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The European Unemployment Dilemma

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The European Unemployment Dilemma

by

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Post World War II European welfare states experienced several decades of relatively low unemployment, followed by a plague of persistently high unemployment since the 1970's. We impute the higher unemployment to welfare states' diminished ability to cope with more turbulent economic times, such as the ongoing restructuring from manufacturing to the service industry and a rapidly changing international economy. We use a general equilibrium search model where workers accumulate skills on the job and lose skills during unemployment.

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1. Introduction

During their first decades, European welfare states exhibited unemployment rates equal to or less than those of other market economies; but in the 1970's, they suffered large increases in unemployment, which have endured. Figure 1 shows that unemployment in European OECD countries has from 1983 persistently exceeded the OECD average by around two percentage points. Higher incidences of long term unemployment have accompanied higher levels of unemployment. According to Table 1, more than half of all European unemployment in 1989 was classified as long-term unemployment with a duration of a year and over, up from less than a third of unemployment in 1979. Table 1 shows that the increasing incidence of long-term unemployment is a problem common to the European OECD countries.[1] In contrast, the United States escaped such a persistent increase in unemployment, and U.S. long-term unemployment has remained low.

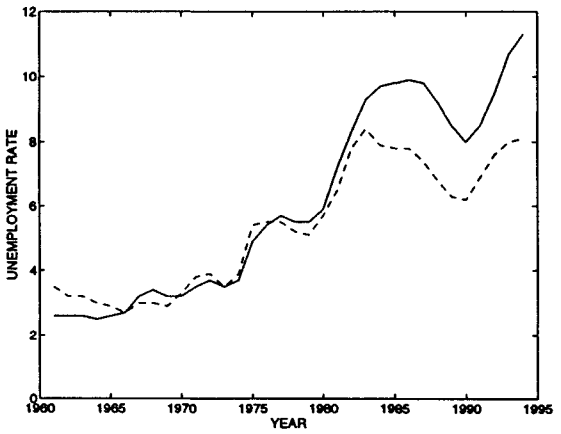

Figure 1. Unemployment rate in OECD as a per cent of the labor force. The solid line is unemployment in the European OECD countries and the dashed line is unemployment in the total OECD. *Source:* Data for 1961–1977 are from OECD (1984a), and data for 1978–1994 are from OECD (1995).

[1] A glaring exception to the European unemployment dilemma in Table 1 is Sweden. Ljungqvist and Sargent (1995b) provide an explanation to the Swedish unemployment experience including the current crisis with more than 13 per cent of the labor force either unemployed or engaged in labor market programs.

Table 1: Unemployment and long-term unemployment in OECD

	Unemployment† (Percentages)		**Long-term unemployment** (Percentages of total unemployment)			
	Average	Average	1979‡		1989§	
	1974–79	1980–89	≥ 6 mos.	≥ 12 mos.	≥ 6 mos.	≥ 12 mos.
Belgium	6.3	10.8	74.9	58.0	87.5	76.3
France	4.5	9.0	55.1	30.3	63.7	43.9
Germany	3.2	5.9	39.9	19.9	66.7	49.0
Ireland	8.4	15.2	47.9	31.8	82.4	67.3
Netherlands	4.9	9.7	49.3	27.1	66.1	49.9
Spain	5.2	17.5	51.6	27.5	72.7	58.5
Sweden	1.9	2.5	19.6	6.8	18.4	6.5
United Kingdom	5.0	10.0	39.7	24.5	57.2	40.8
United States	6.7	7.2	8.8	4.2	9.9	5.7
OECD Europe	4.7	9.2	...	31.5	...	52.8
Total OECD	4.9	7.3	...	26.6	...	33.7

† Unemployment is from OECD, Employment Outlook (1991), Table 2.7.

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

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

Various theories have been used to explain the rise in European unemployment. Blanchard and Summers (1986) and Lindbeck and Snower (1988) imputed the outcome to "insider-outsider" conflicts between employed and unemployed workers that arose in the highly unionized economies of Europe. Bentolila and Bertola (1990) studied the idea that excessive European hiring and firing costs contributed to higher unemployment. Both of these explanations assign the problem to the demand for labor, where the decisions either of employers or of unionized employed workers sustain a high unemployment rate. In contrast, we focus on the effects of the welfare state upon the *supply* of labor. It is well known that high income taxation and generous welfare benefits distort workers' labor supply decisions. However, we believe that insufficient attention has been paid to the adverse *dynamics* in response to economic shocks and increasing turbulence in the economic environment.

The oil price shocks of the 1970's and the ongoing restructuring from the manufacturing sector to the service industry have each put economic turbulence into the industrialized world. In addition, increasing internationalization of the production, distribution, and marketing of goods and services has permanently changed the economic environment. Harris (1993) attributes this globalization to changes in technologies of transport and communication, the rapid growth of part of the former Third World, and the reduction in trade and investment barriers. Increased international competition in both goods and services means that national economies are being affected by changing economic conditions in farther away places. Harris argues that this development has sped up in the last two decades and perhaps in the last decade in particular.

Our thesis is that changing economic conditions from the 1970's onward can explain the high (long-term) unemployment in the welfare states. The formal analysis is carried out in a general equilibrium search model where workers' skills depreciate during unemployment spells, and unemployment benefits are determined by workers' past earnings. Simulations of the model bring out the sensitivity of the equilibrium unemployment rate to the amounts of skills lost during unemployment. The analysis attributes the welfare states' persistently higher unemployment from the 1970's to increased turbulence in the economic environment, while explaining how lower unemployment rates in the 1950's and the 1960's were sustainable under more tranquil economic conditions.

The next section extends our earlier model (Ljungqvist and Sargent, 1995a) by introducing a stochastic technology for skill accumulation and depreciation. Section 3 describes the calibration of the model. We compare the steady state for the welfare state to the laissez-faire outcome in Section 4. We show how the the two economies have very similar performance under tranquil economic conditions, when the loss of efficiency associated with the welfare state seems minimal. However, compared to the laissez-faire economy, the welfare state is much more vulnerable to economic shocks and turbulence. Section 5 traces out the impulse-response from an unexpected transient unemployment shock. The transient shock results in a prolonged period of long-term unemployment in the welfare state, whereas the recovery is almost immediate in the laissez-faire economy.[2] Section 6 demonstrates how persistent economic turbulence leads to higher steady state unemployment in the welfare state than in the laissez-faire economy. The final section contains concluding comments.

