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Should Unemployment Benefits
Decrease with Unemployment Spell ?
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Abstract

In this paper, we investigate whether unemployment benefits should decrease with the unemployment spell in a model where both job search intensity and wages are endogenous. Wages are set by collective agreements bargained by insiders. It is shown that a more declining time sequence of unemployment benefits leads to wage increases when the tax rate is given. Such an effect may imply an increase in unemployment and counteracts the response of job search intensity that can be found in standard job search models with a given wage distribution. Calibration exercises suggest that it costs twice more in terms of welfare loss for the long-term unemployed workers to reduce the unemployment rate of one percent when wages are endogenous than in the standard job search model.

Résumé

Nous étudions les conséquences de la décroissance des allocations chômage avec la durée du chômage dans un modèle où l'intensité de recherche d'emploi et les salaires sont endogènes. Les salaires sont déterminées par des négociations collectives dominées par des *insiders*. Nous montrons que la décroissance des allocations chômage exerce une pression à la hausse sur les salaires lorsque le taux de prélèvement nécessaire à financer les allocations est donné. Un tel effet, qui accroît le chômage, joue à l'encontre du mécanisme habituellement rencontré dans les modèles de recherche d'emploi, selon lequel la décroissance des allocations chômage intensifie l'effort de recherche des chômeurs et est, de ce fait, favorable à l'emploi. La calibration du modèle sur des données représentatives d'une économie "européenne" suggère que l'ajustement des salaires diminue significativement l'efficacité des mesures consistant à accentuer la décroissance des allocations chômage pour lutter contre le chômage.

Key Words: Unemployment, Unemployment benefits, Matching models, Job search.

Mots clés: Chômage, allocation chômage, recherche d'emploi, appariement.

Classification JEL: H29, J23, J38, J41, J64

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1 Introduction¹

In most countries, unemployment benefits decrease with the unemployment spell. Generally, this characteristic of unemployment compensation schemes stems from the coexistence of unemployment insurance, that pays relatively high benefits at the beginning of the unemployment spell for a limited duration, and unemployment assistance, that gives a relatively low compensation to those unemployed agents who are no more eligible for unemployment insurance. Sometimes, even unemployment insurance pays a declining unemployment compensation over time, as it has been the case in France, since 1993 (for a recent survey, see: OECD, 1996, chapter 2).

It is generally believed that a declining time sequence of unemployment compensation is desirable. For instance, Alogoskoufis *et alii* (1995, p. 106) claim that “European unemployment insurance schemes are badly structured, in that they give insufficient incentives to take work, by paying a flat rate of unemployment benefit for a long time (or in some cases indefinitely). Offering a lump-sum payment on job loss, rather than making what is effectively a duration-contingent payment as at present, would improve job-taking incentives. In practice, the way to do this would be to reduce the amount of benefits with the duration of the unemployment spell, or simply make them payable for a finite period of, say, six mouths”. Such a claim rests on the idea, put forward by Shavell and Weiss (1979), that the optimal scheme should be declining over time if it is costly to monitor job search. In that case, a declining scheme is a means to shorten the duration of unemployment, because it urges the unemployed to look for a job.

A series of papers, initiated by the seminal contribution of Shavell and Weiss, analyses the consequence of the time sequence of unemployment benefits in job search models with moral hazard. Shavell and Weiss (1979) and Hopenhayn and Nicolini (1997) consider a dynamic principal-agent model where the principal, *i.e.* the government, maximizes the welfare of an unemployed individual, subject to a budget constraint. The government cannot observe the worker’s search effort. In both papers, the optimal compensation scheme decreases monotonically with the unemployment spell. Wang and Williamson (1996) provide a calibrated dynamic model with moral hazard associated with search effort and job retention effort, in order to define the optimal unemployment compensation scheme for the U.S. In this framework, the optimal unemployment insurance scheme maximizes the steady state aggregate consumption minus output (the costs of the steady state allocation)

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subject to the constraint that each new labor-force entrant obtains at least a given level of expected utility. Wang and Williamson show that the optimal replacement ratio should decline with the unemployment spell if one only takes into account the moral hazard associated with search effort. The study of Wang and Williamson suggests that the actual system currently in place in the U.S. is far from being optimal, since an optimal system would reduce the steady state unemployment rate by 3.40 and increase output by 3.64%, according to their computations.

In a quite similar framework, Hopenhayn and Nicolini (1997) compute the cost of an optimal unemployment benefits system compared to the actual American one. They conclude that the optimal system is financed by a tax that increases with the last unemployment duration and proposes a slightly decreasing profile of unemployment benefits. The optimal digressiveness is decreasing, but less than with the one in the case of a flat tax rate.

Moral hazard associated with search effort is not the only justification for declining unemployment benefits. Cremer, Marchand and Pestieau (1996) consider that the government cannot observe the quality of jobs. Hence, in their paper, an adverse selection problem comes in addition to the standard moral hazard problem. It arises from the inability to distinguish between two types of unemployed: Those who wait for a job offer which fits their specific preferences or capacity, and those whose productivity in informal work is so high that they will refuse any offer. Cremer, Marchand and Pestieau show that the optimal unemployment insurance system should also pay decreasing benefits in their framework.

Wright (1986) argues that moral hazard is not a necessary argument in favor of a declining schedule of unemployment benefits. His model is very simple, with neither moral hazard nor monitoring problems, the probabilities of transition being exogenous. Wright looks at the schedule which maximizes the welfare of an employed worker, this individual being the “median voter” when the unemployment rate is smaller than 0.5. Declining time sequence is good for employed worker since “the benefits of insurance accrue to an employed worker only in the future, while the cost of financing the current unemployed out of his wages must be paid immediately” (Wright 1986, p. 393).

