On the extent of re-entitlement effects in unemployment compensation*

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Abstract

We analyze the implications of two-tier unemployment compensation systems with non-automatic eligibility in an equilibium matching model with Nash bargaining. As eligibility for UI does not automatically follow from employment, the two types of unemployed workers have different threat points, which delivers equilibrium wage dispersion. The parameters of the model are estimated for France, and the model is also calibrated for Denmark and the U.S. Re-entitlement effects are shown to be sizeable for all three countries. For France, re-entitlement effects lower by 15% the rise in the wage and by 25% the rise in unemployment following a 10% increase in the benefit level. Finally, we show that in all three countries the optimal compensation system is characterized by time-decreasing unemployment benefits and non-automatic eligibility for UI, with higher levels of both UI and UA benefits, a smaller decrease in benefits over time, and a longer employment duration required for UI eligibility than in the current system.

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1 Introduction

The characteristics of unemployment compensation systems have increasingly attracted attention, beyond the interest in the level of unemployment insurance (UI) benefits alone.[1] One important strand of this recent literature has revisited "re-entitlement effects" identified by Mortensen (1977) as a counteracting force to the standard disincentive effect of UI on job acceptance. In Mortensen (1977), taking a job opens the door to UI entitlement upon future job loss, and thus more generous UI makes current employment more attractive in the first place. Recently, Fredriksson and Holmlund (2001), Albrecht and Vroman (2005), and Coles and Masters (2006) show that re-entitlement effects remain valid in models where both the arrival rate of job offers and the distribution of wage offers are endogenous.

In this paper, we propose a new channel for the re-entitlement effect: the wage differential due to non-automatic eligibility for UI benefits. We believe this new channel to be interesting for several reasons. First, non-automatic eligibility is a feature common to the unemployment compensation systems of the U.S., Canada, and most European countries, which are all characterized by the existence of a minimum duration of employee contributions for eligibility for insurance benefits.[2] Second, the channel is based on the simple intuition that the wages of employees eligible for UI and for unemployment assistance (UA) may differ in equilibrium. In addition, as the wage differential in our model exclusively comes from the re-entitlement effect, wage dispersion becomes in itself a natural measure of the extent of re-entitlement effects. Finally, our approach allows us to explicitly characterize the optimal eligibility requirement for UI.

We consider a labor market matching model, in which the unemployed are either entitled to UI benefits or to lower UA benefits, and the employees are either eligible for UI or UA upon separation. UI recipients face some probability of losing eligibility and start receiving UA benefits, and similarly employees eligible for UA face some probability of gaining UI eligibility while employed. Firms open job vacancies, taking into account the average compensation received by the unemployed, and the meetings between employers and job-seekers are described by a standard matching function à la Pissarides (2000). If an unemployed worker finds a job while currently on UI, she is still eligible for UI upon future separation, while a UA recipient finding a job is initially only entitled to UA upon separation. Individuals are assumed to be risk-averse and the budget constraint of the unemployment compensation system is explicitly modelled. Finally, wages are determined through Nash bargaining within each firm-worker pair. In equilibrium, as eligibility for UI does not automatically follow from employment, the two types of unemployed have different threat points, which generates equilibrium wage dispersion. Wage dispersion is shown to vanish in particular whenever eligibility is automatic or benefit levels do not decrease with unemployment duration.

We calibrate and simulate the model using transition probabilities across labor market states and earnings estimated on the 1994-2000 waves of the French sample of the European Community

[1] See for example, Hopenhayn and Nicolini (1997), Wang and Williamson (2002), Cahuc and Malherbet (2004), Pellizzari (2006), Pavoni (2007), and Lentz (2009).

[2] This minimum duration is equal to 4 months in France, 6 months in the Netherlands and Luxembourg, and goes up to 15 months in Portugal. The most frequent duration, 12 months, is observed in the US, Denmark, Germany, Belgium, Spain, Italy, etc.

Household Panel (ECHP) controlling for individual characteristics. The ECHP has the advantage of providing all the information necessary to the construction of the monthly series of UI eligibility for both the employed and the unemployed, together with the benefit level received by each group of unemployed. We are thus able to precisely evaluate the quantitative effects of the unemployment compensation system in the particular case of France. Among the countries participating in the ECHP, we focus on France mostly because the French unemployment compensation system is one of the very few that remained unchanged in this period. The model is also calibrated using macro data for the polar cases of Denmark (generous UI) and the U.S. (low UI).

We then quantify re-entitlement effects. For this purpose, our model needs to be compared to a benchmark model identical in every respect except for the existence of re-entitlement effects. This model is simply the standard Pissarides (2000, ch. 1) model, which is calibrated using parameters derived from our model. We show in particular that the re-entitlement effect is smaller the lower is the decrease in benefit levels with unemployment duration. To assess the extent of entitlement effects for France, Denmark, and the U.S., we then compare the impact of a same increase in benefit levels in our model and in the calibrated version of Pissarides (2000). For France, the re-entitlement effect lowers by 15.4% the rise in wages and by 25.4% the rise in unemployment following a 10% increase in benefit levels. The re-entitlement effect is also shown to be significant for Denmark (8.5% for wages and 17.4% for unemployment) and for the U.S. (respectively, 11.3% and 31.1%).

In our model, unemployment compensation can be rendered more generous along four dimensions, namely the levels of UI and UA benefits, the duration of UI entitlement, and the employment spell required for UI eligibility. An important question is then whether the effects of changing unemployment compensation are similar or not across different dimensions and for different countries.

As comprehensive reforms to unemployment compensation are often politically difficult to implement, we first compare "small" reforms along these four alternative dimensions.[3] In particular, we show that raising UA benefits increases the utility of all groups of workers in all three countries, while raising the level or the duration of UI benefits makes the unemployed on UA benefits worse-off in the two countries with already generous UI benefits (France and Denmark). In addition, easier eligibility for UI is the only reform which actually ends up lowering social welfare in France and Denmark, while all reforms raise social welfare in the U.S.

Next, we analyze how the current unemployment compensation systems stand with respect to the optimal systems along all four dimensions. In all three countries, (i) the optimal system is characterized by time-decreasing unemployment benefits and non-automatic eligilibility for UI; (ii) the optimal level of both UI and UA benefits is higher than the current benefits, and the optimal decrease in benefits over time smaller, but (iii) the employment spell for UI entitlement is longer in the optimal system. Therefore, the degree of generosity should move in opposite directions along different dimensions to improve social welfare. Finally, the welfare gains generated by moving from the current system to the optimum are small in France and Denmark, while in the US the gains are large and would lead to a Pareto-improvement.

[3] All reforms under consideration within each specific country have been designed to produce the same increase in the expected utility of an unemployed worker.

The paper is organized as follows. Section 2 describes our model. Section 3 presents the data and the method implemented to estimate the key variables and parameters of the model. Section 4 quantifies re-entitlement effects. In section 5, we simulate the impact of four "small" reforms making unemployment compensation more generous. Section 6 characterizes the optimal design for the unemployment compensation system. Finally, section 7 concludes.

2 The model

2.1 Environment

The economy consists of a fixed number workers normalized to 1, and an endogenous number of one-job firms. Time is continuous and lasts forever. The entire analysis is carried out in steady state. Two unemployment benefit systems coexist: unemployment insurance (UI) and unemployment assistance (UA). As in most countries and unlike in the existing literature, eligibility for UI benefits requires a "long enough" previous employment spell and lasts only for a limited period of time. u_1 unemployed individuals (also called here the "type-1 unemployed") are entitled to UI benefits, while the remainder $u_2 = u - u_1$ unemployed receive UA benefits, where u denotes total unemployment. Similarly, e_1 employees are eligible for unemployment insurance in case of job loss, while the remainder $e_2 = e - e_1$ would receive UA benefits, where e denotes total employment. In order to keep things simple, transitions between states are here modelled as Poisson rates. We thus assume that an employed worker not entitled to UI gains eligibility at Poisson rate p and that a UI recipient exhausts benefits with probability d[4] (see Figure 1). The eligibility rules of the UI system are thus fully represented by p and d.

Firms post vacancies and transitions into employment are endogenously determined by a CRS matching function à la Pissarides (2000).[5] Meetings between individuals and firms are then ruled by:

$$m = Am(v, u) \tag{1}$$

where m is the number of job matches, v the number of vacancies, $u \equiv u_1 + u_2$ the number of unemployed workers, and A a parameter representing the efficiency of the matching process.[6] Given CRS and the standard random matching assumption, a vacancy is matched to a worker at Poisson rate $Aq(\theta)$ where $q(\theta) \equiv \frac{m(v,u)}{v} = m\left(1, \frac{1}{\theta}\right)$, with $\theta \equiv \frac{v}{u}$ denoting labor market tightness. Similarly, an unemployed worker –whether entitled to UI benefits or not– is matched to a vacancy at rate $A\theta q(\theta)$.