2. The Economy

There is a continuum of workers with geometrically distributed life spans, indexed on the unit interval with births equaling deaths. An unemployed worker in period t chooses a search intensity $s_t \geq 0$ at a disutility $c(s_t)$ increasing in s_t. Search may or may not generate a wage offer in the next period. With probability $\pi(s_t)$, the unemployed worker receives one wage offer from the distribution $F(w) = \text{Prob}(w_{t+1} \leq w)$. With probability $(1 - \pi(s_t))$, the worker receives no offer in period $t+1$. We assume $\pi(s_t) \in [0,1]$, and that it is increasing in s_t. Accepting a wage offer w_{t+1} means that the worker earns that wage (per unit of skill) for each period he is alive, not laid off, and has not quit his job. There is also a disutility ϕ incurred in each period of work. The probability of being laid off at the beginning of a period is $\lambda \in (0,1)$. In addition, all workers are subjected to a probability of $\alpha \in (0,1)$ of dying between periods.

[2] Pissarides (1992) analyzes loss of skills during unemployment in a matching model, where it is also true that a transient shock to unemployment can have persistent effects. Firms are shown to create fewer jobs after the shock, since they are matching with workers of a lower average quality. Thus, this is another model of unemployment that is driven by the demand side for labor, while our paper focuses on the supply of labor in a welfare state.

Employed and unemployed workers experience stochastic accumulation or deterioration of skills. There is a finite number of skill levels with transition probabilities from skill level h to h' denoted by $\mu_u(h, h')$ and $\mu_e(h, h')$ for an unemployed and an employed worker, respectively. That is, an unemployed worker with skill level h faces a probability $\mu_u(h, h')$ that his skill level at the beginning of next period is h', contingent on not dying. Similarly, $\mu_e(h, h')$ is the probability that an employed worker with skill level h sees his skill level change to h' at the beginning of next period, contingent on not dying and not being laid off. In the event of a lay off, the transition probability is given by $\mu_l(h, h')$. After this initial period of a lay off, the stochastic skill level of the unemployed worker is again governed by the transition probability $\mu_u(h, h')$. All newborn workers begin with the lowest skill level.

A worker observes his new skill level at the beginning of a period before deciding to accept a new wage offer, choose a search intensity, or quit a job. The objective of each worker is to maximize the expected value $E_t \sum_{i=0}^{\infty} \beta^i (1-\alpha)^i y_{t+i}$, where E_t is the expectation operator conditioned on information at time t, β is the subjective discount factor, and $1-\alpha$ is the probability of surviving between two consecutive periods; y_{t+i} is the worker's after-tax income from employment and unemployment compensation at time $t+i$ net of disutility of searching and working.[3]

Workers who were laid off are entitled to unemployment compensation benefits that are a function of their last earnings. Let $b(I)$ be the unemployment compensation to an unemployed worker whose last earnings were I. Unemployment compensation is terminated if the worker turns down a job offer with earnings that are deemed to be 'suitable' by the government in view of the worker's past earnings. Let $I_g(I)$ be the government determined 'suitable earnings' of an unemployed worker whose last earnings were I. Newborn workers and workers who have quit their previous job are not entitled to unemployment compensation. Both income from employment and unemployment compensation are subject to a flat income tax of τ. The government policy functions $b(I)$ and $I_g(I)$ and the tax parameter τ

[3] Our analysis focuses on how the welfare state affects labor market incentives and efficiency in skill accumulation. We have abstracted from the benefits of risk sharing that government policies can provide when capital markets are incomplete. Adding such considerations would modify our results, but the forces at work in our analysis would remain.

must be set so that income taxes cover the expenditures on unemployment compensation in an equilibrium.

Let $V(w,h)$ be the value of the optimization problem for an employed worker with wage w and skill level h at the beginning of a period. The value associated with being unemployed and eligible for unemployment compensation benefits is given by $V_b(I,h)$, which is both a function of the unemployed worker's past earnings I and his current skill level h. In the case of an unemployed worker who is not entitled to unemployment compensation, the corresponding value is denoted by $V_o(h)$ and depends only on the worker's current skill level. The Bellman equations can then be written as follows.

$$(1)\quad V(w,h) = \max_{\text{accept,reject}}\Big\{(1-\tau)wh - \phi + (1-\alpha)\beta\Big[(1-\lambda)\sum_{h'}\mu_e(h,h')V(w,h') + \lambda\sum_{h'}\mu_l(h,h')V_b(wh,h')\Big]\,,\, V_o(h)\Big\},$$

$$(2)\quad V_b(I,h) = \max_{s}\Bigg\{-c(s) + (1-\tau)b(I) + (1-\alpha)\beta\sum_{h'}\mu_u(h,h')\Bigg[\big(1-\pi(s)\big)V_b(I,h') + \pi(s)\Bigg(\int_{w\geq I_g(I)/h'} V(w,h')dF(w) + \int_{w<I_g(I)/h'}\max_{\text{accept,reject}}\Big\{(1-\tau)wh' - \phi + (1-\alpha)\beta\Big[(1-\lambda)\sum_{h''}\mu_e(h',h'')V(w,h'') + \lambda\sum_{h''}\mu_l(h',h'')V_b(wh',h'')\Big]\,,\, V_b(I,h')\Big\}dF(w)\Bigg)\Bigg]\Bigg\},$$

$$(3)\quad V_o(h) = \max_{s}\Big\{-c(s) + (1-\alpha)\beta\sum_{h'}\mu_u(h,h')\Big[(1-\pi(s))\,V_o(h') + \pi(s)\int V(w,h')dF(w)\Big]\Big\}.$$

Associated with the solution of equations (1)–(3) are two functions, $\bar{s}_b(I,h)$ and $\bar{w}_b(I,h)$,

giving an optimal search intensity and a reservation wage of an unemployed worker with last earnings I and current skill level h, who is eligible for unemployment compensation benefits; and two functions, $\bar{s}_o(h)$ and $\bar{w}_o(h)$, giving an optimal search intensity and a reservation wage of an unemployed worker with skill level h, who is not entitled to unemployment compensation. The reservation wage of an employed worker will be the same as for an unemployed worker without benefits, $\bar{w}_o(h)$, since anyone who quits his job is not eligible for unemployment compensation.

We will study stationary equilibria, or steady states, for our economy. A steady state is defined in a standard way, as a set of government policy parameters, optimal policies $(\bar{s}_o(h), \bar{w}_o(h), \bar{s}_b(I,h), \bar{w}_b(I,h))$ and associated time invariant employment and unemployment distributions and total unemployment compensation payments that satisfy workers' optimality conditions and the government's budget constraint. We compute a steady state as a fixed point in the tax rate τ. For a fixed tax rate τ, we solve workers' optimization problem and use the implied search intensities and reservation wages to deduce stationary employment and unemployment distributions, and unemployment compensation. A balanced government budget defines a fixed point in τ, which is associated with a stationary equilibrium. After having found a stationary equilibrium, we compute various quantities such as GNP per capita, average productivity of employed, average skill level, average duration of unemployment, and measures of long-term unemployment.