It is worth stressing that models with job search and moral hazard consider the wages distribution as exogenous and assume a functional form to define the probability to exit from unemployment. This is consistent with a focus on the supply side of the labor market. Nevertheless, it is well known that the level of unemployment benefits influences wages, labor cost and labor demand. Accordingly, the consequences of the unemployment benefit system need to be studied in

a general equilibrium framework with endogenous wages. Some contributions have addressed the issue of the consequences of the time profile of unemployment benefits in a general equilibrium set up with endogenous wages. Cahuc and Lehmann (1997) and Hansen and Jacobsen (1998) investigate this issue with a model that ignores job search but allows for endogenous wage determination through wage bargaining. Cahuc and Lehmann find that a constant time sequence yields lower unemployment than a declining time profile when the tax rate is given, because a declining schedule increases the welfare of the short-term unemployed, which improves the welfare of insiders in case of contract breach, and accordingly raises the wage pressure. Moreover, they argue that a flat sequence satisfies Rawls (1971) justice criterion, which requires the maximization of the welfare of the individuals in the most disadvantageous position. The idea that a program with a flat sequence of unemployment benefits is desirable has been challenged by Fredriksson and Holmlund (1998) in a search and matching model with both endogenous wage and search effort. Their key result is that a socially optimal unemployment insurance policy implies a decreasing profile of unemployment benefits over the spell of unemployment. By socially optimal, Fredriksson and Holmlund mean a system that maximizes an utilitarian welfare function.

The aim of our paper is twofold. First, we want to clarify the unemployment and welfare effects of the time sequence of unemployment benefits in a unified framework. Second, we want to give some quantitative evaluations of these effects. From this point of view, this paper is closely related to Fredriksson and Holmlund, but with a focus on some different points. In particular, for the sake of operationalism, we avoid using only an utilitarian social welfare function. Indeed, the problems implied by the aggregation of preferences in a model with heterogeneous individuals (workers are risk-averse and entrepreneurs risk-neutral in Fredriksson and Holmlund model) lead us to believe that it is more informative to look at the consequences on the welfare of each type of individual. In this perspective, we think that Rawls justice criterion is very useful, since it allows for paying a special attention to the individuals in the less advantageous position, who are among those who are the most concerned by changes in the unemployment benefits programs. Accordingly, it seems to us that a very operational approach consists in evaluating the consequences of the time sequence of unemployment benefits on the Rawls criterion and on the unemployment rate. This allows us to compare the welfare loss of long term unemployed workers with the decrease in unemployment induced by a more declining time sequence of unemployment benefits. Using such a criterion, calibration exercises suggest that the response of wage strongly reduces the efficiency of an increase in the digressiveness of unemployment benefits. Therefore, the advantage of a declining time

sequence of unemployment benefits becomes much more questionable than in a standard search model with an exogenous wage distribution.

The paper is organized as follows. The model is presented in section 2. Section 3 is devoted to the analysis of a situation where job search effort is endogenous and the wage is exogenous. In such a situation, one gets the standard results obtained in the job-search literature, that a more declining unemployment benefits profile is conducive to lower unemployment. Section 4 is focused on the opposite case where the wage is endogenous and the search effort is considered as given. In that case, it is shown that a more declining time profile of unemployment benefits has an ambiguous impact on the unemployment rate. A quantitative analysis of the situation where both the wage and the search effort are endogenous is presented in section 5. Concluding comments are provided in section 6.

2 The model

We consider a discrete time search and matching model *à la* Pissarides (1990, chapter 4). There are two goods: Labor and a numéraire non-storable good produced thanks to labor. There is an exogenous continuum of infinite lived workers, which size is normalized to unity. Workers have perfect foresights but have no access to financial markets and cannot save since the good that is produced is assumed to be non-storable. At any time, a worker may be in one of the three following situations: Either employed, or short-term unemployed, or long-term unemployed. By definition, a long-term unemployed worker has an unemployment spell longer than one period. An employed workers is paid a wage denoted by w . A short-term unemployed worker gets an unemployment benefit z_s , whereas a long-term unemployed worker gets z_ℓ . We also define short-term and long-term replacement ratios ρ_i as z_i/w , $i \in \{s, \ell\}$.

There is also a representative competitive firm with constant returns to scale. It is composed by filled and vacant jobs. Each filled job produces one unit of the numéraire good per period and can become unproductive with an exogenous probability q at the end of every period. Every vacant job costs c per period and becomes filled with probability an endogenous probability $m(\theta)$.

The mass of matches between unemployed workers and vacant jobs is determined by the matching function $M(v, \pi(e_s) \cdot u_s + \pi(e_\ell) \cdot u_\ell)$, where u_s and u_ℓ denote the mass of short-term and long-term unemployed respectively, and e_s , e_ℓ stand for their respective search effort intensity. $\pi(\cdot)$ is an increasing and concave function of search effort. $M(\cdot)$ satisfies the standard properties of matching functions: It is increasing with respect to both arguments, equal to zero if one argument is nil, and

homogeneous of degree one. The linear homogeneity of the matching function allows us to define the probability to fill a vacancy as $m(\theta)$, with $m(\theta) \equiv M(1, 1/\theta)$ and $\theta \equiv v/[\pi(e_s) \cdot u_s + \pi(e_\ell) \cdot u_\ell]$, being the labor market tightness. The same reasoning leads us to define the exit rate of an unemployed of type i , $i = s, \ell$, as: $\pi(e_i) \cdot \theta m(\theta)$. Let us remark that the properties of the matching function imply that $m(\theta)$ and $\theta m(\theta)$ are respectively decreasing and increasing with respect to θ .

The definitions of the matching and the job destruction processes allow us to determine the relationship between the labor market tightness, the search efforts, the job destruction rate and the unemployment rates. In a steady state, the flow equilibrium conditions read as:

$$q(1 - u_s - u_\ell) = \theta m(\theta) [\pi(e_\ell) u_\ell + \pi(e_s) u_s], \quad (1)$$

$$u_s = q(1 - u_s - u_\ell). \quad (2)$$

These two equations show that the steady state unemployment rates depend on the equilibrium value of the labor market tightness θ , and the effort devoted to search e_s, e_ℓ . These values are determined by the behavior of employers and workers which is presented now.

