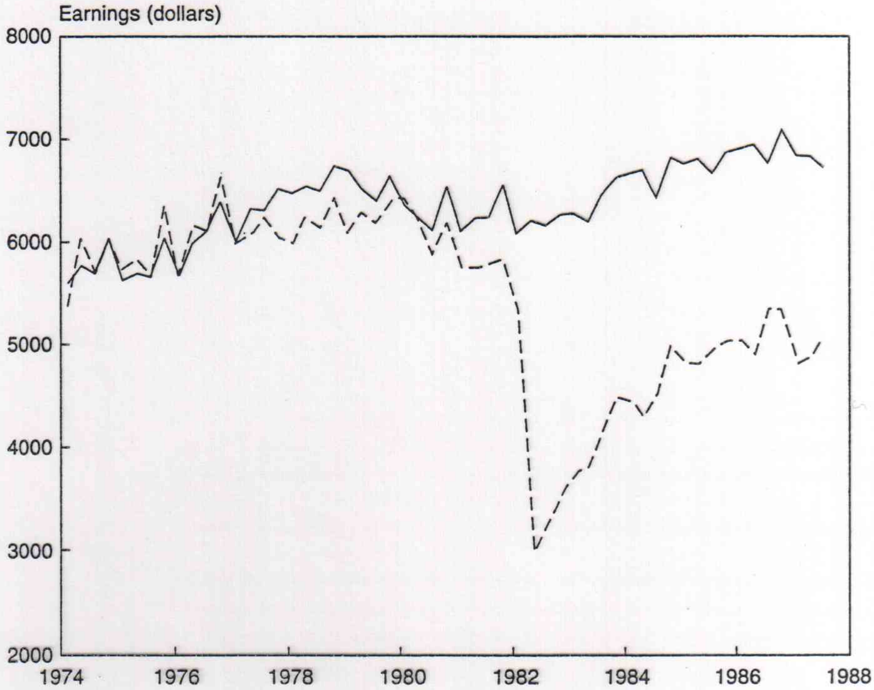

Figure 5. Quarterly earnings of high-attachment workers separating in the first quarter of 1982 and workers staying through 1986. The solid line refers to stayers, the dashed line, to separators. (Reproduction of Jacobson et al., fig. 1 [1993]. We have omitted the last observation of Jacobson et al. because it is based on too small a sample.)

$\mu_e(h,h')$ = Skill transition prob. for employed worker

$\mu_u(h,h')$ = " " " " unemployed "

$\mu_\ell(h,h')$ = " " " when laid-off

"Turbulence". Job-specific human capital

Bellman Eqs.

$$V(w,h) = \max_{\text{work, quit}} \Big\{ (1-\tau)w \cdot h + (1-\alpha)\beta \Big[(1-\lambda)\sum_{h'} \mu_e(\cdot) V(w,h') + \lambda \sum_{h'} \mu_\ell(\cdot) V_b(wh,h') \Big], V_0(h) \Big\}$$

$$V_0(h) = \max_{s} \Big\{ -c(s) + (1-\alpha)\beta \sum_{h'} \mu_u(\cdot) \Big[(1-\pi(s)) V_0(h') + \pi(s) \int V(w,h')dF \Big] \Big\}$$

$$V_b(I,h) = \max_s \Big\{ -c(s) + (1-\tau)b(I) + (1-\alpha)\beta \sum_{h'} \mu_u(\cdot) \Big[(1-\pi(s)) V_b(I,h')$$

$$+ \pi(s) \Big(\int_{w \geq \frac{I_b}{h'}} V(w,h')\, dF(w) + \int_{w < \frac{I_b}{h'}} \max_{acc.,\, rej.} \Big\{ (1-\tau) w h'$$

$$+ (1-\alpha)\beta \Big[(1-\lambda) \sum_{h''} \mu_e(\cdot) V(w,h'') + \lambda \sum_{h''} \mu_\lambda(\cdot) V_b(wh', h'') \Big],\ V_b(I,h') \Big\}$$

$$dF(w) \Big) \Big] \Big\}$$

Policy Functions

$\bar{s}_o(h)$, $\bar{w}_o(h)$

$s_b(I,h)$, $\bar{w}_b(I,h)$

These depend on govt. policies $b(I)$, $I_g(I)$, τ

(Note: $\bar{w}_e(h) = \bar{w}_o(h)$ since you lose UI if you quit).

Computation of Steady State Equilibrium

L+S assume UI must be "self-financing" (i.e., financed out of payroll taxes).

Labor Supply depends on taxes $\Longleftrightarrow$ Tax Revenues Depend on Labor Supply

$\Longrightarrow$ Fixed Point Problem

Solution Strategy:

1.) Specify policies, $b(I)$, $I_g(I)$
2.) Guess a (low) τ
3.) Compute ~~equilibrium~~ optimal decisions
4.) Given the decisions compute tax revenues
5.) Check whether revenue covers UI payments.