3. Calibration

We set the model period to be two weeks. We set the discount factor $\beta = 0.9985$, making the annual interest rate 4.0 percent. The probabilities of dying and being laid off are $\alpha = 0.0009$, and $\lambda = 0.009$, respectively. The working life of an individual is then geometrically distributed with an expected duration of 42.7 years. Similarly, the average time before being laid off (given that the worker has not quit or died) is 4.3 years.

There are 21 different skill levels evenly partitioning the interval $[1, 3]$. All newborn workers start out with the lowest skill level equal to one. After each period of employment that is not followed by a lay off, with a probability of 0.25 the worker's skills increase by one level (0.1 units of skills), and with probability .75 they remain unchanged. Employed

workers who have reached the highest skill level retain those skills until becoming unemployed. As a point of reference, someone who starts out working with the lowest skill level will on average reach the highest skill level after three years and a month, conditional upon no job loss. The stochastic depreciation of skills during unemployment is twice as fast as the accumulation of skills. That is, after each period of unemployment, there is a probability of 0.5 that the worker's skills decrease by one level; otherwise they remain unchanged. The lowest skill level reached through depreciation is also an absorbing state until the unemployed worker gains employment. Finally, in a period of being laid off, it is assumed that the worker keeps his skill level from the last period of employment.

The disutility from searching and the function mapping search intensities into probabilities of obtaining a wage offer are assumed to be

$$c(s) = 0.5\,s\,,$$
$$\pi(s) = s^{0.3}\,, \qquad \text{where } s \in [0,1]\,.$$

The disutility from work, ϕ, is set equal to 0.2.

The exogenous wage offer distribution is assumed to be a normal distribution with a mean of 0.5 and a variance of 0.1 that has been truncated to the unit interval (and then normalized to integrate to one). Since a worker's earnings are the product of his wage and his current skill level, it follows that observed earnings fall in the interval $[0,3]$.

For purposes of awarding unemployment compensation, the government divides the earnings interval $[0,3]$ evenly into 15 earnings classes; let the upper limits of these classes be denoted W_i, for $i = 1,2,...,15$. A laid off worker with last earnings belonging to earnings class i receives an unemployment compensation of $0.7 \cdot W_i$ in each period of unemployment. However, the benefit is terminated if the worker does not accept a job offer associated with earnings greater than or equal to $0.7 \cdot W_i$. That is, a laid off worker faces both a 'replacement ratio' and 'suitable earnings' criterion equal to 70% of the upper limit of the earnings class containing his own last earnings before being laid off. Newborn workers and quitters are not entitled to unemployment compensation.

4. Economic Forces at Work

Given the calibration above, the tax rate that balances the government budget is $\tau = 0.0335$. To shed light on the workings of this welfare state (WS), we will now contrast its steady state to that of a laissez-faire economy (LF), in which there is no government intervention whatsoever.

Table 2 shows that the two economies have very similar steady states. Both their production and average skill levels are indistinguishable, and the unemployment rate is only eight tenths of a percentage point higher in the WS economy. As a welfare measure, the discounted expected net consumption stream of a newborn worker differs by less than six weeks of per capita GNP (three 2-week periods). We conclude that the efficiency costs associated with the welfare system are relatively small. However, behind these numbers lurk important differences in unemployment dynamics. It is true that the average unemployment spell is very similar across the two economies: 11.6 weeks in the WS economy as compared to 9.4 weeks in the LF economy. But the WS economy has considerably more dispersion in the duration of unemployment spells, as indicated by the fractions of long-term unemployed at any point in time. The percentage of currently unemployed workers with spells to date greater than or equal to 6 months (12 months) is 14.0 % (5.1 %) in the WS economy as compared to 4.7 % (0.3 %) in the LF economy.

Let us now explore the similarities and differences between the WS economy and the LF economy by first looking at unemployed workers' behavior in terms of reservation wages and search intensities. The reservation wages in the WS economy of unemployed workers receiving unemployment benefits are depicted in Figure 2. The reservation wages are graphed as a function of the unemployed workers' current skills and their last earnings before being laid off. Not surprisingly, the reservation wage is a positive function of last earnings, which determine the level of unemployment compensation. For example, the reservation wage of someone with the lowest skill level of one, but with the highest possible last earnings, is 0.95. This is an example of a worker who once had attained a high skill level while making a wage at the top of the wage distribution. If such a worker with a high unemployment benefit happens to lose all his skills due to a prolonged period of unemployment, he will be extremely picky in terms of the wage offers he will accept. For

Table 2: Steady state values for the WS economy and the LF economy.

	WS	LF
GNP per capita†	2.352	2.373
Average productivity of employed†	2.532	2.533
Average wage of employed	0.882	0.878
Average skill level in the population	2.839	2.864
Unemployment rate	7.11 %	6.33 %
Average duration of unemployment	11.6 weeks	9.4 weeks
Percentage of unemployed at a point in time with spells so far $\geq$ 6 months	14.0 %	4.7 %
Percentage of unemployed at a point in time with spells so far $\geq$ 12 months	5.1 %	0.3 %
Discounted expected net consumption of a newborn worker‡	837.6	844.4

† GNP and average productivity are computed for the 2-week period.

‡ The discounted stream of consumption is net of disutility of searching and working.

the same reason, this worker will also be unwilling to expend too much energy in searching for a new job. As can be seen in Figure 3, the optimal search intensity of such a worker is a mere 0.04.

Figure 3 shows also how the search intensity is lower for unemployed workers with benefits and high current skills that have not yet deteriorated due to unemployment. These workers feel constrained by the government stipulated 'suitable earnings'. In fact, they choose their reservation wages in Figure 2 mostly to avoid violating the rules that qualify them for unemployment compensation. For them, it is not worth losing a generous unemployment benefit in order to search for a better wage at one's own expense. Since the potential benefits of job search are thereby reduced, these unemployed workers respond by reducing their search intensity and so lowering the utility cost of searching.

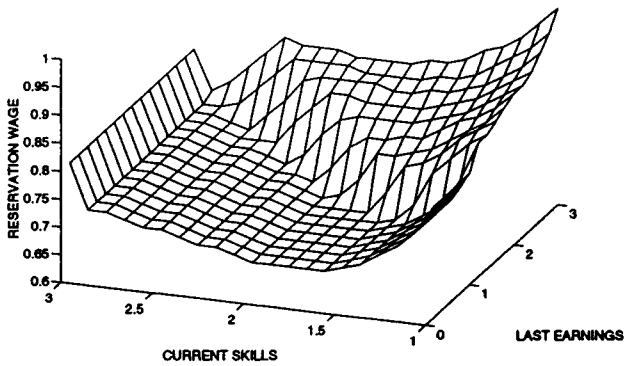

Figure 2. Reservation wages in the WS economy of unemployed workers with unemployment compensation. The reservation wages are drawn as a function of the unemployed workers' current skills and their last earnings before being laid off.