[4] Fredriksson and Holmlund (2001) and Albrecht and Vroman (2005) also assume that the termination of benefits occurs at a Poisson rate. This assumption allows one to keep the model stationary and is not restrictive.

[5] Search effort is not modelled here, and thus both types of unemployed have the same job finding probability. This assumption, discussed in detail in section 2.5, is supported by several studies that show that the unemployment benefit level does not significantly affect search effort. See for example Rioux (2001a) for France, Schmitt and Wadsworth (1993) for the United Kingdom, and Hughes, Peoples, and Perlman (1996) for the US. Note that Coles and Masters (2006), and Albrecht and Vroman (2005) make the same assumption, while Fredriksson and Holmlund (2001) assume endogenous search effort.

[6] This parameter is useful for avoiding an unrealistically large cost of opening a vacancy in the simulations.

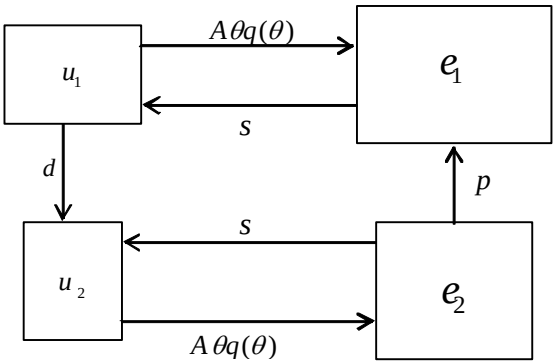

Figure 1: Labour Market Flows

An unemployed worker entitled to UI who finds a job would still be eligible after a future job loss. For this reason, in our model, a type-1 unemployed worker finding a job becomes a type-1 employee. In contrast, a UA recipient finding a job does not initially meet the eligibility requirements, and thus becomes a type-2 employee. Finally, employed workers lose their job at an exogenous rate s.

The dynamic equations governing the model thus are:

$$\dot{u}_1 = se_1 - du_1 - A\theta q(\theta)u_1, \tag{2}$$

$$\dot{u}_2 = se_2 + du_1 - A\theta q(\theta)u_2, \tag{3}$$

$$\dot{e}_1 = A\theta q(\theta)u_1 - se_1 + pe_2. \tag{4}$$

The steady-state equilibrium number of individuals in each state is obtained by imposing $\dot{e}_1 = \dot{u}_2 = \dot{u}_1 = 0$ in (2), (3), and (4). After some substitutions, we obtain:

$$u_1 = \frac{psA\theta q(\theta)}{\Omega(\theta)} \tag{5}$$

$$u_2 = \frac{ds(s+p)}{\Omega(\theta)} \tag{6}$$

$$e_1 = \frac{pA\theta q(\theta)[d + A\theta q(\theta)]}{\Omega(\theta)} \tag{7}$$

where $\Omega(\theta) \equiv ds\left[s + p + A\theta q(\theta)\right] + pA\theta q(\theta)\left[s + d + A\theta q(\theta)\right]$.

Finally, the unemployment compensation system is assumed to be financed out of proportional social contributions on wages, which means that the unemployed do not contribute. Let b_i denote type-i unemployment benefit and τ the tax rate. Then, the budget constraint of the benefit system satisfies:

$$b_1u_1 + b_2u_2 = \tau\left(w_1e_1 + w_2e_2\right), \tag{8}$$

i.e. the total amount of net-of-tax benefits is financed through a proportional tax τ on wage income $w_1e_1 + w_2e_2$. Using (5), (6), and (7), and $e_2 = 1 - e_1 - u_1 - u_2$, this constraint can be rewritten as:

$$\tau = \frac{b_1psA\theta q(\theta) + b_2ds(s+p)}{\left[w_1p\left(d + A\theta q(\theta)\right) + w_2ds\right]A\theta q(\theta)}. \tag{9}$$

2.2 Firms

Firms post vacancies, which are filled at rate $Aq(\theta)$. Let γ be the flow cost of posting a vacancy and V its value while unfilled. Firms cannot post different types of vacancies for the unemployed entitled to UI and for those not entitled as this would otherwise be illegal. Then, the value of an unfilled vacancy can be written in terms of the expected value from a filled job (J^e):

$$rV = -\gamma + Aq(\theta)(J^e - V). \tag{10}$$

However, once a firm meets a worker, the firm may directly observe whether the candidate is entitled to UI, or can infer this from her labor market history. Thus wages and the value of an occupied job are specific to the type of unemployed that fills the jobs. In particular, the value of a job filled by a type-1 unemployed worker is:

$$rJ_1 = y - w_1 + s(V - J_1) \tag{11}$$

where y is the productivity, w_1 the bargained wage, and $V_1 - J_1$ the capital loss born with separation probability s.

The value of a job filled with a type-2 unemployed worker differs from (11) because the employee gains eligibility with probability p, in which case the value of the job becomes J_1:

$$rJ_2 = y - w_2 + s(V - J_2) + p(J_1 - J_2). \tag{12}$$

The expression for the expected value of a filled job is given by:

$$J^e = \frac{u_1 J_1 + u_2 J_2}{u_1 + u_2}, \tag{13}$$

where $\frac{u_1}{u_1+u_2}$ is the probability that a vacancy is filled by a worker eligible for UI, conditional on the event of meeting a worker. Using (5) and (6), we obtain the proportion of the unemployed entitled to UI:

$$\frac{u_1}{u_1 + u_2} = \frac{pA\theta q(\theta)}{pA\theta q(\theta) + d(s + p)}. \tag{14}$$

Firms open vacancies up to the point where the expected value of posting a further vacancy is zero ($V = 0$).

2.3 Workers

Workers are assumed to be risk-averse with instantaneous utility given by the isoelastic CRRA utility function $v(x) = x^\eta/\eta$, where x is after-tax income and $\eta \leq 1$. Let U_i denote the asset value of unemployment when receiving type-i benefit and E_i the corresponding value for an employee eligible for type-i benefit in case of separation. In a stationary environment,

$$rU_1 = v[b_1] + A\theta q(\theta)(E_1 - U_1) + d\,(U_2 - U_1)\,, \tag{15}$$

stating that an unemployed worker entitled to UI gets felicity $v\,[.]$ from insurance benefit b_1, makes a capital gain $E_1 - U_1$ when finding a type-1 job [with probability $A\theta q(\theta)$], and incurs into a capital loss $U_2 - U_1$ when UI benefits expire (with probability d).

In turn, the expected discounted utility for a type-2 unemployed is:

$$rU_2 = v\left[b_2\right] + A\theta q(\theta)(E_2 - U_2), \tag{16}$$

i.e. while unemployed, the individual gets felicity $v\left[b_2\right]$ from assistance benefit b_2, and makes a capital gain $E_2 - U_2$ when finding a job.

Similarly, we have:

$$rE_1 = v\left[w_1(1-\tau)\right] + s(U_1 - E_1), \tag{17}$$

i.e. while employed and eligible for UI in case of separation, the individual has felicity $v[w_1(1-\tau)]$, since she finances the unemployment compensation system. Should a separation occur, she incurs into a capital loss of $U_1 - E_1$. The expression for the expected utility from employment for a type-2 employee is similar, except that she becomes eligible for UI (i.e. a type-1 employee) with probability p per unit of time:

$$rE_2 = v\left[w_2(1-\tau)\right] + s(U_2 - E_2) + p(E_1 - E_2). \tag{18}$$

2.4 Wages

2.4.1 Type-1 employees

Wages are the outcome of a bilateral Nash bargain between worker-firm pairs and can be renegotiated all the time. A type-1 worker receives employment value E_1 if an agreement is reached and her threat point is U_1. For the firm, the expected value of a filled vacancy is J_1 and its threat point is V. The wage w_1 solves:

$$\underset{w_1}{MAX}(E_1 - U_1)^{\beta}(J_1 - V)^{1-\beta} \tag{19}$$

where β is worker's bargaining power. Under the free entry condition ($V = 0$), using (10), (11), and (17) in (19), the optimality condition for this problem is:

$$\frac{(1-\beta)(1-\tau)^{\eta}w_1^{\eta}}{\eta} - \beta\left(y - w_1\right)(1-\tau)^{\eta}w_1^{\eta-1} = (1-\beta)rU_1. \tag{20}$$

For $\eta \leq 1$, the wage bargained by type-1 employees depends positively on U_1. As a result, a change in the parameters governing UI eligibility (p and d) or in benefit levels (b_1 and b_2) that makes type-1 unemployment more attractive increases w_1.