Workers have identical preferences, represented by the instantaneous utility function: $\ln(x) - e$, where x stands for the income and e for the search effort. The value function for a worker who has a job satisfies:

$$V = \ln(w) + \beta [(1 - q)V + qV_s], \quad (3)$$

where $\beta \in [0, 1]$ is the discount factor and V_s is the value function of a short-term unemployed, which satisfies:

$$V_s = \ln(z_s) - e_s + \beta \{ [1 - \pi(e_s) \cdot \theta m(\theta)] V_\ell + \pi(e_s) \cdot \theta m(\theta) V \}, \quad (4)$$

V_ℓ being the value function for a long-term unemployed, solving:

$$V_\ell = \ln(z_\ell) - e_\ell + \beta \{ [1 - \pi(e_\ell) \cdot \theta m(\theta)] V_\ell + \pi(e_\ell) \cdot \theta m(\theta) V \}. \quad (5)$$

The asset value of a vacant job, denoted by J_v , is defined by:

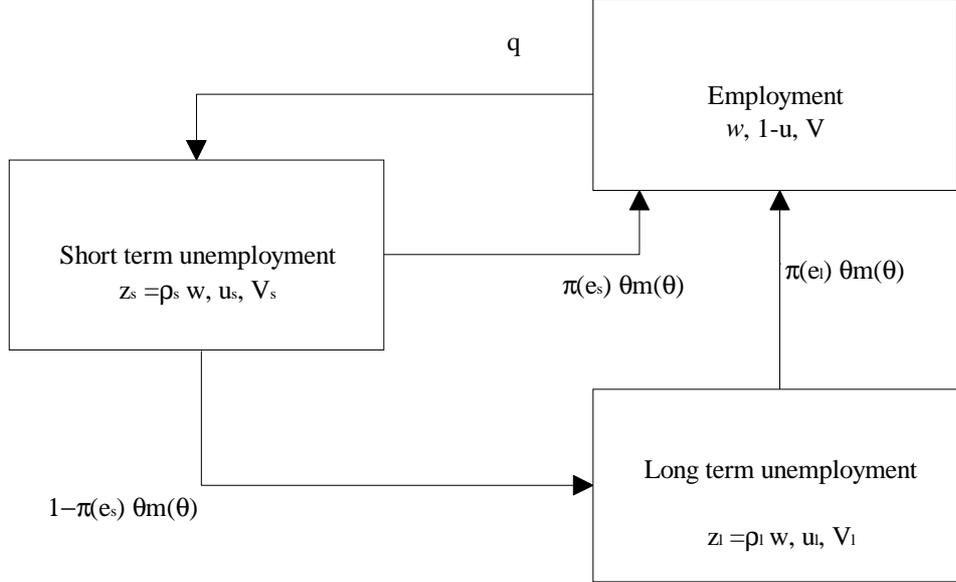


Figure 1: Jobs flows and workers values

$$J_v = -c + \beta \{m(\theta)J + [1 - m(\theta)] J_v\}, \quad (6)$$

where c denotes the instantaneous cost of a vacancy and J the asset value of a filled job, that satisfies:

$$J = 1 - w(1 + \tau) + \beta [qJ_v + (1 - q)J], \quad (7)$$

τ being the tax rate, used to finance unemployment benefits.

Profit maximization implies that employers create jobs until the expected return of a vacancy is nil (see Pissarides, 1990, chapter 2). Using equation (6), this condition implies:

$$J = \frac{c}{\beta m(\theta)}. \quad (8)$$

It is assumed that the whole expenses of the government are devoted to unemployment benefits. Accordingly, the budget constraint reads as:

$$u_s \rho_s + u_l \rho_l = \tau(1 - u_l - u_s). \quad (9)$$

3 Equilibrium with endogenous search effort and exogenous wage

In this section, the wage is exogenous and the search effort is endogenous. This set of assumptions allows us to illustrate the working of search models, which generally rest on a framework where wages are given and the variations of the search effort intensity plays the main role. Each type of unemployed worker chooses the effort intensity that maximizes its value function. Equations (4) and (5) imply that the first-order condition defining the optimal search intensity for each type of unemployed worker reads as:

$$1 = \beta \pi'(e_i) \theta m(\theta) [V - V_\ell], i = s, \ell. \quad (10)$$

In our very simple model, short-term and long-term unemployed workers choose the same optimal effort intensity. This is a consequence of two assumptions: The instantaneous utility function is additively separable, and the high level of unemployment benefit is paid for one period only. Such assumptions have been chosen for the sake of simplicity. They could be relaxed without changing our other conclusions concerning the impact of the unemployment benefit profile on the search effort. Indeed, appendix 1 shows that the optimal search intensity increases when the unemployment profile is more decreasing for any given tax rate τ . Accordingly, the standard Shavell and Weiss (1979) effect obtains: Since individuals are forward looking, the incentive to look for a job is raised when the future expected income in unemployment drops, which is exactly the consequence of a more decreasing unemployment benefits profile.

For a given wage, it can easily be understood that an increase in job search intensity decreases the unemployment rate $u = u_s + u_\ell$. Equations (7) and (8) implies that the equilibrium value of the labor market tightness, denoted by $\bar{\theta}$, is defined by:

$$m(\bar{\theta}) = \frac{c [1 - \beta(1 - q)]}{\beta [1 - w(1 + \tau)]}. \quad (11a)$$

In the equilibrium with exogenous wages, the labor tightness does not depend on search intensity. Therefore, if one denotes by \bar{e} the equilibrium value of search intensity, the flow equilibrium conditions (1) and (2) imply that the equilibrium unemployment rate is:

$$\bar{u} = \frac{q}{q + \bar{\theta} m(\bar{\theta}) \pi(\bar{e})}. \quad (12)$$

Since the only effect of a more decreasing unemployment benefits profile is to raise search intensity, the unemployment rate decreases when the unemployment benefits of the long-term unemployed are reduced. That is the usual effect expected from a more declining unemployment benefits time profile. However, the next section shows that wages react to the unemployment benefits profile, and that wages reaction may counteract the impact of the change in search intensity.