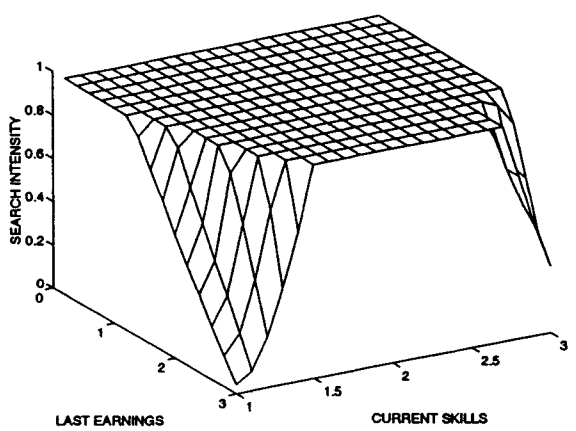

Figure 3. Search intensities in the WS economy of unemployed workers with unemployment compensation. The search intensities are drawn as a function of the unemployed's current skills and their last earnings before being laid off.

Unemployed workers without benefits in the WS economy and the unemployed in the LF economy prefer to choose the maximum search intensity of one. Their reservation wages can be found in Figure 4. Contrasting Figure 4 to Figure 2 for the WS economy, the

reservation wage of an unemployed worker without benefits is always less than or equal to the reservation wage of an unemployed worker with benefits, for any given skill level. Unemployment spells are of course more costly to the unemployed without unemployment compensation. Across the WS and the LF economies, there is a slight tendency for higher reservation wages in the WS economy. An unemployed worker without benefits in the WS economy takes into account the future potential benefits from the unemployment compensation program. It is important for the worker to be vested at a high wage rate in the event of being laid off. The U-shaped pattern for reservations wages in Figure 4 emerges from the depreciation and accumulation of skills. On the one hand, at the lower end of the skill spectrum, unemployed workers have less to lose in terms of skills from an extended period of unemployment. They therefore tend to choose higher reservation wages as compared to unemployed workers with skills in the intermediate range. On the other hand, at the upper end of the skill spectrum, the potential for further skill accumulation becomes smaller and the emphasis shifts towards the search for higher wages, i.e., the reservation wage curve starts to slope upward.

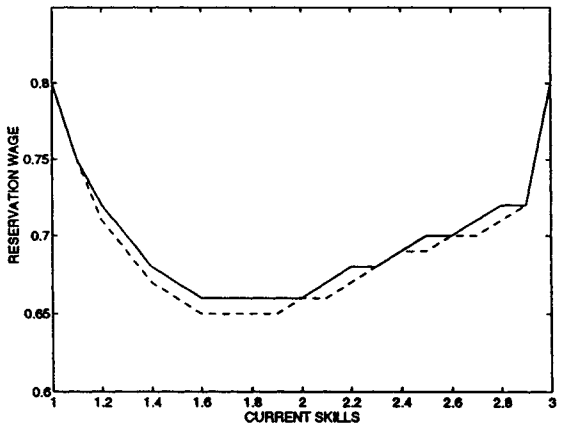

Figure 4. Reservation wages of unemployed workers without benefits drawn as a function of their current skills. The solid line describes the WS economy and the dashed line refers to the LF economy.

As pointed out earlier in Table 2, the different reservation wage and search intensity policies in the WS and the LF economy have only a minor impact on the steady state outcomes. But there remains an important difference in the underlying dynamics for unemployment. Let us take a look at Figures 5.a and 5.b, which depict the distributions of unemployment over the unemployed workers' current skills and last earnings. These figures share two prominent features. First, there is a peak of unemployment at the lowest skill level and the lowest earnings class. This peak is solely composed of newborn workers who have not yet found a first job. (There cannot be any laid off workers in this category since the smallest reservation wage would generate earnings at all skill levels which are in excess of this earnings class.) Second, both figures display a downward sloping hill at the higher earnings.

To a large degree, the downward sloping hills in Figures 5.a and 5.b reflect a flow of workers who become unemployed at the highest skill level and work themselves through the distribution. For every period that a worker remains unemployed, there is a risk of losing skills. That is, unemployed workers are over time sliding down the hill in the skill dimension. But we also see how the height of the hill drops when moving towards lower skill levels, which tells us that more and more of the unemployed workers have found and accepted new jobs. Less noticeable to the naked eye is that the hill shrinks faster for the LF economy as compared to WS economy. This accounts for the fact that unemployment has virtually vanished in the LF economy when we reach the lowest skill level (at the upper end of last earnings), while some unemployment still survives at this end point in the WS economy. As we have seen above, the generous unemployment compensation in the WS economy has the effect of decreasing search intensities and increasing reservation wages.

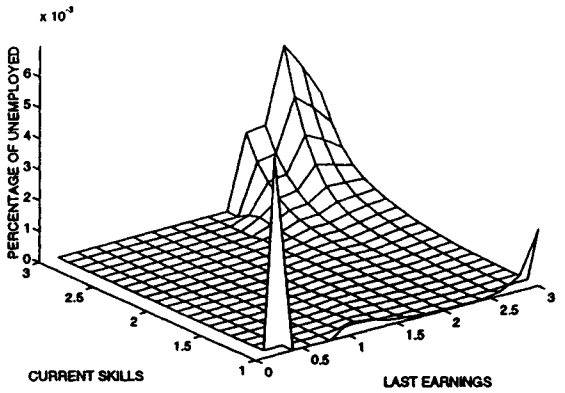

Figure 5.a. How unemployment in the WS economy is distributed over the unemployed workers' current skills and last earnings.

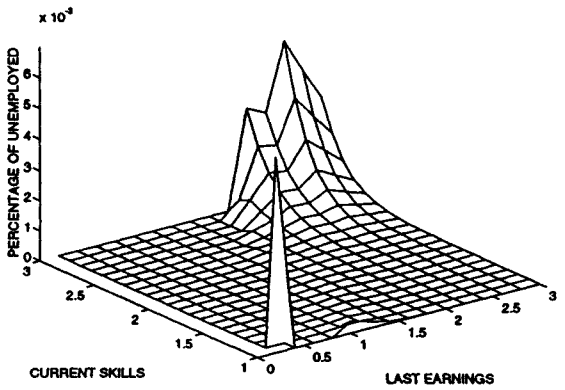

Figure 5.b. How unemployment in the LF economy is distributed over the unemployed workers' current skills and last earnings.