2.4.2 Type-2 employees

Similarly the wage w_2 solves[7]

$$\underset{w_2}{MAX}(E_2 - U_2)^{\beta}(J_2 - V)^{1-\beta} \tag{21}$$

[7] There are two reasons for assuming that UA recipients bargain over their monthly wage. First, the empirical evidence shows that the wage distribution of former UA recipients is non degenerate in France, since two thirds of them are not paid the hourly legal minimum wage (Rioux, 2001b). Second, the monthly wage depends both on the hourly wage and on the number of hours worked. Even though the hourly wage is fixed at the minimum wage, the number of hours worked can still be bargained over. The empirical evidence shows a significant dispersion in the hours worked by the unemployed not entitled to UI when they find a job.

The optimality condition then verifies:

$$(1-\beta)(E_2-U_2)=\beta(J_2-V)(1-\tau)^{\eta}w_2^{\eta-1} \tag{22}$$

Using (10), (12), and (18) in (22), we get:

$$\frac{(1-\beta)\,(1-\tau)^{\eta}\,w_2^{\eta}}{\eta}-\beta\left[y-w_2+p\left(\frac{y-w_1}{r+s}\right)\right](1-\tau)^{\eta}\,w_2^{\eta-1}=(1-\beta)\,[rU_2-p(E_1-U_2)] \tag{23}$$

The difference between equations (23) and (20) lies in the presence of p, the probability for a type-2 employee of gaining UI eligibility. When type-2 employees never become eligible ($p=0$), the expression for w_2 is similar to that for w_1, except that the threat point is type-2 unemployment. When $p>0$, equation (23) is more complicated, since w_2 now depends on w_1, E_1, and U_2, while w_1 itself is a function of U_1. Therefore any change in the parameters describing unemployment compensation (b_1, b_2, p, d) affects w_2 directly via U_2, but also indirectly via w_1 (and in turn E_1). Numerical simulations show that after a change in b_1 or d that makes type-1 unemployment more attractive, the value of type-2 employment increases more than the value of type-2 unemployment, which decreases w_2.

The mechanism at work is close to the entitlement effect first identified by Mortensen (1977) in a search framework, and later extended to a matching framework by Fredriksson and Holmlund (2001), Albrecht and Vroman (2005), or Coles and Masters (2004, 2006). Specifically Mortensen (1977) finds that higher UI benefits or longer entitlement make current employment more attractive for the unemployed not entitled to UI benefits, which lowers their reservation wage. The result is shown under the assumption that an employee losing her job automatically qualifies for insurance benefits. Our model confirms this result in a general equilibrium setting with endogenous wages and where UI eligibility does not follow automatically from unemployment.

3 Equilibrium

Under the free entry condition, equation (10) can be rewritten as:

$$J^e=\frac{\gamma}{Aq(\theta)}, \tag{24}$$

stating that, in equilibrium, the expected income from a filled vacancy must equal the total costs of posting it. Using (13) and (14), we get:

$$\frac{pA\theta q(\theta)J_1+d(s+p)J_2}{pA\theta q(\theta)+d(s+p)}=\frac{\gamma}{Aq(\theta)}. \tag{25}$$

The equilibrium is then defined as follows:

Definition 1 *An equilibrium is a vector* $(\theta, w_1, w_2, \tau, U_1, U_2, E_1, E_2, J_1, J_2)$ *solving the system of ten equations given by the value of unemployment and employment to workers [equations (15) to (18)], the value of filled jobs to firms [(11) and (12), with* $V=0$*], the free-entry condition (25), the FOC of the Nash bargains [(23) and (20)], and the budget constraint of the unemployment compensation systems (9).*

Proposition 1 establishes the conditions under which wage dispersion arises in equilibrium:

Proposition 1 *Let $b_1 \geq b_2$ and $\eta \leq 1$. If UI eligibility is automatic ($p = +\infty$) or $b_1 = b_2$ or $d = +\infty$ or $d = 0$, the Nash bargaining process yields to $w_1 = w_2$. If UI eligibility is not automatic ($p < +\infty$), $b_1 > b_2$, and $0 < d < +\infty$, then $w_1 > w_2$.*

Proof. See the Appendix ■

Given that wages can be renegotiated all the time, when eligibility follows automatically from employment all workers have the same threat point and are paid the same wage (cf. Fredriksson and Holmlund, 2001). Indeed, if an employer was to propose a lower wage to UA recipients, then once hired the latter would threaten to quit and search to obtain elsewhere the same wage as other employees. In contrast, when UI eligibility requires a minimum duration of contributions (provided that unemployment benefits decrease over time, i.e. $b_1 > b_2$ and $0 < d < +\infty$), the unemployed not entitled to UI have a lower threat point, which gives rise to wage dispersion.

Wage dispersion is an important feature here, as it creates an incentive for UA recipients to accept jobs in order to be re-entitled to UI benefits. We thus propose a new channel for the re-entitlement effect: the wage differential due to non-automatic eligibility. Endogenous search effort creates the same kind of incentives when eligibility is automatic (Fredriksson and Holmlund, 2001). However we believe our mechanism to be more relevant empirically. In most European countries, but also in the US, Canada, etc., there exists a minimum duration of employee contributions for eligibility for insurance benefits. Moreover, endogenous search effort has two unrealistic features: all types of workers are paid the same wage;[8] UA recipients search more effectively and find jobs at a higher rate than UI recipients. The empirical evidence does not support these predictions. For example, in France, former UI recipients get on average higher wages than former UA recipients (see section 3 of this paper and Rioux, 2001b), and both types of recipients have the same search effort and use the same number of search methods.[9]

A search model where wages are posted by firms can also produce a non degenerate wage distribution, as shown by Albrecht and Vroman (2005). In their framework, time-varying unemployment benefits are sufficient to lead to a distribution of worker reservation wages. However this does not give rise to wage dispersion with certainty: a degenerate wage distribution is also one of the possible equilibria.

3.1 Welfare

In the welfare analysis, we compare steady state solutions and ignore the transition among steady states. Let W_w denote the steady state utilitarian welfare of workers in unit of the consumption

[8] The alternative hypothesis made by Cahuc and Lehmann (2000) that wages are negotiated by unions gives the same degenerate wage distribution.

[9] Specifically, using the Labor Force survey and the Outcomes for RMI recipients Survey (*Enquête Sortants du RMI*, 1998), Rioux (2001a) finds that the proportion of benefit recipients actively searching for a job are the same for UA and UI recipients, and that among active job seekers, two thirds of both UA and UI recipients use between two and four search methods. These results, obtained when controlling for personal characteristics, are corroborated by other studies. For example, Schmitt and Wadsworth (1993) on British data, and Hughes, Peoples, and Perlman (1996) on US data find that the unemployment benefit level does not significantly affect search effort.

good:

$$W_w = v^{-1}\left(e_1 r E_1 + e_2 r E_2 + u_1 r U_1 + u_2 r U_2\right),$$

Substituting the explicit expression for the value functions (15)-(18) into W_w and using the steady state equilibrium conditions (5)-(7),

$$W_w = v^{-1}\left(e_1 v\left[w_1\left(1-\tau\right)\right] + e_2 v\left[w_2\left(1-\tau\right)\right] + u_1 v\left[b_1\right] + u_2 v\left[b_2\right]\right), \tag{26}$$

implying that $v(W_w)$ simplifies to a weighted average of instantaneous utilities.

Similarly let W_f denote the welfare of firms' owners

$$W_f = e_1 r J_1 + e_2 r J_2 + v r V.$$

Firms' owners do not participate in the labor market and are assumed to be risk-neutral.[10] Substituting (10)-(12) in W_f and using (5)-(7), and (25),

$$W_f = e_1\left(y - w_1\right) + e_2\left(y - w_2\right) - \theta u \gamma, \tag{27}$$

i.e. W_f simplifies to the sum of profits minus the total cost of posting θu vacancies.

We can then define the steady state utilitarian welfare function W as

$$W = W_w + W_f, \tag{28}$$

and net output Y by

$$Y = ey - \theta u \gamma, \tag{29}$$

i.e. Y simplifies to the sum of gross production net of the total cost of posting θu vacancies.