Calibration

$w \in [0, 1]$

$h \in [1, 2]$

$\pi(s) = s^{1/3}$

$c(s) = \frac{1}{2} s$

time unit = 2 weeks

$\alpha = .0009 \Rightarrow$ expected (working) life $\approx$ 43 years

$\lambda = .009 \Rightarrow$ average job duration $\approx$ 4.3 years

$b(I) = .7 \cdot I$

$I_g(I) = .7 \cdot I$

μ_e : with prob. $\frac{1}{10}$ you move up one skill level
$\Rightarrow$ expected time until maximum skill (conditional on continuous employment) is $7\frac{1}{2}$ years

μ_u : with prob. $\frac{2}{10}$ you move down one notch

Turbulence = Higher variance of the post-firing skill distribution.

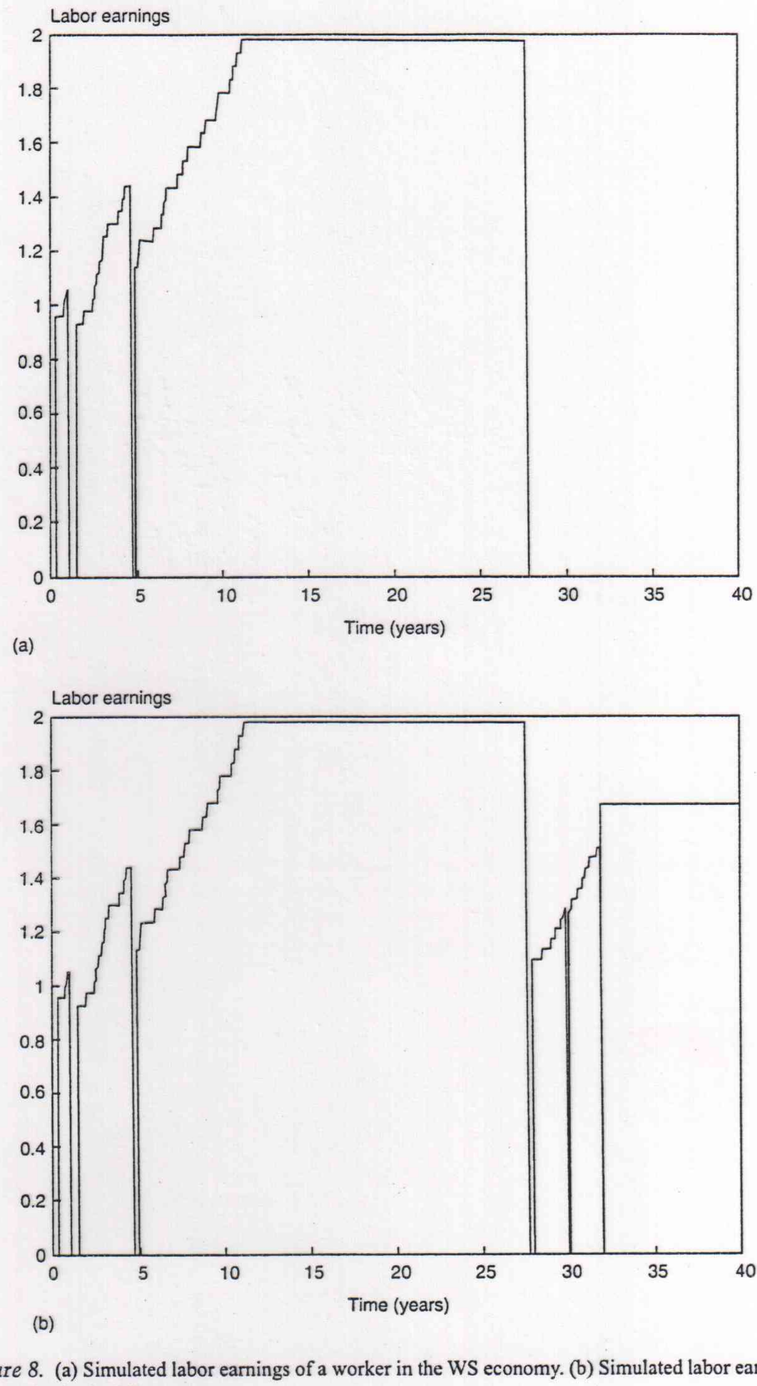

Figure 8. (a) Simulated labor earnings of a worker in the WS economy. (b) Simulated labor earnings of a worker in the LF economy.