4 Equilibrium with exogenous search intensity and endogenous wage

In this section, the search effort is assumed to be given in order to shed some light on the impact of the unemployment benefits profile on unemployment through the reaction of wages. This assumption corresponds to a case where job search effort can be monitored with zero cost by the unemployment insurance institution. It will be relaxed in the next section. It is assumed that there is a collective bargaining at the firm level and that the insiders, whose seniority is at least one period and who are therefore eligible for unemployment insurance if laid-off, set the wage for the whole workers belonging to the firm. This assumption seems to fit European labor market institutions, where more than 80% of workers are covered by collective agreements. Wages are bargained in every period according to the Nash bargaining solution that amounts to maximize the Nash criterion with respect to the current wage. The solution to the Nash bargaining solution strongly depends on the fall back position of both firms and workers. If the labor contract is broken off, the insiders, who bargain the wage, become short-term unemployed workers² while the job becomes vacant. Hence wage solves:

$$\max_{\gamma \in]0, 1[} [V - V_s]^\gamma [J - J_v]^{1-\gamma} \quad (13)$$

It is shown, in appendix 2, that the first-order condition defines a negative relation between the labor market tightness and the level of unemployment benefits. Namely, by influencing the welfare of the short-term unemployed workers, the unemployment benefits time profile changes the insiders' fall-back position in the bargaining process. Therefore, the unemployment compensation profile influences the negotiated wage, and then the labor market tightness and the unemployment rate. To study the effect of the unemployment profile, we consider changes in replacement ratios that leave unchanged the tax rate. One gets the following result:

²Note that the assumption that wages are bargained by insiders and apply to the whole workers is crucial, since the fall-back pay-off of a new-hired worker corresponds to the expected utility of a long term unemployed worker.

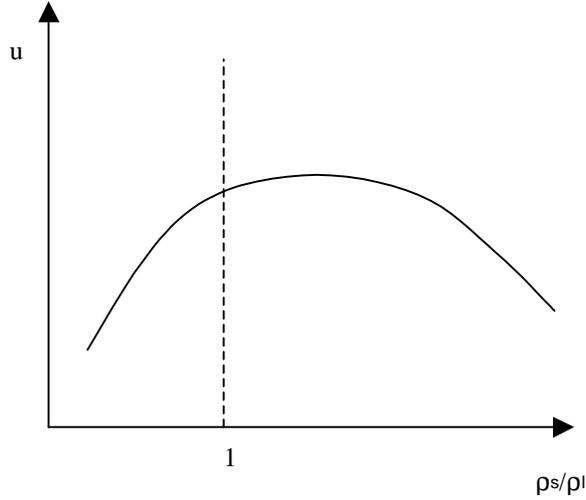


Figure 2: The relation between the time profile of unemployment benefits and unemployment when job search intensity is exogenous.

$$\left. \frac{\partial u}{\partial \rho_s} \right|_{e,\tau} \leq 0 \Leftrightarrow \frac{1 - \beta + \beta\pi(e)\theta m(\theta)}{\beta\pi(e)\theta m(\theta)} \leq \frac{\rho_s}{\rho_\ell} \quad (14)$$

This equation shows that the relation between unemployment and ρ_s/ρ_ℓ is not monotonic. The relationship between the unemployment rate and ρ_s/ρ_ℓ is drawn in Figure 2.

This result is a consequence of the fact that workers are risk adverse and have a positive discount factor. For a low level of ρ_s/ρ_ℓ , the unemployment rate increases with ρ_s/ρ_ℓ , because in that case, a more declining time sequence of unemployment compensation unambiguously raises the welfare of the short-term unemployed. Current incomes increase while the decrease in long-term unemployment benefits is discounted since it will concern the short-term unemployed only in future periods. But, if ρ_s/ρ_ℓ is very high, z_ℓ is very small, and the short-term unemployed workers instantaneous marginal utility is very small compared to the marginal utility of long term unemployed workers. Thus, for a given tax rate, when z_ℓ is very small, any increase in z_s has a weak effect on the instantaneous marginal utility of the short-term unemployed relatively to the decrease in their future marginal welfare entailed by the decrease in z_ℓ . Hence, in that case, the welfare of both short-term and long-term unemployed diminishes with ρ_s/ρ_ℓ .

Actually, for any given tax rate and search intensity, the unemployment rate reaches a maximum for a declining time sequence of unemployment benefits. This means that moving from a flat profile to a weakly declining profile may increase unemployment. In order to be sure that moving to a more

declining profile diminishes unemployment, one has to consider strongly declining profiles. But, as it will be seen in the next section, this may also be at the expenses of the welfare of the long-term unemployed workers, who are in many circumstances the most disadvantageous agents. Using equations (4) and (5), one sees that $V_s - V_\ell = \ln(\rho_s/\rho_\ell)$, and then that the most disadvantageous individuals are the unemployed workers who are paid the lowest level of unemployment benefits, since the wage bargaining process insures that the workers who have a job always get at least the welfare level of the short-term unemployed workers.

Accordingly, when the search effort is exogenous, except in the case where a more decreasing profile allows for a decrease in the welfare of both short-term and long-term unemployed workers, a flat profile of unemployment benefits as many advantages relative to a decreasing one: It implies a relatively low unemployment rate and satisfies Rawls justice criterion. Obviously, a paramount issue is to evaluate the relative importance of the consequences of the search and employment responses to changes in the unemployment benefits system. This is the issue addressed in the next section.

5 Endogenous search effort and wages: Some quantitative exercises

When search effort and wages are endogenous, the model becomes quite complex and it becomes difficult to be solved analytically. We hence calibrate it in order to evaluate the impact of the unemployment benefits profile on the unemployment rate and on the welfare of the less advantageous individuals.

In the calibration exercise, we assume that the search efficiency function is homogenous of degree $\alpha \in]0, 1[$, $\pi(e) = e^\alpha$. A matching function of the Cobb-Douglas form is assumed, such that $m(\theta) = m_0\theta^{-0.5}$. Assuming that the elasticity of the matching function with respect to vacancies is 0.5 is quite standard (see Blanchard and Diamond, 1989, Andolfatto, 1996, Mortensen and Pissarides, 1997, Fredriksson and Holmlund, 1998). q is the rate of job destruction, which value usually lies around 0.1 per year.

Apart the choice of these functional forms, the model is roughly calibrated for the french economy over the current period (see Table 1). Parameters are set so that unemployment rate is 12% for levels of short-term and long-term replacement ratios of respectively 0.8 and 0.6 (see Martin, 1996).

u	ρ_s	ρ_ℓ	λ	q	β	γ
12%	0.8	0.6	0.5	0.1	0.95	0.5

Table 1 : The French Economy

We do not have any precise information on the bargaining power γ . We consider that the workers' bargaining power is equal to the elasticity of the matching function with respect to vacancies, i.e. $\gamma = 0.5$, a situation known to provide an efficient decentralized equilibrium if agents perfectly share their income (Pissarides, 1990). For the annual discount factor β , we choose a value of 0.95.