4 Estimation and calibration

The existing literature (see e.g. Fredriksson and Holmlund, 2001, Albrecht and Vroman, 2005, Coles and Masters, 2006) provides more examples of qualitative effects of unemployment compensation systems than precise quantifications. Analytical results are typically derived in cases where workers are assumed to be risk-neutral (Albrecht and Vroman, 2005, Coles and Masters, 2006) or when there is no discounting (Fredriksson and Holmlund, 2001), while numerical calibrations are used in more general cases, and they are often constrained by the availability of parameters from a number of external sources.

Here we go a step further and simulate the model for France using transition probabilities and earnings estimated on the 1994-2000 waves of the French sample of the ECHP. Being estimated on the same individuals and the same period, our parameter values are consistent with each other and moreover account for individual characteristics. However our 4-state model is more general and applies to any two-tier system with non-automatic eligibility. In order to show that our main results are also relevant to other countries, we calibrate our model for Denmark and the US using

[10] Alternatively, one could assume that the workers own the firms. However, under this assumption all potential conflicts of interests between workers and firms disappear, whereas we show in this paper that reforms to the unemployment compensation system have important distributional effects.

the UI eligibility rules and macroeconomic data. We choose these two countries because they display strongly diverse unemployment compensation systems. The Danish compensation system is known as one of the more generous among OECD countries. In contrast, in the US, the level of benefits and the maximum duration of UI entitlement are particularly low.

4.1 Estimation for France

4.1.1 The ECHP (1994-2000)

The ECHP contains detailed information on employment status, earnings, and individual characteristics. Each year in October, individuals over the age of 17 are asked to state their monthly labor market status (employed, unemployed, inactive) for each month of the previous calendar year. This allows us to reconstruct the individual (self-declared) labor market history of 9,686 individuals going back to January 1993. In addition, these individuals provide monthly information on the source of their earnings (wage, UA benefits, UI benefits, ...) and annual information on the amount of each type of earnings.

In principle, the data set directly provides monthly information on the entitlement status (UI or UA) of each unemployed individual. Moreover, the monthly level of each type of benefit could be computed as the annual amount divided by the number of months of receipt. However, the information on benefit type and on the annual amounts received is often missing,[11] and subject to significant measurement error when available. Given these limitations, we reconstruct information on the type and level of benefits received by applying the eligibility rules of the French legislation on unemployment compensation (see Pellizzari, 2006, and Lollivier and Rioux, forthcoming). The same method is used to determine whether employees are eligible for UI benefits in case of job loss.

The French UI eligibility rules were fairly complicated (see Table A1 in the Appendix), but they remained essentially unchanged over the period 1994-2000. Two points are worth noting. First, most unemployed are entitled to 30 months of benefits, even if eligibility for UI requires 4 months of employment during the 8 months preceding the unemployment spell, in which case the unemployed is entitled to 4 months. Second, if a UI recipient finds a job before exhaustion of benefits, she would automatically be eligible for UI benefits if she was to lose her new job. For this new unemployment spell, the benefit duration is equal to the maximum of her new entitlement and the remainder of her past entitlement.

The unemployed who exhaust their UI entitlement are eligible for a permanent (and flat) unemployment benefit (the Special Solidarity Allowance or *Allocation de Solidarité Spécifique*) provided they have worked at least five years during the ten years preceding their entry into unemployment. Because of this strong eligibility condition, this benefit is treated here as an insurance benefit, and the beneficiaries are considered as type-1 unemployed.

Finally, all the unemployed who fail to meet the UI eligibility criteria or have exhausted their

[11] For example, in December 1997, the number of individuals registered for unemployment insurance according to the UI agency (Unedic) was 2,351,549, while the corresponding estimate using the ECHP was roughly 30% lower, equal to 1,631,262. Similarly, 956,132 individuals were receiving UA benefits according to the UA agency (Cnaf), and only 385,809, i.e. 60% less, according to the ECHP.

entitlement[12] can still receive a permanent, means tested social assistance benefit, the RMI (*Revenu Minimum d'Insertion*), which is essentially added to the household income so as to reach a minimum income level. While the actual benefit received varies thus across households depending on their composition and income level, here we assume that each unemployed not entitled to UI receives the maximum benefit level.[13]

We then apply the French UI eligibility rules to the individuals -employed and unemployed- in our sample in order to construct monthly series of UI eligibility and entitlement. We first consider the employed workers of our sample. Any employee who has worked for at least 4 months during the preceding 8 months or whose past UI benefits are not exhausted, is eligible for UI benefits upon future job loss, and in our model this means being a type-1 employee. If neither of these conditions is satisfied, an employee losing her job is only eligible for UA benefits, and is thus a type-2 employee. Since the retrospective employment history goes back to January 1993, we can construct a monthly series of UI eligibility for the employed from September 1993 onwards.

Determining whether an unemployed worker of our sample is entitled to UI in a given month is somewhat more complicated since both her maximum benefit duration and her unemployment duration need to be known. While the latter is directly available in the data set, the former depends on the length of her contributions to UI during the 24 months preceding unemployment and has to be reconstructed using the monthly information on employment status. Since the retrospective employment history goes back to January 1993, this method allows us to reconstruct the UI entitlement status for all the individuals who entered unemployment after December 1994. In practice, we can also determine the UI entitlement status for an extremely large proportion of the individuals who entered unemployment during 1994,[14] and thus apply this method from January 1994. All the unemployed not eligible for UI benefits are considered as UA recipients (type-2 unemployed, in our model). In this way, we are able to reconstruct the monthly series of UI eligibility for 9,515 individuals from January 1994 to December 2000.

4.1.2 Transitions

In accordance with the legislation, and as represented in Figure 1, there exist 4 labor market states, but only six types of transitions, namely job separations for each type of employee, job findings for each type of unemployed, and changes in eligibility status for either the employed or the unemployed. We thus consider a 4-state homogeneous Markov model with 6 possible transitions. We impose a Cobb-Douglas matching function with constant returns to scale and parameter $\frac{1}{2}$, implying $q(\theta) = \theta^{-\frac{1}{2}}$.[15]

[12] Except those who are under the age of 25 and have no children.

[13] In December 1997, for example, two out of three beneficiaries received the maximum benefit level (Collin, 2000).

[14] For instance, if, when entering unemployment, the individual has worked at least 14 months since January 1993, then she is entitled to 30 months of benefits which is the maximum duration and this allows us to determine her UI eligibility status over the unemployment spell. We can also determine the monthly UI eligibility status during all the unemployment spell when the effective unemployment duration is shorter than the maximum benefit duration.

[15] For the choice of the elasticity of match with respect to unemployment, we refer in particular to Blanchard and Diamond (1989) and Burda and Wyplosz (1994). For the U.S., Blanchard and Diamond (1989) find an elasticity with respect to unemployment varying between 0.4 and 0.6 depending on the specification. For France, Burda and Wyplosz (1994) estimate a parameter close to 0.5.

We first show that the dynamic structure of the model provides a good description of the French labor market and reproduces well its main characteristics. To this end, we initially estimate the monthly transition probabilities across labor market states non parametrically and ignoring individual heterogeneity.[16] Since the steady state equilibrium conditions (5)-(7) are completely determined by the transition rates (s, p, d, $A\theta^{\frac{1}{2}}$), we can simulate the unemployment rate, the average unemployment duration, and the proportion of the unemployed who receive UI benefit payments, and compare them with the official figures provided by the French Institute of Statistics and the UI agency for 1994-2000. The model reproduces well the observed unemployment rate (11.37% versus 11.7%) and the average unemployment duration (15.72% versus 15.26%), and provides a fairly reasonable approximation for the UI recipiency rate (66.45% versus 55.2%).[17]

Our theoretical model applies to a representative individual and reforms to the unemployment compensation system must be simulated on this representative individual for equilibrium effects to be accounted for. We thus extend the basic model to allow for time-constant and time-dependant covariates, and model the transition probabilities by multinomial logit regressions. Let Y_t denote the state occupied at time t by an individual. The probability to transit from state i to j between dates $t-1$ and t is then

$$p_{ij}\left(X_t\right) = \Pr\left(Y_t = j \,|Y_{t-1} = i;\, X_t\right) = \begin{cases} \frac{\exp(X_t'\beta_{ij})}{1+\sum_{k\neq i}\exp(X_t'\beta_{ik})} & if\ i \neq j \\ \frac{1}{1+\sum_{k\neq i}\exp(X_t'\beta_{ik})} & if\ i = j \end{cases},$$

where X_t is a vector of individual characteristics (sex, age, level of education, number of children, citizenship) common to all individuals whatever their labor market status. The parameters β_{ij} are estimated by maximum likelihood (see Table A2 in the Appendix for the results). The effects of age, education, and sex have the expected sign. For instance, women and young workers experience a higher risk of losing their job than men and older workers.