The effects of different search behavior in the LF economy and the WS economy are illustrated in Figure 6. The figure follows a cohort of workers who lost their jobs after having reached the highest skill level. At different lengths of the unemployment spell, the curves show the fraction of still unemployed workers who gain employment in the current 2-week period ('hazard rate'). The dashed curve pertains to the LF economy without any

unemployment compensation benefits. Since all unemployed workers in the LF economy choose the highest search intensity, the shape of the curve is solely determined by how reservation wages vary with skill levels. Recall from Figure 4 that reservation wages must initially be decreasing when skills start depreciating from the maximum level. That is, over time, unemployed workers become more and more concerned about additional losses of skills. Their willingness successively to reduce their reservation wages explains the rising hazard of gaining employment during the first year of unemployment. After a year, the remaining unemployed have lost enough of their skills that further losses are less of a concern to them. Their increasing reservation wage policy in Figure 4 translates into a falling hazard of gaining employment in Figure 6. The hazard of gaining employment in any given 2-week period levels out at 13.8 % in the LF economy.

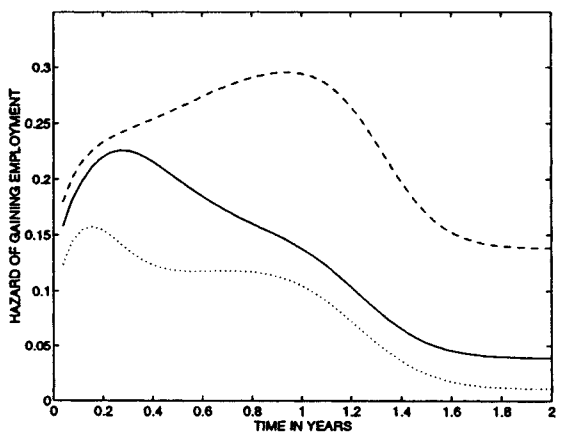

Figure 6. The hazard of gaining employment as a function of the length of the unemployment spell, given an initial skill level equal to the highest one. The curves show the fraction of still unemployed workers who gain employment in any given 2-week period after the lay off. The dashed line pertains to the LF economy; the solid and dotted lines refer to the WS economy with the workers' last earnings belonging to the third highest earnings class and the highest earnings class, respectively.

The solid line in Figure 6 traces the corresponding hazard of gaining employment for a cohort of workers who become unemployed at the highest skill level in the WS economy with their last earnings in the third highest earnings class. This group of workers is

the most numerous one in a steady state, comprising roughly one third of all employed workers. Over the first four months, the hazard of gaining employment is quite similar to that in the LF economy, but thereafter diverges considerably. A long-term unemployed worker in the WS economy becomes disillusioned, and his prospect of finding a job seems less attractive over time as compared just to living on his unemployment compensation benefits. As a result, the worker is both raising his reservation wage and reducing his search intensity, as earlier shown in Figures 2 and 3. The hazard of gaining employment finally settles down to 3.9 %, which is much smaller than the 13.8 % in the LF economy. The third dotted line in Figure 6 shows the hazard of gaining employment if the cohort of laid off workers had last earnings in the highest earnings class. With these even more generous unemployment benefits, the hazard function is naturally lower, and it converges to a low of 1.1 %. Fortunately, these potential incentive problems have only a small impact on the steady state of the WS economy, as earlier shown in Table 2. Loosely speaking, the incentive problems are minor thanks to the relatively low average duration of unemployment.

We now turn to the equilibrium distributions of wages and earnings in the two economies. Figure 7 contains the distributions of employed workers' earnings in the WS and the LF economy. They closely mimic the distributions for wages in Figure 8. Recall that a worker's earnings are the product of his wage and his current skill level. In an equilibrium, most workers are at the highest skill level, so the earnings distribution is practically equal to the wage distribution multiplied by the highest skill level, which is equal to three.[4] The tails at the lower ends of both the earnings distribution and the wage distribution consist of workers who are in the process of accumulating skills. They have not yet reached their full earnings and, while accumulating skills, are willing to accept temporarily lower wages. Except for this tail, the wage distribution for the LF economy reflects the fact that workers are drawing wages from a truncated normal distribution. What we see is the right-hand tail of that distribution above the workers' reservation wage. The observed wage distribution in the WS economy is slightly different in this dimension. The explanation for the

[4] Workers with the highest skill level constitute 79.6 % of all employed in the WS economy and 80.7 % in the LF economy. (The LF economy has less skill depreciation because of shorter unemployment spells.)

slight shift of mass towards higher wages in the WS economy is that the employed workers have different histories of covered unemployment spells. As we know, laid off workers with higher earnings become choosier and pick higher reservation wages. This tends to skew the wage distribution in the WS economy towards higher outcomes.

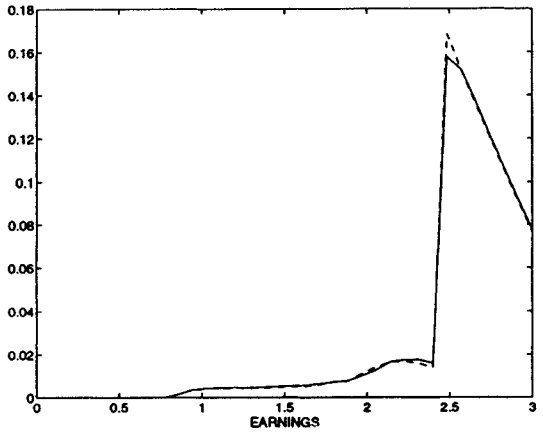

Figure 7. Distribution of workers' earnings. The solid line describes the WS economy and the dashed line refers to the LF economy. (Earnings are wages multiplied by skills.)

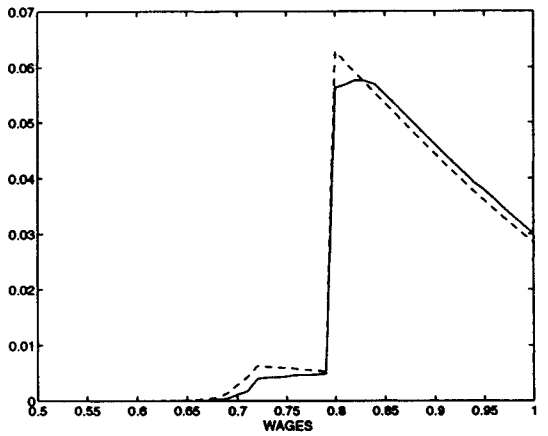

Figure 8. Distribution of workers' wages. The solid line describes the WS economy and the dashed line refers to the LF economy.