To calibrate the remaining parameters, we also want the model to reproduce the microeconomic evaluation of the elasticity of unemployment durations with respect to unemployment benefits, which is denoted by λ in Table 1. Layard and *alii* (1991, p 255) reports the large uncertainty about this estimate, which lies in the interval $[0.2, 0.9]$. We choose 0.5 as the benchmark value we want to reproduce for the actual economy. In our model, we interpret this parameter as being the opposite of the elasticity of the exit rate out of unemployment with respect to unemployment benefits, when the tightness parameter is exogenous (see appendix 1 and equation (18)). Once the values in Table 1 have been set, one can determine the values of the remaining parameters to set: c , m_0 , τ , and α , which are presented in Table 2.

c	m_0	τ	α
0.4	1	0.10	0.23

Table 2

Three simulations are presented. In each of them we compute the unemployment rate, the exit rate from unemployment, the level of job search intensity, the replacement ratios and measures of welfare for a given level of tax rate and for different level of ρ_s/ρ_ℓ (standard curve for employed workers, alternate dashed curve for short-term unemployed worker and regular dashed curve for long-term unemployed worker). Our measure of welfare corresponds to the discounted certainty equivalent of the expected utility for each type of individual. For instance, the measure of welfare for a short term unemployed worker is the value of x that solves $\ln(x) = (1 - \beta)V_s$. In the same spirit, our measure of aggregate social welfare is defined as the value of x that solves $\ln(x) = (1 - \beta)[(1 - u)V + u_s V_s + u_\ell V_\ell]$.

In Figure 3, the traditional search approach with an exogenous wage distribution is presented of Shavell and Weiss (1979) is presented. Only job search matters and wages are set to their value for the actual profile of unemployment benefits ($\rho_s/\rho_\ell = 1.33$), which is about 0.85. A more declining time profile of unemployment benefits reduces the unemployment rate and increases the utilitarian criterion. Moving from a flat profile to $\rho_s/\rho_\ell = 2$ allows for a 2.1 points decrease in the unemployment rate. But in such a case, the decrease in unemployment is obtained at the expenses

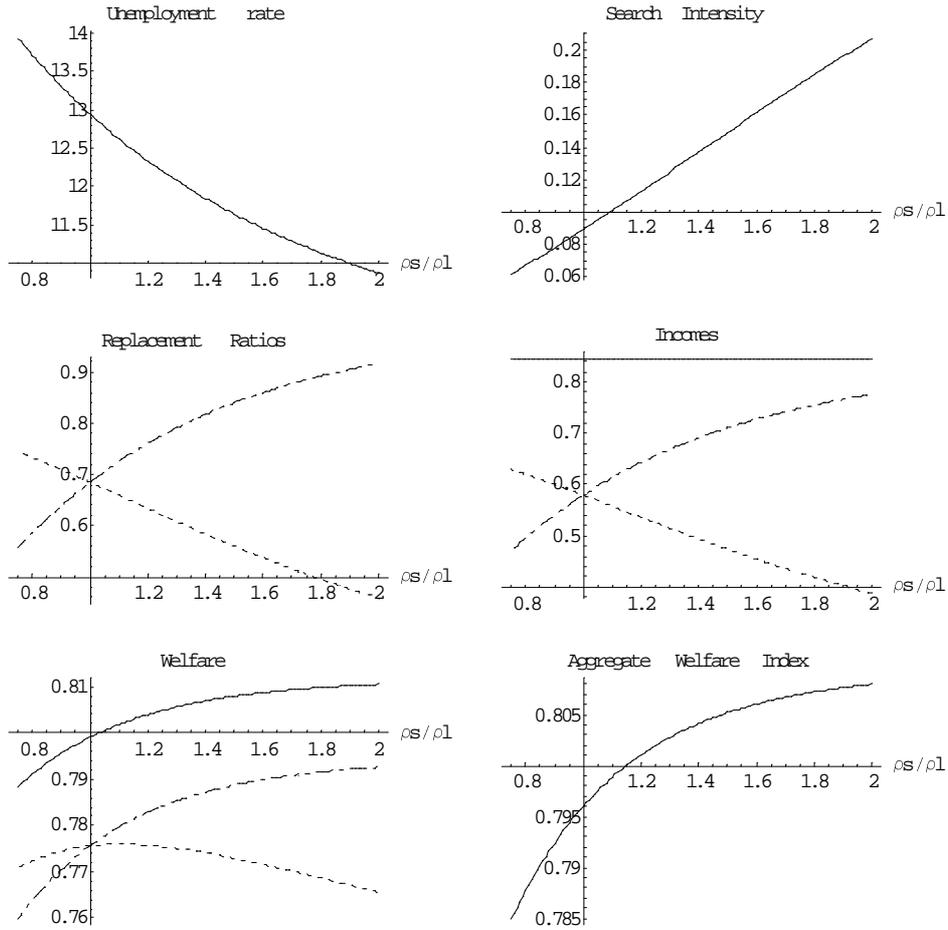


Figure 3: The consequences of unemployment benefits in the standard search model.

of the welfare of the long-term unemployed workers, who face a 1.3 points decrease in their certainty equivalent. Therefore, it appears that there is a trade-off between the improvement of the situation of the individuals in the most disadvantageous situation and the decrease in unemployment. In particular, a flat time profile of unemployment benefits satisfies Rawls criterion, even if it is at the expense of a higher unemployment rate.