The transition probability between states i and j for the representive individual (see Table 1) is then simply computed as an average of this transition across types of individuals. The transformation probability of type-2 jobs into type-1 jobs is quite high, 24%. As a consequence, a type-2 employee has a much higher probability of becoming eligible the next month than of losing her job (0.977%). The job finding probability is low, with only 6.5% of the unemployed going out of unemployment each month. Lastly, 3.17% of UI recipients exhaust their entitlement each month and become UA recipients.

4.1.3 Earnings

In order to compute the monthly wages in type-1 and type-2 jobs, we use the annually reported wages and the employment histories of workers. More precisely, we divide the annual wages by

[16] We find that $s = 0.816$, $A\theta^{\frac{1}{2}} = 6.36$, $d = 3.1$, and $p = 23$.

[17] Our model over-estimates the proportion of the unemployed entitled to UI. The fit of the UI recipiency rate to the official figure would be significantly improved if UI recipients were allowed to find jobs at higher rate than UA recipients or if the employees not eligible for UI were allowed to have a higher separation rate than those who are eligible. However these differences would be inconsistent with the assumption of a representative individual.

the number of months during which a given individual has occupied respectively a type-1 and a type-2 position, which gives w_{it} the wage paid in state i at date t. Then controlling for observed heterogeneity we estimate: $w_{it} = X_t'\alpha_i + \varepsilon_{it}, \quad i = 1, 2$. The effects of individual characteristics on wages present a familiar picture, with women receiving wages that are on average 29% lower than men in type-1 jobs, and 21.6% lower in type-2 jobs (Table A3, Appendix).

Computing the expected wage in state i for each individual and then averaging out, we obtain the monthly wage for the representative individual (see Table 1). As the entitlement status is related to job tenure, type-1 employees typically receive a better wage (€1366.6) than type-2 employees (€856.7). It is also worth noting that the average wage paid in type-2 jobs is above the legal minimum wage (€798 on average over 1994-2000), which motivates our assumption of a negotiated wage for type-2 jobs versus the alternative hypothesis of an exogenously determined wage.

The UI benefit received by a given unemployed individual in each month is constructed using the UI legislation. First, from the duration of contributions, the age, and the previous labor earnings, we infer the UI category each unemployed individual belongs to and the benefit paid at the beginning of the unemployment spell. Second, applying the rules of this UI category (Table A1), we simulate the sequence of UI benefits over time, $b_1(t)$. After a certain period of time, the benefit is reduced by a fixed fraction (15 or 17% depending on the category of benefits) in regular intervals. Controlling for observed heterogeneity, we estimate $b_{1t} = X_t'\mu + \omega_t$, and from the parameters $\widehat{\mu}$ we deduce b_1 for the representative individual (Table 1).[18]

Finally, each UA recipient is affected a monthly income b_2 corresponding to full RMI allowance (€323.6 in average in the period under consideration).

4.1.4 Calibration

The ECHP survey thus allows us to estimate five of the parameters (s, p, d, b_1, b_2) and three of the endogenous variables ($A\theta^{\frac{1}{2}}$, w_1, w_2) of the model (see Table 1).

Table 1: The estimated transitions and earnings for the representative individual (% and euros)

s	$A\theta^{\frac{1}{2}}$	d	p	w_1	w_2	b_1	b_2
0.977	6.5	3.17	24	1366.6	856.7	696.6	323.6

Source: French sample of the ECHP, Insee, 1994-2000.

However, it does not provide any information on the six remaining parameters, namely the cost of posting a vacancy (γ), the scale parameter of the matching function (A), the productivity (y), the discount rate (r), the relative risk aversion coefficient ($1 - \eta$), and the bargaining power of workers (β). For the model to be identified, we have to make additional assumptions on three of these parameters. We assume that $r = 0.01$, $\eta = -0.5$, and $A = 0.05$. The values chosen for r and η are standard in the literature. Then γ, β and y can be deduced so as to match the endogenous variables ($\theta^{\frac{1}{2}}$, w_1, w_2) using the chosen and estimated parameters. Table 2 presents the chosen and

[18] For detailed results, see Table A3 (Appendix). Women are shown to receive lower UI benefits than men. In addition, as benefits positively depend on the past wage, the observed benefit level increases with age and education.

deduced parameters for the representative individual. The value of β satisfies the Hosios (1990) rule.

Table 2: Other parameters for the representative individual

γ	A	y	β	r	η
561.81	0.05	1517	0.5	0.01	-0.5

Source: French sample of the ECHP, Insee, 1994-2000.

Using the estimated and deduced parameters, we simulate the three endogenous variables ($A\theta^{\frac{1}{2}}$, w_1, w_2) that helped us to calibrate the model and compare them to their estimated value. The job finding probability and the wage bargained by the employees not eligible for UI benefits are perfectly reproduced, while for those who are eligible the simulated wage is significantly lower than its estimated value (Table 3).[19] Finally we deduce the steady-state equilibrium number of individuals in each state and the equilibrium tax rate τ using equations (5)-(7) and the budget constraint (9) (Table 3).[20]

Table 3: The simulated variables for the representative individual

$A\theta^{\frac{1}{2}}$	w_1	w_2	u_1	u_2	u	$\frac{u_1}{u}$	e_1	e_2	τ
6.5	1237.8	856.7	8.66	4.4	13.06	66.34	85.79	1.14	6.958

Source: French sample of the ECHP, Insee, 1994-2000.

4.2 Calibration for Denmark and the U.S.

The calibration for Denmark and the U.S. uses the UI eligibility rules and macro data (average wage, unemployment rate, monthly separation rate, etc.). When possible, we compute the variables using the same sources (Statistics Denmark on the one hand and the Bureau of Labor Statistics on the other hand) and the same period of time (1994-2004).

4.2.1 Denmark

In Denmark, unemployment insurance is a voluntary scheme administered by the unemployment insurance funds. As we are interested in the effects of changes in the parameters governing unemployment insurance, we restrict the calibration exercise to those workers who are members of an insurance fund. To be entitled to UI benefits, an individual must have worked at least 52 weeks within the last three years and been a member of a fund for at least one year. The maximum duration of benefits has changed over the period 1994-2004, going from 7 years to 4 years.

[19] Here, again, the fit of the simulated w_1 (Table 3) to the estimated w_1 (Table 1) would be significantly improved if UI recipients were allowed to find jobs at higher rate than UA recipients or if the employees not eligible for UI were allowed to have a higher separation rate than those who are eligible.

[20] The unemployment rate amounts to 13.06% and two-third of the unemployed receive UI benefits. The employees not eligible for UI benefits in case of job loss represent only 1.31% of the employees, which is small but non surprising, considering that eligibility is very easy to obtain in France. In countries with a less generous unemployment compensation system, the proportion of employees not eligible for UI benefits would be higher, as for example for the U.S.

Then, $p = 0.0833$ and $d = 0.015$. The insured unemployed who fail to meet these criteria or have exhausted their UI entitlement can still receive social benefits administered by municipalities.

In addition to the UI eligibility rules, we use macro data over 1994-2004: $u = 5.48\%$, $Ew =$ 3671€, $b_1$1670€, and $b_2$768€ from the Statistics Denmark website. We follow Rosholm and Svarer (2004) and set the separation rate equal to 0.8% per month.[21] Finally, (A, r, β, η) are set at the same levels as for France.

Adding up (5) and (6) and replacing u, s, p, and d by their values, we find that the job finding probability ($A\theta^{\frac{1}{2}}$) is equal to 13.79%, which implies an average unemployment duration of 7.25 months. Then the productivity ($y = 4152$), the vacancy cost ($\gamma = 493.45$), and the wages bargained by the two types of employees ($w_1 = 3679.8$ and $w_2 = 2738.2$) can be deduced so as to match the endogenous variables $A\theta^{\frac{1}{2}}$ and Ew.