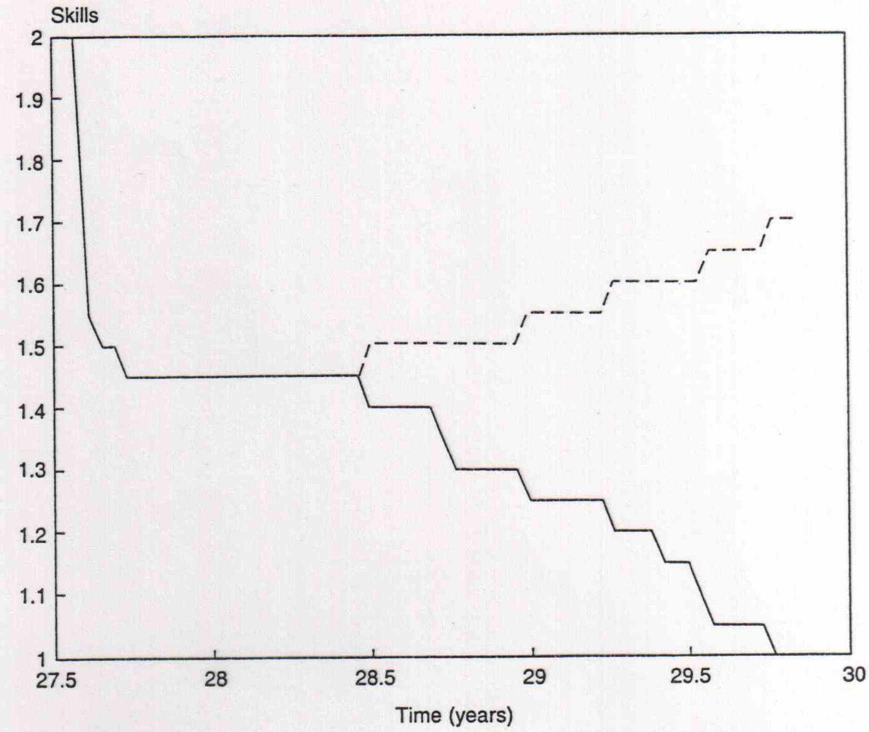

Figure 9. Simulated skills of a worker in the WS economy (solid line) and one in the LF economy (dashed line).

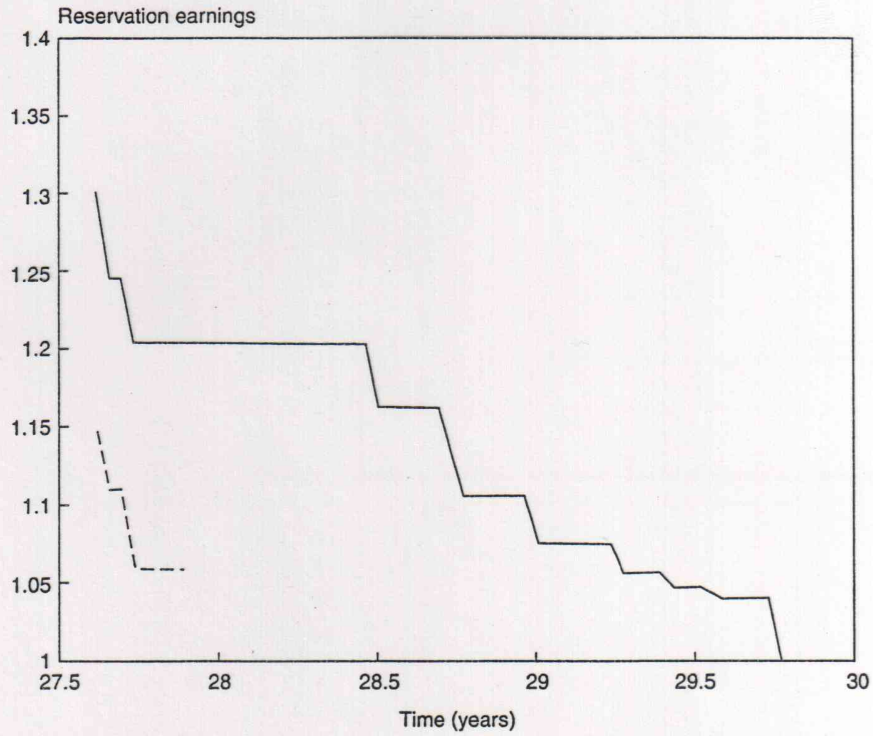

Figure 10. Simulated reservation earnings of a worker in the WS economy (solid line) and one in the LF economy (dashed line).