In Figure 4, only wage bargaining matters and job search intensity is set equal to its value for the benchmark time profile presented in Table 1. As predicted by our theoretical analysis, the unemployment rate is hump-shaped with a maximum value for a slightly decreasing profile of unemployment benefits. Moving from a flat profile to $\rho_s/\rho_\ell = 2$ allows for only a 0.18 point decrease in the unemployment rate, which is much more lower than when search effort is endogenous and wages are exogenous. Moreover, the decrease in the welfare of the long-term unemployed workers

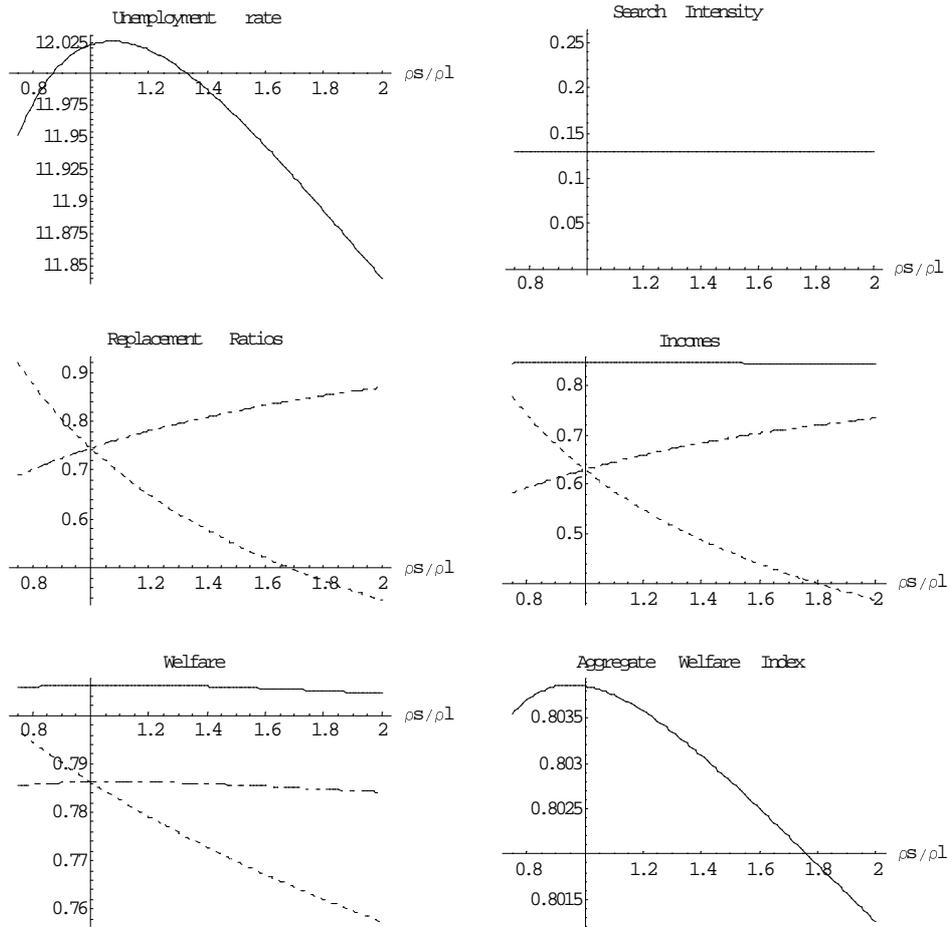


Figure 4: The consequences of unemployment benefits with exogenous effort intensity and endogenous wage.

is bigger when wages are endogenous, since long-term unemployed workers face a 3.7 points drop of their equivalent revenue, against 1.3 points in the previous case. It is also worth noting that aggregate welfare reaches a maximum for a very slightly increasing profile of unemployment benefits when search effort is exogenous, whereas aggregate welfare was raised when the unemployment benefits profile was more decreasing in the previous exercise.

In Figure 5, both effects matter. At first, it appears that job search effects dominate wage bargaining effects, so that the more declining the time profile of unemployment benefits, the lower the unemployment rate. But this effect is considerably reduced, compared to Figure 3. Namely, moving from a flat profile to $\rho_s/\rho_\ell = 2$, entails a 1.5 points drop in unemployment against a 2.1 points in the pure search case. It also appears that the decrease in our measure of welfare of the

long-term unemployed workers is now bigger, since it amounts to 2.2 points. Accordingly, in the standard search model with exogenous wages, one needs a decrease of 0.6 point in the certainty equivalent of the long term unemployed workers to get a drop of 1 point of the unemployment rate, while the decrease in the equivalent revenue amounts to 1.5 points when wages become endogenous (see Table 3). According to such a criterion, an increase in the digressiveness of the unemployment benefits is twice less efficient when wages are endogenous. Therefore, tacking into account the response of wages moderates the arguments in favor of a declining time sequence of unemployment benefits that is found in the standard job search framework.

	Exogeneous w	Exogeneous e	Both endogenous
Changes in Unemployment rate $100 \times \Delta u$	-2.1	-0.18	-1.5
Changes in Long-term unemployed welfare	-1.3%	-3.7%	-2.2%
Changes in Aggregate Welfare Index	1.5%	-0.3%	1.0%

Table 3: Changes from $\rho_s/\rho_l = 1$ to $\rho_s/\rho_l = 2$

Overall, it may be argued that our results show that the cost of a decrease in unemployment in terms of welfare loss for the long term unemployed workers is still reasonable when wages are endogenous. However, it is worth noting that we would get much larger losses by taking a lower discount rate, which is likely to be relevant when one considers unemployed workers who generally face borrowing constraints. Choosing $\beta = 0.9$ implies that a drop of 1 point in the unemployment rate costs 1.8 points of our measure of welfare for the long-term unemployed when wages are exogenous and 3.7 points when both search effort and wages are endogenous. These two numbers amount to 2.9 points and 6 points respectively when $\beta = 0.85$. We still find that an increase in the digressiveness of the unemployment benefits is twice less efficient when wages are endogenous, but the welfare loss for the unemployed workers is much more important than when the discount factor is big (see Table 4).