4.2.2 The U.S.

In most States in the U.S., an individual must have worked at least 52 weeks (one year) to be eligible for unemployment insurance and benefits can be paid for a maximum of 26 weeks (6 months). Then, $p = 0.0833$ and $d = 0.1666$. There is no unemployment assistance but different programs provide unemployment benefits for those who have exhausted their UI entitlement.[22] The unemployed not eligible for unemployment insurance or for these programs can receive government food subsidies in the form of food stamps or cash assistance. The social benefit level (b_2) is computed as the sum of food stamps, cash assistance, and benefits paid by the programs divided by the total number of uninsured unemployed.[23]

In addition, we use macroeconomic data coming from the Bureau of Labor Statistics over 1994-2004: $b_1 =$ \$949.47, $w_1 =$ \$2746.8, $s = 1.5\%$, and $A\theta^{\frac{1}{2}} = 27.02\%$.[24] Finally, ($A$, r, β, η) are set at the same levels as for France and Denmark. The productivity ($y = 3450$), the vacancy cost ($\gamma = 279.46$), and the wage of type-2 employees ($w_2 =$ \$2213.7) are then deduced so as to match the endogenous variables $A\theta^{\frac{1}{2}}$ and w_1.

5 Quantifying re-entitlement effects

This section quantifies re-entitlement effects for France, Denmark, and the U.S. To this purpose, we compare our model with a model as close as possible to ours but where re-entitlement is not at work. The model used for comparison is simply the standard Pissarides (2000) 2-state model (see the Appendix), where all the unemployed are indefinitely paid the same unemployment benefit, and all the employees have the same rights to unemployment benefits after a job separation and receive the same wage. Clearly, in that model, only the standard disincentive effect of unemployment

[21] The separation rate is estimated by Rosholm and Svarer (2004) on the CLS longitudinal database over the period 1981-1990. Unfortunately, we could not find an estimate of the monthly separation rate for the period 1994-2004.

[22] Extended benefits during times of high unemployment, Federal Supplemental Compensation program, Disaster Unemployment Assistance program, etc.

[23] All these figures are available at the websites of the U.S. Departments of Labor and Agriculture.

[24] The transition rates s and $A\theta^{\frac{1}{2}}$ are very close to that found by Fallick and Fleischman (2004) on the same period of time.

benefits is at work. In our two-tier system, instead, this standard effect is accompanied by a re-entitlement effect working in the opposite direction. The comparison between the two models is feasible because the Pissarides model is the limit of our model when $p \to +\infty$ and $b_1 = b_2$. To precisely perform this comparison, the unemployment benefit in the Pissarides model is set so as to match the *ex post* weighted average obtained in our model, i.e. $b \equiv \frac{u_1 b_1 + u_2 b_2}{u_1 + u_2}$. The remaining parameters (β, y, r, η, A, γ, s) are common to both models (see Tables 1 and 2).

A simple way of assessing the extent of re-entitlement effects is to compare the equilibrium under both models. Both w_1 and w_2 (and thus the average wage Ew) in our model are lower than $w_{Pissarides}$, the wage bargained over in the Pissarides model and interestingly, the difference between Ew and $w_{Pissarides}$ is non negligible (-1.39%), as shown in Table 4. Firms open more vacancies and thus unemployment is lower by almost one percentage point (-6.4%). In spite of this, workers are worse-off with re-entitlement effects, and in particular the welfare of the unemployed is significantly lower (-2.7%). Instead, firms are better-off by 5.9%. Finally, the presence of the re-entitlement effect lowers aggregate welfare by 0.9% and raises output by 2.9%. Tables 10 and 11 in the Appendix show that re-entitlement effects are also important in Denmark and the U.S.

Table 4: Comparison between our two-tier system and a unified system for France

	w	u	$A\theta^{\frac{1}{2}}$	E	U	W_w	W_f	W	Y	τ
Our model	1232.8	13.06	6.5	100.96	94.02	1013.45	122.9	1136.35	1194.7	6.96
Pissarides (2000)	1250.2	13.99	6	101.55	96.6	1030.5	116	1146.3	1191.3	7.36

A more intuitive way of understanding the extent of re-entitlement effects is to compare the impact of a 10% increase in both b_1 and b_2 in our model with a 10% increase in b in the Pissarides model (see Table 5). For France, the re-entitlement effect lowers by 15.4% the rise in the average wage and by 25.4% the rise in unemployment following a 10% increase in benefit levels. The size of the effect is comparable for the U.S. (11.3% and 31.1% respectively for wages and unemployment), and smaller for Denmark (8.5% and 17.4% respectively for wages and unemployment).

Table 5: Quantifying re-entitlement for France, Denmark, and the U.S.

	w			u		
	F	DK	U.S.	F	DK	U.S.
10% increase in b_1 and b_2 (our model)	1.45	0.78	0.79	5.52	5.68	2.71
10% increase in b (Pissarides, 2000)	1.71	0.84	0.89	7.4	6.88	3.93
Difference (%)	15.4	8.5	11.3	25.4	17.4	31.1

The observed differences in the size of the effect for these three countries raise the issue of whether one could directly infer the extent of re-entitlement effects in a given country from the parameters (b_1, b_2, d, p) characterizing its unemployment compensation system. The following simulations show that this is unlikely to be the case, because the size of the effect varies non-monotonically with respect to some of these parameters.

Figure 2 shows how the size of the re-entitlement effect on wages –measured as the ratio of the expected wage in our model, Ew, to the wage in the equivalent Pissarides (2000) model, $w_{Pissarides}$–

varies with b_2, p, and d in the French case.[25]

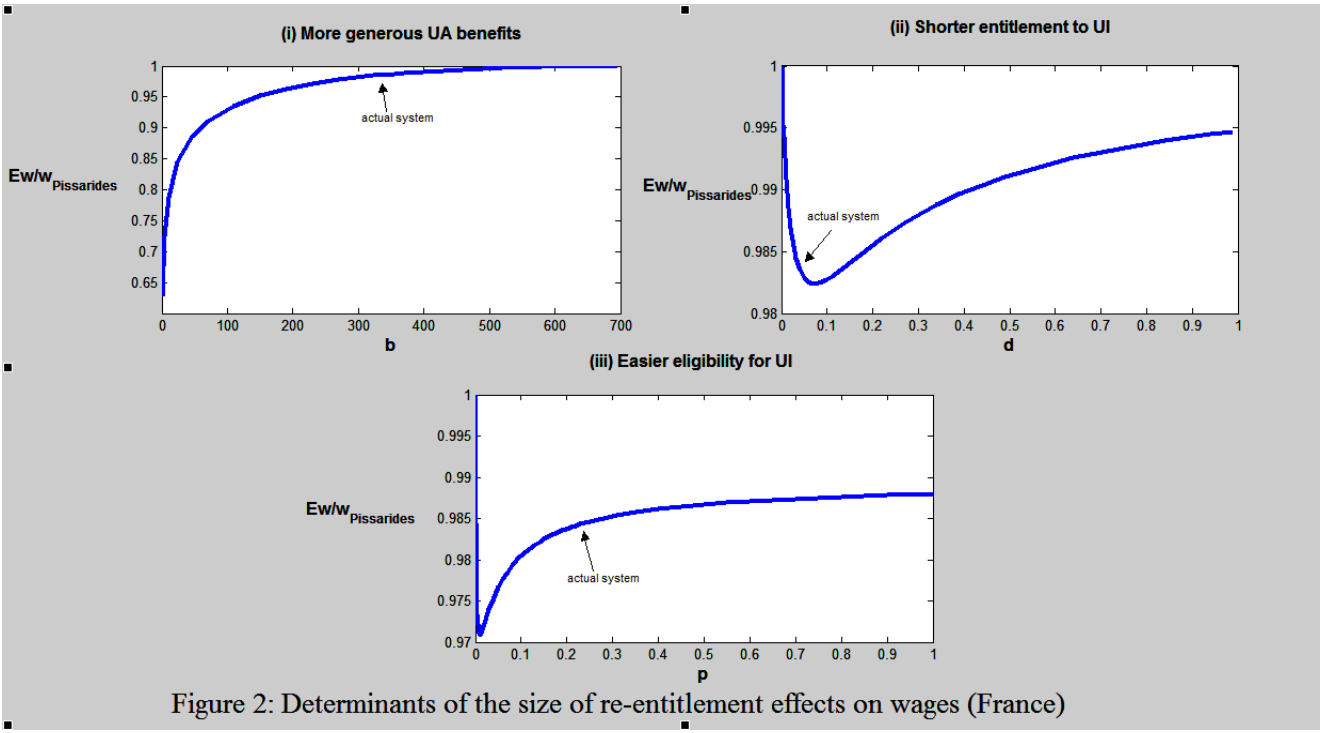

Figure 2: Determinants of the size of re-entitlement effects on wages (France)

Panel (i) shows that the re-entitlement effect monotonically decreases with b_2 and vanishes (i.e. $Ew/w_{Pissarides} = 1$) for $b_2 = b_1$, as already shown in Proposition 1. Indeed, if $b_1 = b_2$, the eligibility and entitlement rules become irrelevant, and $w_1 = w_2 = w_{Pissarides}$. Instead, whenever the two-tier system is not degenerate (i.e. $0 < d < +\infty$ and $0 < p < +\infty$), a decrease in b_2 relative to b_1 makes type-2 unemployment less attractive, which in turn increases the wedge between w_1 and w_2, and drives down Ew in the two-tier system relative to $w_{Pissarides}$.