5. A Transient Economic Shock

The unemployment dynamics described in the previous section make the WS economy more vulnerable to economic shocks. This section demonstrates how a transient shock can cause a prolonged period of long-term unemployment in the WS economy while the LF economy is more resilient. Specifically, we will trace out both economies' responses to an unexpected transient unemployment shock. We assume that once and for all, the normal lay off rate of 0.009 rises 20-fold to 0.18 in a single 2-week period at time 0 in the following figures. Also, everyone who becomes unemployed in this particular period immediately loses 75 % of his accumulated skills. After this one-period shock, both economies once again experience the normal lay off rate and rates of skill depreciation and accumulation. All policy parameters such as taxes and the unemployment compensation program are kept constant throughout the experiment, which means that the workers' decision rules

stay the same over time, and that the economies will eventually return to their steady states.[5]

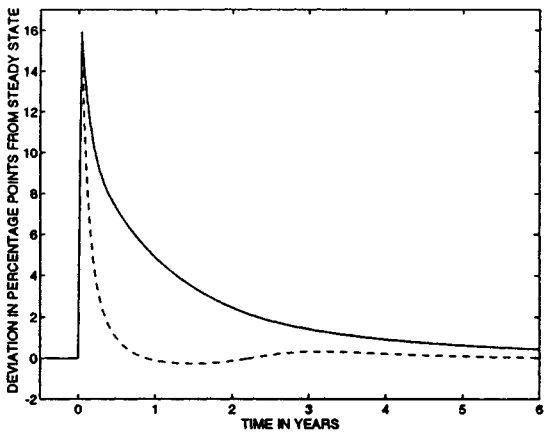

Figure 9. Response in unemployment. The solid line describes the WS economy and the dashed line refers to the LF economy.

As can be seen in Figure 9, the unemployment rates in both economies jump up initially by roughly 16 percentage points. However, the unemployment rates take very different paths thereafter. In the LF economy, the high unemployment rate dies out pretty quickly when the unemployed workers 'bite the bullet' and search intensively for less well-paying jobs as compared to their lost earnings.[6] In contrast, the WS economy is plagued by a prolonged period of unemployment since the unemployed workers with their depreciated skills have difficulty finding jobs that dominate their unemployment compensation based on past earnings. Besides their higher reservation wages, these workers also reduce search intensities to balance the small prospective gains from search against the utility costs associated with search.

[5] Let us assume that the extra government expenditures on unemployment compensation in WS economy are financed by levying lump-sum taxes.

[6] Readers might be curious about the oscillation in the unemployment response in the LF economy. This outcome is due to the U-shaped reservation wage policy in Figure 4. Workers who suddenly find themselves unemployed in the intermediate skill range are accepting low wages with the intention to quit after having accumulated some skills. Thus, unemployment in the second year falls below the steady state rate, and rises thereafter once again above the level of unemployment in the steady state before settling down.

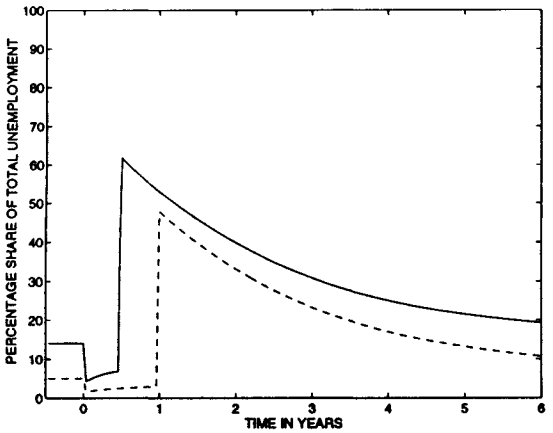

Figure 10.a. Response in the decomposition of the unemployed in the WS economy with respect to the length of their unemployment spells so far. The percentage of unemployed workers with at least 6 months (12 months) of unemployment to date is below the solid line (dashed line). The percentage above the solid line is then unemployed workers who have until now been unemployed for less than 6 months.

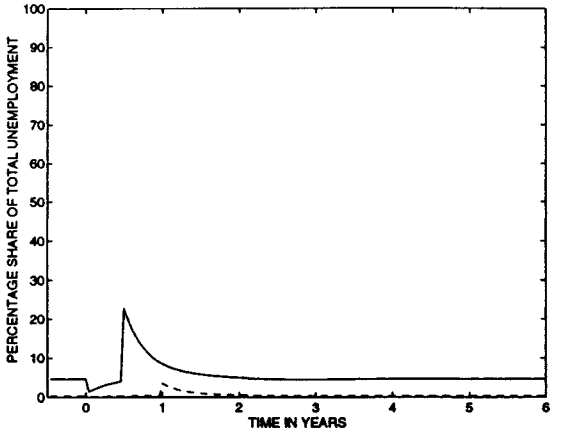

Figure 10.b. Response in the decomposition of the unemployed in the LF economy with respect to the length of their unemployment spells so far. The percentage of unemployed workers with at least 6 months (12 months) of unemployment to date is below the solid line (dashed line). The percentage above the solid line is then unemployed workers who have until now been unemployed for less than 6 months.

The drawn out unemployment response in the WS economy is naturally associated with longer unemployment spells. Figures 10.a and 10.b show how long-term unemployment gradually emerges after the shock. At any point in time, the figures decompose unemployment into the fraction of unemployed workers who have to date been unemployed for at least one year (below the dashed line), those who have so far suffered unemployment of less than a year but at least 6 months (between the solid line and the dashed line), and those who have until now been unemployed for less than 6 months (above the solid line). Not surprisingly, both of the first two measures of unemployed fall at the time of the shock, since there is a flood of newly laid off workers into unemployment. The two measures then rise predictably after 6 months and 12 months, respectively. The problem of long-term unemployment in the WS economy shows up starkly in Figure 10.a. At the peaks of the two long-term unemployment measures, there is first a fraction of 61.8 % of all unemployed workers being unemployed for at least half a year, and later 47.8 % of all unemployed have to date experienced unemployment for a year or more. In contrast, the corresponding numbers for the LF economy in Figure 10.b are 22.9 % and 3.5 %, respectively. Besides the lower incidence of long-term unemployment, the LF economy shows

hardly any persistence in the fractions of long-term unemployed as compared to the WS economy.

The exogenous jump in the lay off rate and the accompanying depreciation of workers' skills affect the economies' GNP adversely. Figure 11 shows a sharp drop of around 17 % in GNP. The faster recovery in the LF economy as compared to the WS economy is due to the fact that its labor force is returning to work more quickly. Besides a more sluggish GNP, the resulting long-term unemployment in the WS economy has a negative impact on the economy's stock of human capital. Figure 12 shows how the average skill level of all workers continues to decline in the WS economy after the initial shock, and how rebuilding takes much more time as compared to the LF economy.

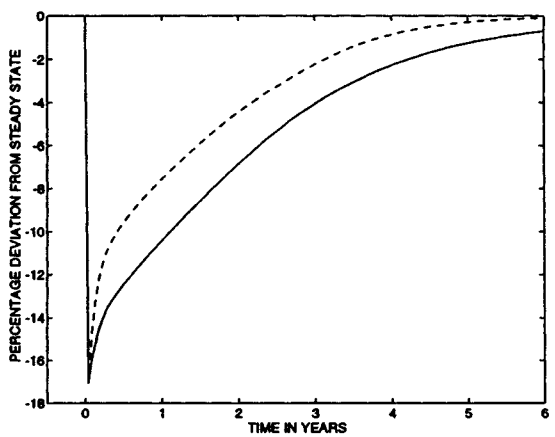

Figure 11. Response in GNP. The solid line describes the WS economy and the dashed line refers to the LF economy.