	Job search model	General model
$\beta = 0.95$	0.6%	1.5%
$\beta = 0.9$	1.8%	3.7%
$\beta = 0.85$	2.9%	6%

Table 4: Decrease in long term unemployed workers' certainty equivalent for a 1 point decrease in the unemployment rate

6 Conclusion

In this paper, we suggest that it may be very costly for the long-term unemployed workers to try to decrease the unemployment rate by choosing a more declining time sequence of unemployment

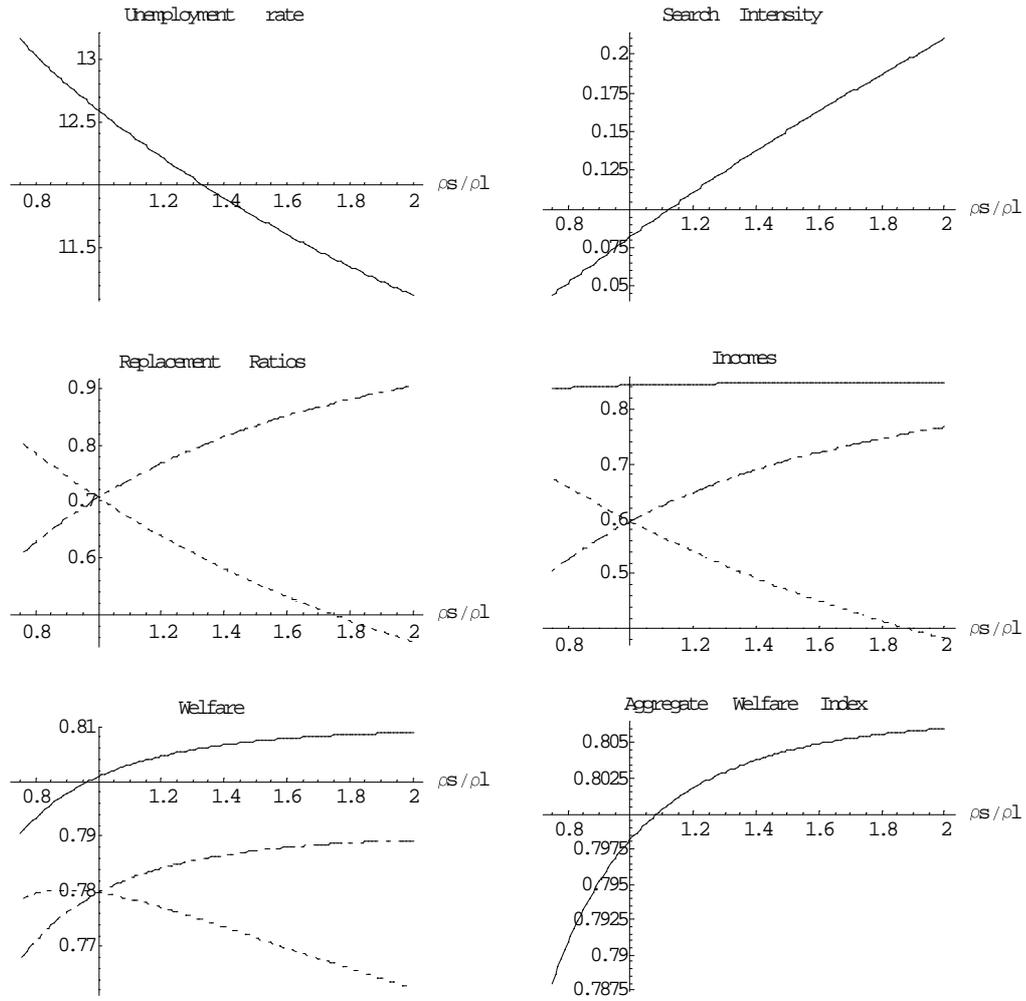


Figure 5: The consequences of unemployment benefits with endogenous wage and effort intensity.

benefits when the response of wages is taken into account. We stressed that changes in the time profile unemployment benefits do not have only incentive effects that urge the unemployed workers to raise their job search intensity. The time profile of unemployment benefits also influences wages which are negotiated by insiders in our framework, and this influence reduces the efficiency of declining time sequence of unemployment benefits. It is worth noting that the mechanism that has been put forward in our paper may also be found in efficiency wage models.

Our results have been obtained with a very simple model. We think that more can be done to better understand the consequences of the time profile of unemployment benefits in a context where both job search intensity and wages are endogenous. In particular, trying to evaluate the influence of the response of wages with other models, such as trade unions or efficiency wage models, might provide different results than those obtained here. Introducing borrowing constraints explicitly or considering richer tax and unemployment benefits profiles (as done by Hopenhayn and Nicolini, 1997, in a pure search model) might also yield interesting informations.

References

- Andolfatto, D., 1996, "Business Cycles and Labor-Market Search", *American Economic Review*, 86(1), 112-132.
- Alogoskoufis, G., C. Bean, G. Bertola, D. Cohen, J. Dolado and G. Saint-Paul, 1995, "Unemployment, choices for Europe", *Monitoring European Integration*, CEPR, London.
- Atkinson, A. B. and J. Mickelwright, 1991, "Unemployment compensation and the labor market transition : a critical review", *Journal of Economic Literature*, 29(4), 1679-1727.
- Blanchard, O. J. and P. Diamond, 1989, "The flow approach to labor market", *American Economic Review*, 82, 1-76.
- Cahuc, P. and E. Lehmann, 1997, "Equilibrium Unemployment and the Time Sequence of Unemployment Benefits", *Working Paper*, Cahier Eco&Math 97-49, Université Paris I.
- Cremer, H. M. Marchand and P. Pestieau, 1996, "The optimal level of unemployment insurance benefits in a model of employment mismatch", *Labour Economics*, 2, 407-420.
- Fredriksson, P. and B. Holmlund, 1998, "Optimal Unemployment Insurance in Search Equilibrium", *Working Paper* 1998:2, Uppsala University.
- Hansen, C. T. and H. J. Jacobsen, 1998, "Duration Dependent Unemployment Benefits in Trade Union Theory", Working Paper, Copenhagen University.
- Holmlund, B., 1998, "Unemployment Insurance in Theory and Practice", *Scandinavian Journal of*

- Economics*, 100(1), 113-141.
- Hopenhayn, H. and J. P. Nicolini 1997, "Optimal unemployment insurance", *Journal of Political Economics*, 105(2), 412-438.
- Layard, R. , S. Nickell, R. Jackman, 1991, *Unemployment, macroeconomic performance and the labor market*, Oxford University Press.
- Martin, J., 1996, "Measures of Replacement Rates for the Purpose of International Comparisons: a note", *O.E.C.D. Economic Studies*, 26(1), 98-118.
- Mortensen, D. and C. Pissarides, 1997, "Unemployment Responses to Skill Biased Technology Shocks: The role of Labour Market Policy", *mimeo*, Center for Economic Performance, London School of Economics.
- OECD, 1996, *Unemployment outlook*, July.
- Pissarides, C. 1990: *Equilibrium unemployment theory*, Basil Blackwell.
- Rawls, J., 1971, *A theory of justice*, Harvard University Press, Cambridge, MA.
- Shavell, S. and L. Weiss, 1979, "The optimal payment of unemployment benefits over time", *Journal of Political Economy*, 87(6), 1347-1362.
- Wang, C. and S. Williamson, 1996, "Unemployment insurance with moral hazard in a dynamic economy", *Carnegie-Rochester Conference Series on Public Policy*, 44, 1-41.
- Wright, R. 1986, "The redistributive role of unemployment insurance and the dynamics of voting", *Journal of Public Economics*, 31, 377-99.