Panel (ii) shows that a shorter entitlement to UI first increases and then decreases the size of the re-entitlement effect,[26] with a turning point at around 13 months. First, for long enough UI durations (i.e. for d sufficiently small), the unemployed spend on average so few periods in type-2 unemployment that the values of U_1 and U_2 are similar, and thus the two-tier system generates little incentives for the type-2 unemployed to accept lower wages. As d increases, the future expected time spent in type-1 unemployment relative to type-2 unemployment becomes increasingly different for individuals currently in different types of unemployment, which increases $Ew/w_{Pissarides}$. However, for d sufficiently high, both types of unemployed spend very short periods of time in type-1 unemployment in the future, and then $Ew/w_{Pissarides}$ starts decreasing.

Finally, the re-entitlement effect displays the same type of pattern with respect to p (see Panel (iii)), except that the turning point comes at values of p smaller than those commonly observed,[27]

[25] Thus, for each point in the set of parameters, we need to compute the equilibrium of our economy and the equilibrium of the corresponding Pissarides (2000) economy. The qualitative shape of the curves for Denmark and the U.S. is the same, except for different turning point values for d and p.

[26] The re-entitlement effect vanishes for $d = 0$ since in that case the economy consists only of type-1 workers which are paid $w_1 = w_{Pissarides}$, and for $d = +\infty$, as shown in Proposition 1.

[27] Corresponding to employment requirements for UI entitlement of 8.3 years for France, 20 years for Denmark, and 4 years for the U.S.

implying that we expect the re-entitlement effect to be increasing in the requirement for UI entitlement.

6 Reforming unemployment compensation

We next simulate the effects on unemployment, wages, taxes, welfare, and output, of different reforms "at the margin" to the unemployment compensation system. We examine in turn four types of reforms that would make the unemployment compensation system more generous: (i) an increase in the insurance benefit level; (ii) an increase in the assistance benefit level; (iii) an increase in the duration of UI entitlement; and finally (iv) a reduction in the employment duration required for UI eligibility. The specific reforms under consideration within each country have all been designed to produce the same increase in the expected utility of an unemployed worker.

6.1 France

Table 6: Reforms to French unemployment compensation: parameter values

Reform	before	after	% change
(i) 20€ increase in UI benefit levels	$b_1 = 696.58$	$b_1 = 716.58$	2.87
(ii) 3.95€ increase in UA benefit levels	$b_2 = 323.6$	$b_2 = 327.55$	1.22
(iii) 5.5-week increase in UI benefit duration	$d = 3.17$	$d = 3.052$	-3.73
(iv) 13-week reduction in the employment spell required for UI	$p = 0.6208$	$p = 0.8767$	157.7

Table 7: Reforming French unemployment compensation

	w_1	w_2	$A\theta^{\frac{1}{2}}$	u_1	u_2	u	$\frac{u_1}{u}$	τ
initially	1237.8	856.7	6.5	8.66	4.39	13.06	66.34	6.96
(i) raising b_1	1241.1	847.6	6.44	8.71	4.46	13.16	66.14	7.14
(ii) raising b_2	1238.7	860.7	6.48	8.68	4.42	13.10	66.27	6.99
(iii) lowering d	1239	852.9	6.47	8.8	4.31	13.11	67.09	7.02
(iv) raising p	1238.6	803	6.34	8.86	4.48	13.35	66.41	7.11

Table 8: Reforming French unemployment compensation: welfare

	U_1	U_2	E_1	E_2	W_w	W_f	W	Y
initially	95.8	90.71	100.98	100.02	1013.45	122.9	1136.35	1194.7
(i) raising b_1	95.96	90.68	101.07	100.07	1015.16	121.35	1136.51	1194.4
(ii) raising b_2	95.86	90.84	101.01	100.07	1014.28	122.5	1136.78	1194.6
(iii) lowering d	95.87	90.70	101.02	100.05	1014.4	122.3	1136.7	1194.6
(iv) raising p	95.78	90.94	100.94	100.62	1012.82	122	1134.82	1193.8

Note: U_1, U_2, E_1, and E_2 are measured with respect to a reference value $v(W_w) \equiv 100$ before the reform.

For France, we take as a benchmark a 20€ increase in the unemployment insurance benefit.[28]

[28] We have chosen a small increase in b_1 in order to maintain our discrete time interpretation of the transition

The parameters of the four reforms under consideration are presented in Table 6, while their impact is presented in Table 7 (for unemployment rates, wages, job finding rate, recipiency rate, and tax rate) and Table 8 (welfare).

6.1.1 Raising insurance benefits by 20€

Raising the insurance benefit b_1 by 20€ improves the threat point of UI recipients, which raises the wage of the employees eligible for UI benefits by 0.26%. A type-2 employee eventually gaining UI eligibility is now also paid a better wage and receives a higher UI benefit upon future separation. As a consequence, getting a type-2 job becomes more attractive in the first place, which puts downward pressure on w_2 (-1.06%). The large negative impact on w_2 and the small positive impact on w_1 suggest that re-entitlement effects are quantitatively relevant. The average wage increases as a result of the reform and firms choose to open fewer vacancies, which results in a higher unemployment rate (+0.88%). In addition, more UI recipients tend to exhaust their entitlement and start receiving assistance benefits, which translates into a lower equilibrium UI recipiency rate ($\frac{u_1}{u}$).

Unsurprisingly, the type-1 unemployed benefit the most from an increase in b_1, followed by type-1 employees, who would enjoy higher b_1 upon job loss. Type-2 employees are the next in line and only slightly better-off, as they first have to gain eligibility before being able to enjoy higher wages and higher benefits upon job loss. Yet the type-2 unemployed lose from this reform, both because of a lower unemployment exit rate and lower wages. On the whole, despite lower employment and UI recipiency rate, the utilitarian welfare of workers (W_w) is slightly higher. By contrast, firms experience a 1.3% decline in their welfare due to higher wages. Yet aggregate welfare (W) increases and net output (Y) declines.[29]

6.1.2 Raising assistance benefits

Consider next a 3.95€ increase in b_2. This strengthens the threat point of UA recipients (U_2) in the bargaining process and enables them to negotiate a wage w_2 higher by 0.47%. In addition, from equation (15), this reform slightly improves the threat point of UI beneficiaries who negotiate a wage higher by 0.07%. The rise in w_1 is much smaller than the rise in w_2 since UI entitlement is only lost with probability 0.0317 each month. Also, the elasticity of w_2 with respect to b_2 (0.39) is much bigger than the elasticity of w_1 with respect to b_1 (0.09). Then, both wages being higher, firms open fewer vacancies, and θ falls. Unsurprisingly, a higher unemployment rate (+0.23%) is thus associated to this reform. Thus more UI recipients exhaust their entitlement and the UI recipiency rate falls.

In welfare terms, UA recipients are those who benefit the most, as they receive a higher benefit. This leads their expected utility to rise with elasticity 0.12. For the three other groups, the pos-

probabilities: with a larger increase in b_1, the utility comparable reduction in the employment spell required for UI would have been reached for $p > 1$.

[29] Net output is given by $Y = ey - \theta u\gamma$. As UI benefits become more generous, both the value of production ey and the cost of vacancies $\theta u\gamma$ decrease. When the initial unemployment compensation system is generous, the fall in output dominates and net output declines.

sibility of receiving higher UA benefits in the future quantitatively dominates the negative effects associated to higher taxes and/or lower transitions into employment. Moreover, the groups whose transition rate from their current state into social assistance is higher benefit more from the reform.

In contrast with the increase in insurance benefits, raising assistance benefits thus improves the situation of all four groups of workers.[30] Another important difference is that producing a given improvement in the expected utility of an unemployed is much cheaper by raising b_2 than by raising b_1 (a 0.44% instead of a 2.9% associated increase in taxes). In all other respects, the two policies are similar, as they both increase the utilitarian welfare of workers and total welfare, while worsening the welfare of firms and reducing (to a small extent) total output.