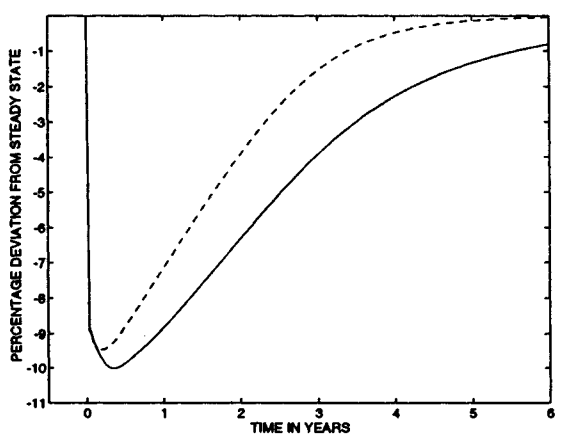

Figure 12. Response in average skill level of all agents. The solid line describes the WS economy and the dashed line refers to the LF economy.

A conceivably misleading measurement of the economies' performances is the change in average productivity of employed workers. According to Figure 13, the average productivity in the WS economy suffers a drop by at most 5.4 % while the drop is faster and deeper in the LF economy, with a largest decline of 8.6 %. The explanation for this difference is that laid off workers with depreciated skills return to employment much faster in the LF economy, while they are slowly phased in to the WS economy. The long-term unemployment in the WS economy is in this way concealing the severity of the exogenous

shock to workers' skills. Finally, the budgetary impact of the shock on the WS government is displayed in Figure 14. The deficit reaches a high of 12.6 % as a share of steady state GNP, and is persistent due to the economy's unemployment problems.

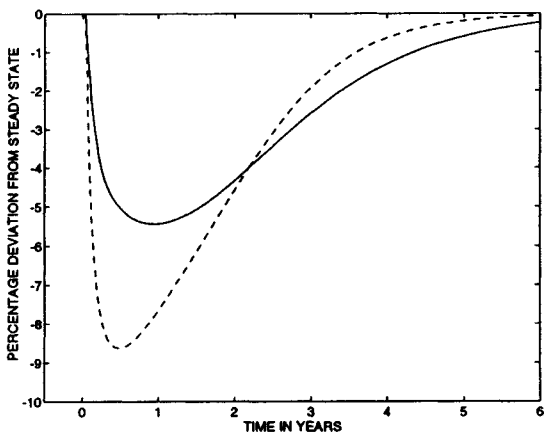

Figure 13. Response in average productivity of employed. The solid line describes the WS economy and the dashed line refers to the LF economy.

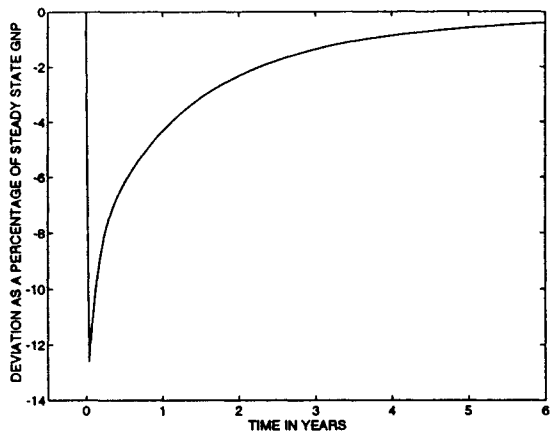

Figure 14. Response in government finances in the WS economy.

6. Persistent Economic Turbulence

The previous section indicated that the welfare state is prone to experience enduring periods of long-term unemployment after transient economic shocks. This section demonstrates how persistent economic turbulence increases the unemployment rate in welfare states. Specifically, we compute and compare the steady states for different economic environments with more or less economic turbulence. Economic turbulence is defined as the variance in skill losses associated with lay offs. We now let the skills of a newly laid off worker be distributed according to the left half of a normal distribution with the range starting at the lowest possible skill level and ending at the worker's skill level before the lay off. During the unemployment spell itself and at times of continuing employment, skill depreciation and accumulation are governed by the same transition probabilities as before.

With this definition of economic turbulence, the earlier steady state serves as a benchmark case with zero variance. Recall that our earlier assumption was that a newly laid off worker kept his skill level from last period of employment. Let us now consider three

alternative environments with different probability distributions for skills of newly laid off workers, as depicted in Figure 15. The graph is drawn for a worker who had attained the highest skill level of 3 before being laid off. The same distributions apply to a worker with another skill level so long as we rescale the range so that it ends at that particular worker's skill level before the lay off. The exact distributions in Figure 15 are obtained by taking the left side of a normal distribution that is confined to and centered on the unit interval. The solid, dotted, and dashed lines correspond to variances of .010, .015, and .0175, respectively. The left halves of these distributions are then normalized to integrate to one. Finally, since there are only a discrete number of skill levels in the model, the distributions in Figure 15 are transformed into step functions for each kind of laid off workers.

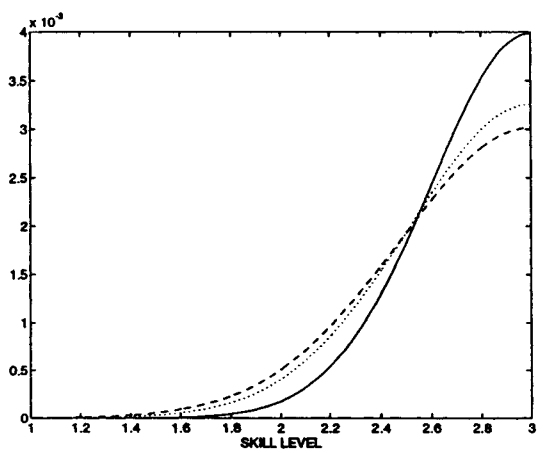

Figure 15. The probability distribution of a worker's skills immediately after a lay off. The range starts at the lowest skill level of 1 and ends at the worker's skill level before the lay off. (The current graph is drawn for a worker who had attained the highest skill level of 3 before the lay off.) The solid line, dotted line, and dashed line refer to different degrees of economic turbulence indexed by a variance of .010, .015, and .0175, respectively.