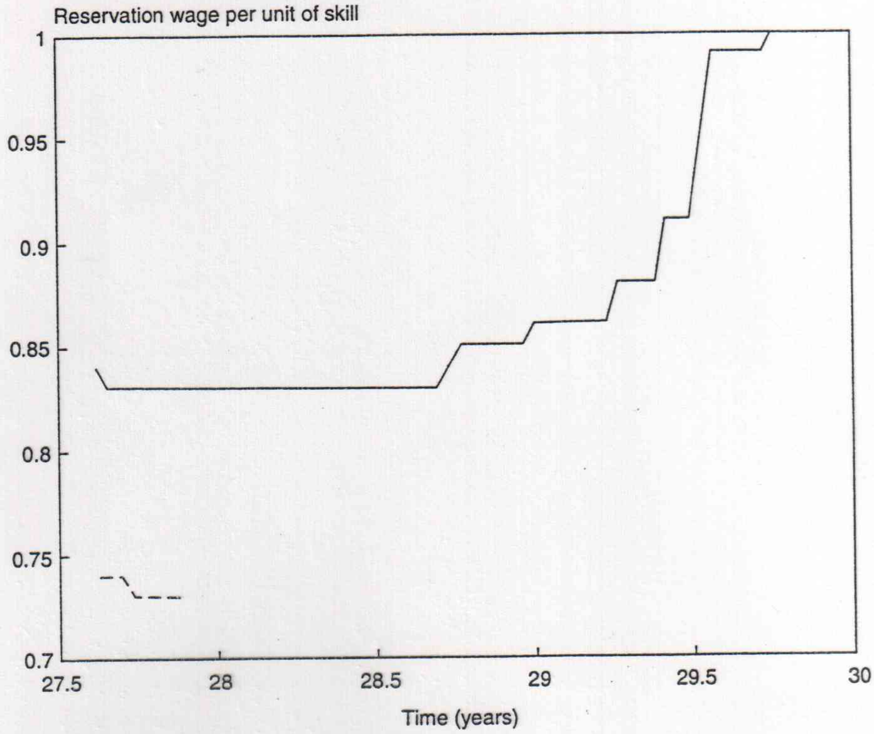

Figure 11. Simulated reservation wage per unit of skill of a worker in the WS economy (solid line) and of one in the LF economy (dashed line).

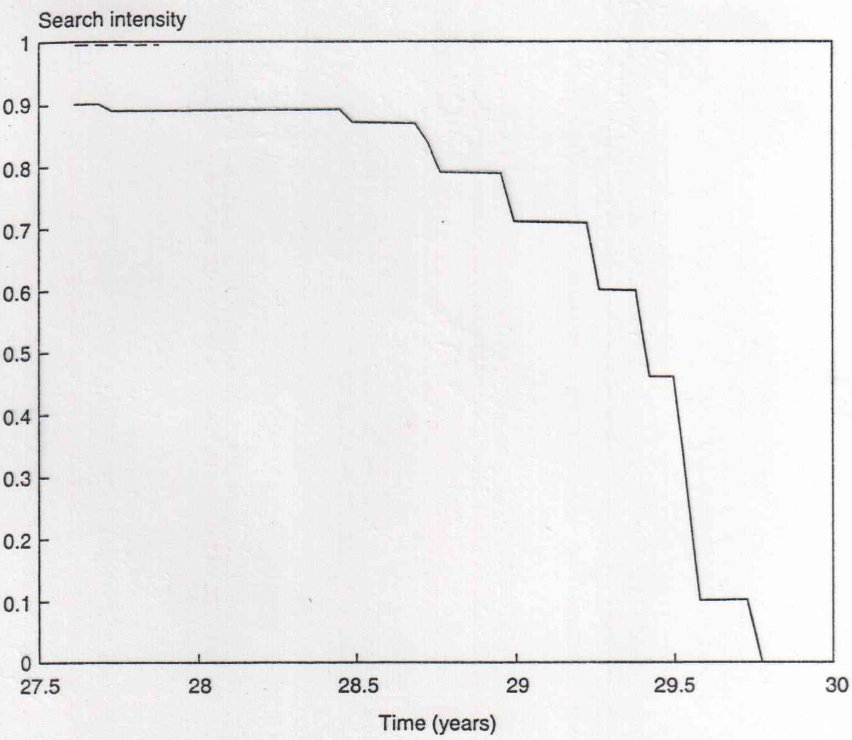

Figure 12. Simulated search intensity of a worker in the WS economy (solid line) and of one in the LF economy (dashed line).

Table 3. Equilibrium Outcomes for the WS Economy and the LF Economy with Different Degrees of Economic Turbulence

	Degree of economic turbulence			
	.02		*.04*	
	WS	*LF*	*WS*	*LF*
Tax rate (%)	3.88	n.a.	11.69	n.a.
Unemployment rate (%)	7.13	5.81	14.87	5.73
Average duration of unemployment (weeks)	13.7	10.6	31.8	10.7
Percentage of unemployed at a point in time with spells so far ≥ 6 months	18.2	8.2	63.1	8.5
Percentage of unemployed at a point in time with spells so far ≥ 12 months	5.8	0.6	55.6	0.6