Appendix 1: Exogenous wages

Using the budget constraint (9) and the flow equilibrium conditions (1), (2), one can compute the long-term unemployment benefits ratio ρ_ℓ as a function of the short-term unemployment benefits ratio ρ_s and the tax rate τ when each unemployed worker chooses the same search intensity:

$$\rho_\ell = \frac{\pi(e)\theta m(\theta)}{1 - \pi(e)\theta m(\theta)} \left(\frac{\tau}{q} - \rho_s \right) \in [0, 1]. \quad (15)$$

The definition of the value functions of the short-term, long-term unemployed and of the workers who have a job leads to:

$$V - V_\ell = \frac{e + \beta \ln(\rho_s) - (1 + \beta q) \ln(\rho_\ell)}{1 - \beta [1 - q - \pi(e)\theta m(\theta)]} > 0 \quad (16)$$

In a symmetric situation where all individuals choose the same search intensity e , the first-order condition for the optimal current search effort of an individual can thus be written as:

$$\Phi(e, \rho_s) \equiv - \{1 - \beta [1 - q - \pi(e)\theta m(\theta)]\} + \beta \pi'(e)\theta m(\theta) \{e + \beta q \ln(\rho_s) - (1 + \beta q) \ln(\rho_\ell)\} = 0 \quad (17)$$

For given levels of tightness parameter θ and tax rate τ , the partial derivatives of function $\Phi(e, \rho_s)$ can be obtained from (15) together with (17):

$$\begin{aligned} \Phi_1 &= \beta \pi''(e)\theta m(\theta) \{e + \beta q \ln(\rho_s) - (1 + \beta q) \ln(\rho_\ell)\} - \frac{\beta (1 + \beta q) \theta m(\theta) [\pi'(e)]^2}{\pi(e) [1 - \pi(e)\theta m(\theta)]} < 0 \\ \Phi_2 &= \beta \pi'(e)\theta m(\theta) \left[\frac{\beta q}{\rho_s} + \frac{1 + \beta q}{\rho_\ell} \frac{\pi(e)\theta m(\theta)}{1 - \pi(e)\theta m(\theta)} \right] > 0 \end{aligned}$$

We hence get $\left. \frac{\partial e}{\partial \rho_s} \right|_{w, \tau} = -\frac{\Phi_2}{\Phi_1} > 0$.

We can compute λ , the microeconomic elasticity of the average duration of unemployment $1/\pi(e)\theta m(\theta)$ with respect to the long-term replacement ratio ρ_ℓ , for given levels of θ and of ρ_s . This elasticity is:

$$\lambda = - \left(\frac{\pi'(e)}{\pi(e)} \right) \left(\frac{\pi'(e)}{\pi''(e)} \right) \frac{(1 + \beta q)}{[e + \beta q \ln(\rho_s) - (1 + \beta q) \ln(\rho_\ell)]} > 0 \quad (18)$$

Appendix 2: Exogenous search intensity

>From equations (3) and (8), the first-order condition of program (13) reads as:

$$V - V_s - \frac{\gamma J}{(1 - \gamma)w(1 + \tau)} = 0. \quad (19)$$

The definitions of the workers' value functions imply that:

$$V - V_s = \frac{e - \{1 - \beta [1 - \pi(e)\theta m(\theta)]\} \ln(\rho_s) - \beta [1 - \pi(e)\theta m(\theta)] \ln(\rho_\ell)}{1 - \beta [1 - q - \pi(e)\theta m(\theta)]}, \quad (20)$$

whereas equations (6) to (8) allows us to write:

$$\frac{J}{w(1 + \tau)} = \frac{c}{\beta m(\theta) - [1 - \beta(1 - q)] c}. \quad (21)$$

One sees that (19) together with equations (20), (21) and (15), defines the labor market tightness as a function of the short-term unemployment benefits. More precisely, one can write that the left hand side of equation (19) is equal to a function $\Omega(\theta, \rho_s)$. Therefore, differentiating (19) taking into account equations (20), (21) and (15), one gets $d\theta/d\rho_s = -\Omega_2(\theta, \rho_s)/\Omega_1(\theta, \rho_s)$, with:

$$\Omega_1(\theta, \rho_s) = \frac{-\beta\pi(e)m(\theta)[1 + \eta(\theta)]}{1 - \beta[1 - q - \pi(e)\theta m(\theta)]} \left\{ V - V_\ell + \frac{1}{\pi(e)\theta m(\theta)} \right\} + \frac{\gamma m'(\theta) c \beta}{(1 - \gamma) \{ \beta m(\theta) - [1 - \beta(1 - q)] c \}^2} \quad (22)$$

$$\Omega_2(\theta, \rho_s) = \frac{[1 - \pi(e)\theta m(\theta)] \left\{ \beta\pi(e)\theta m(\theta) - \frac{\rho_\ell}{\rho_s} [1 - \beta(1 - \pi(e)\theta m(\theta))] \right\}}{\pi(e)\theta m(\theta) \left(\frac{\tau}{q} - \rho_s \right) \{ 1 - \beta [1 - q - \pi(e)\theta m(\theta)] \}} \quad (23)$$

where $\eta(\theta) \equiv \theta m'(\theta)/m(\theta) \in]-1, 0[$.

We can notice that the value of an employed worker should be higher than the one of a long-term unemployed worker, otherwise unemployed worker would always reject a job proposal. Thus, $V - V_\ell > 0$, $\Omega_1(\theta, \rho_s) < 0$ and $d\theta/d\rho_s \leq 0 \Leftrightarrow \frac{1 - \beta[1 - \pi(e)\theta m(\theta)]}{\beta\pi(e)\theta m(\theta)} \leq \frac{\rho_s}{\rho_\ell}$.