Table 3 reports the steady states for the WS economy and the LF economy when assuming alternative degrees of economic turbulence. The unemployment response to increased economic turbulence is strikingly different in the two economies. The steady states in the LF economy are associated with a slightly lower unemployment rate when

economic turbulence increases, i.e., when the variance of skill losses for laid off worker increases. The primary explanation for this is that the greater loss of skills among laid off workers, who have typically accumulated the highest level of skills before the lay off, causes more unemployed workers to end up in the middle skill range where reservation wages are the lowest as indicated in Figure 4. In contrast, the unemployment rate in the WS economy rises sharply in response to increased economic turbulence. The explanation for this is two-fold. First, larger numbers of unemployed workers find themselves with considerable losses of skills while being entitled to generous unemployment compensation benefits. That is, the incentive problems identified earlier by Figure 6 now affect a larger group of unemployed. Second, the larger uncertainties associated with skill accumulation and increased taxes make it even less attractive for an unemployed worker to look for and accept a job, especially if he is currently receiving generous unemployment compensation. As a result, these unemployed workers choose to lower their search intensities and raise their reservation wages. This exacerbates the economy's unemployment problem.

Table 3 shows also that a higher WS unemployment rate in a more turbulent economic environment is accompanied by considerably longer average unemployment spells. In the most turbulent environment, the average duration of unemployment is 24.7 weeks, which is more than twice as long as the 11.6 weeks in the benchmark case without any turbulence. Moreover, the fractions of long-term unemployed explode in the WS economy. The percentage of currently unemployed workers with spells to date of six months or more rises from 14.0 % in the WS economy without turbulence to 55.2 % in the WS economy with most economic turbulence. Concerning the percentage of unemployed workers with spells to date of one year or more, the corresponding increase for the WS economy is from 5.1 % to 46.1 %. In contrast, the small numbers of long-term unemployed in the LF economy stay virtually unchanged in response to increased economic turbulence.

Since economic turbulence is modelled in the form of risk of more skill losses at a moment of lay off, it follows that a higher degree of turbulence must be associated with welfare reductions. The LF economy in Table 3 posts a 3.5 % reduction in the discounted expected net consumption of a newborn worker when moving from an environment with no turbulence to the highest degree of turbulence. The corresponding relative welfare loss

Table 3: Steady state values for the WS economy and the LF economy with different degrees of economic turbulence.

		Degree of economic turbulence†			
		0	**.01**	**.015**	**.0175**
Tax rate (%)	WS	3.35	5.09	6.67	9.08
Average productivity of employed‡	WS	2.532	2.478	2.462	2.453
	LF	2.533	2.471	2.450	2.440
Unemployment rate (%)	WS	7.11	8.24	9.93	12.53
	LF	6.33	6.09	6.04	6.02
Average duration of unemployment	WS	11.6	15.0	18.8	24.7
(weeks)	LF	9.4	8.7	8.7	8.7
Percentage of unemployed at a point in	WS	14.0	29.8	42.2	55.2
time with spells so far $\geq$ 6 months	LF	4.7	4.6	4.7	4.8
Percentage of unemployed at a point in	WS	5.1	18.4	31.3	46.1
time with spells so far $\geq$ 12 months	LF	0.3	0.4	0.4	0.4
Discounted expected net consumption	WS	837.6	807.0	786.5	761.4
of a newborn worker§	LF	844.4	825.2	818.3	815.1

† The degree of economic turbulence is indexed by the variance used to compute the distribution of skill losses at lay offs.

‡ Average productivity is computed for the 2-week period.

§ The discounted stream of consumption is net of disutility of searching and working.

in the WS economy is significantly larger at 9.1 %, due to its malfunctioning labor market with excessive unemployment. Despite the dismal performance of the WS economy, the average productivity of employed is comparable to the LF economy for different degrees of turbulence. The good productivity record in the WS economy actually reflects the low job finding rate among long-term unemployed workers with depreciated skills.

Finally, when trying to solve for a WS steady state with a variance of .018, a vicious cycle develops on the computer. Exploding government expenditures on unemployment compensation chase an exploding unemployment rate without finding a feasible steady state with government budget balance. This breakdown of the computations mirrors a potential instability of a generous welfare state. The feasibility of the system depends critically upon the number of workers that has virtually withdrawn from active labor market participation because of disincentives. The size of this group can increase dramatically in response to a more turbulent economic environment. As a consequence, a welfare regime that was earlier sustainable under more tranquil economic conditions can suddenly become infeasible, and lead to a mounting budget deficit.

7. Concluding Discussion

High unemployment rates in the European welfare states have been attributed to many causes such as insiders versus outsiders, adjustment costs in firing and hiring, lack of wage flexibility, shortage of physical capital, mismatch in labor markets, and insufficient demand.[7] Explanations based on workers' distorted incentives in the face of generous entitlement programs have been rare in this context. A reason for this might be that empirical work has had difficulties in establishing causal relationships between changes in welfare programs and the unemployment rate. Specifically, the persistent increase in European unemployment since the 1970's does not seem to have been preceded by any major welfare reform. Instead, the generosity of welfare programs has been increasing steadily over a

[7] For a discussion of several of these potential explanations to the European unemployment problem, see Blanchard et al. (1986). They argue that many of these factors share responsibility for the current dilemma, but on balance it is their "opinion that a sharp decrease in aggregate demand is indeed the proximate cause of the rise in unemployment in the EC [European Communities] since 1980."

long period of time without any discrete jump at the time when the unemployment rate rose.

Our analysis suggests that the smooth performance of the welfare states in the 1950's and 1960's concealed an inherent instability in these economies. In our model, a welfare state with a very generous entitlement program is a virtual "time bomb" waiting to explode. So long as the economy is not subject to any major economic shocks, the welfare state can function well. Workers who get laid off with generous unemployment compensation can without too much trouble get back into employment at working conditions similar to their previous jobs. That is, the availability of 'good jobs' for unemployed workers counteracts the adverse effects of generous unemployment compensation. However, at the time of a large shock, generous unemployment compensation hinders the process of restructuring the economy. Laid off workers then lack the incentives to accept the transition to new jobs where skills will once again have to be accumulated. Consequently, there can be a lengthy transition phase with long-term unemployment largely attributable to the existence of welfare programs. This causality is hard to detect from time series data because there need not have been any changes in the welfare programs at the time of the shock.

In the last two decades, the rapid restructuring from manufacturing to the service industry and the increasing international competition in both goods and services seem to have been major sources of economic turbulence. In the case of internationalization, national economies have found themselves forced to respond to changing economic conditions in distant places. There seems to be no signs of slowing down in the pace of this development. Instead, ongoing market liberalizations in countries such as China, India and the former centrally planned economies in Eastern Europe are accentuating the need for national economies to be flexible and responsive to changing international competition. It follows that the welfare states of today would benefit from restructuring. In designing social safety nets, it is more important than ever to incorporate incentives to work. Failure to do so threatens to produce high and long-term unemployment, and needlessly to waste human capital.

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