6.1.3 Increasing the duration of UI entitlement

Consider now a 5.5-week increase in UI benefit duration from the initial 137-week duration. Similarly as with the increase in b_1, this reform makes employment more attractive for UA recipients, while UI beneficiaries are now less eager to accept a job. The re-entitlement effect thus explains why w_2 falls, while w_1 only increases slightly after this large increase in duration. We unsurprisingly observe a fall in UA recipients (u_2) accompanied by a rise in UI recipients (u_1). As the latter is bigger than the former, unemployment rises, but less than after the increase in b_1.

The welfare effects are qualitatively similar to those produced by the change in b_1. The type-2 unemployed lose from the reform, but less than after the increase in b_1, while all the other groups of workers gain. More generally, while both raising the UI benefit level and extending entitlement are two ways of making the UI system more generous, our results show that extending entitlement may be preferable. Extending entitlement is much cheaper than raising b_1, both in terms of the associated tax rise and additional cost per unemployed.[31] Moreover, the increase in total welfare is higher, while the decrease in output and in the value of type-2 unemployment is lower.

6.1.4 Reduction in the employment spell required for UI eligibility

We next study the effect of a reduction in the employment spell required for UI entitlement from 18 to 5 weeks. Easier eligibility makes the type-2 unemployed more eager to get a job, as they expect to become eligible for UI benefits much more rapidly. This puts downward pressure on the negotiated wage and leads to a 6.3% decline in w_2. At the same time, the type-1 unemployed enjoy initially a better threat point, given that access into type-1 employment is now much easier after exhaustion of their UI rights. For this reason, w_1 slightly increases. Despite the strong decline in w_2, easier eligibility raises the proportion of UI recipients and thus the average threat point of an unemployed worker. As a result, firms end up paying on average slightly higher wages and opening less vacancies, which in turn translates into a 2.26% rise in unemployment.

Turning to welfare, type-2 employees are better-off because of the future gains associated to their much faster access into type-1 employment outweight the fall in their present income (w_2).

[30] However, this reform is not Pareto-improving for workers as the associated increase in type-2 unemployment implies that more workers end-up in a low utility state.

[31] Raising b_1 costs 12.38€ per unemployed and requires a 2.94% increase in taxes, while extending entitlement costs only 2.8€ per unemployed and requires a 0.84% increase in taxes.

The same type of argument applies to type-2 employees, even though with smaller associated gains because both the fall in w_2 and the faster access into type-1 employment are more heavily discounted. However, the other two groups of workers actually lose from this reform due to a lower probability of finding a job and/or a higher tax rate.

More importantly, while this reform –as all the other reforms under consideration– ends up lowering output and firms' welfare, easier eligibility is the only reform which has the specific feature of lowering also the utilitarian welfare of workers and social welfare.[32] This shows that alternative ways of rendering unemployment compensation more generous may not only differ in terms of the identity of the winners and losers, but may actually also result in opposite aggregate welfare effects. Intuitively, the French unemployment compensation system may actually be already too generous in the eligibility dimension, which would explain why easier eligibility lowers welfare. This issue will be studied in detail in section 6 when we identify the characteristics of the optimal unemployment compensation system for France.

6.2 Denmark and the U.S.

This section studies reforms to the Danish and U.S. unemployment compensation systems and relates them to our findings for France. For comparison purposes, the benchmark reforms in Denmark and the U.S. consist respectively in a 20€ and 30$ increase in b_1. As in the French case, alternative reforms are designed to produce the same increase in the expected utility of an unemployed worker within each given country. Tables 12 and 13 in the Appendix report the values of the parameters of the four reforms under consideration, while Tables 14 and 15 report the impact of the reforms.

Although the impact of the reforms shares many common qualitative features across countries,[33] some differences must be noted. First, all four ways of rendering unemployment compensation more generous end up producing an increase in U.S. net output ($Y = ey - \theta u \gamma$), while Y remains constant in Denmark and slightly declines in France. The differential increase in U.S. net output comes from the fact that its initial unemployment compensation system is less generous in all four dimensions than the two other systems:[34] for initially less generous unemployment compensation systems, an increase in the generosity of the system reduces instantaneous output ey to a lower extent than the associated decline in vacancy costs $\theta u \gamma$.

Finally, an important difference among the three countries resides on the opposite welfare impact of easier eligibility. More precisely, easier eligibility reduces both workers' utilitarian welfare and

[32] The same type of result applies for small increases in p.

[33] In particular, in all three countries, (i) all the reforms produce higher unemployment, taxes and a lower firms' welfare; (ii) raising UI benefits and increasing the duration of UI entitlement produce opposite sign variations for w_1 and w_2, and increase utilitarian welfare W_w and aggregate welfare W; (iii) raising UA benefits increases both w_1 and w_2, improves the welfare of each group of workers, utilitarian welfare, and aggregate welfare; and (iv) easier eligibility produces opposite sign variations in w_1 and w_2, and a higher utility for type-2 workers (both employed and unemployed).

[34] The level of UI benefits relative to productivity (b_1/y) is close to 0.3 for the U.S., and to 0.4 and 0.46 respectively for Denmark and France. The difference in the generosity of UA benefits is even larger, as b_2/y is close to 0.07 for the U.S., and to 0.18 and 0.21 respectively for Denmark and France. Finally, the U.S. requires the longest employment period in order to get eligilibity (together with Denmark) and has the shortest UI entitlement.

total welfare in France, while for Denmark workers' welfare increases but total welfare still declines, and for the U.S. both variables actually end up rising. This differential impact is likely again to be linked to the difference in the initial degree of generosity. France has the easiest initial eligibility requirement (roughly 4 months), and while the U.S. and Denmark share the same requirement (one year), the Danish system is much more generous in all other dimensions. Thus, one would expect that France should move towards tighter eligilibity in order to improve welfare, while the U.S. should move in the opposite direction. In order to properly address this type of issue, the next section identifies the welfare-maximizing unemployment compensation systems for these three countries.

7 Optimal unemployment compensation

While the analysis of reforms at the margin is interesting because they are likely to be easier to implement from a political economy perspective than "large" reforms, we here also provide a numerical illustration of how the current unemployment compensation systems may stand with respect to the optimal systems. Table 9 compares for each of the three countries the current system with the system that maximizes social welfare W. As our model is quite stylized, the specific values characterizing the optimal systems should be interpreted with care. More specifically, we are interested only in assessing whether the unemployment compensation systems should be more generous or not along the four specified dimensions (b_1, b_2, d, p).[35]

In all three countries, the optimal system is a two-tier system with non-automatic UI eligibility.[36] Compared with the current system, both unemployment benefits levels are higher in the optimal system, and this finding applies to the three countries. For instance, in the case of France, the optimal b_1 and b_2 are higher by respectively 22% and 75%. The optimal time profile of benefits is decreasing, a result obtained in most previous studies (Hopenhayn and Nicolini, 1997, Fredriksson and Holmlund, 2001, Coles and Masters, 2006, Pavoni, 2009). However, for all three countries, the optimal slope of the decrease is flatter than the current slope, with an optimal ratio b_1/b_2 in the interval [1.5, 1.6].[37] As a result, the optimal wage differential between type-1 and type-2 employees is also lower ($\frac{w_1}{w_2} \simeq 1.067$ in the three countries).

For France and Denmark, currently characterized by long UI entitlements, the decrease in incentives generated by the higher level of compensation and the flatter time-profile of benefits is partly compensated for by a shorter optimal duration of UI benefits. While the decrease in duration is small in France, it is much more important in Denmark because the current Danish system is particularly generous along this dimension. In contrast, for the U.S., the optimal duration of UI entitlement is longer by 9 months than the current duration, which implies an optimal duration

[35] We expect the optimal unemployment compensation systems to be more generous overall than the existing systems. Indeed, given that our measure for optimality is $W = W_w + W_f$, and that W_w is generally at least ten times bigger that W_f, the evolution of W is mainly driven by the evolution of W_w. As W_w generally increases with the generosity of the unemployment compensation system, we expect the same to apply to W in most cases.

[36] The welfare-maximizing two-tier system leads for each of the countries to a higher W than the best one-tier system and than the best two-tier system with automatic eligibility.

[37] This optimal ratio is smaller than that found by Fredriksson and Holmlund (2001) for the U.S. (close to 2), but higher than that found by Coles and Masters (2006) also for the U.S.

Table 9: Current and optimal unemployment compensation.

	France		Denmark		U.S.	
	Current	Optimal	Current	Optimal	Current	Optimal
b_1	696.6	849	1670	2827	949.5	2263
b_2	323.6	566	768	1754	231.2	1422
d	3.17	3.96	1.5	6.04	16.66	6.4
p	24	1.58	8.33	1.73	8.33	2.3
W	1136	1154	3624	3661	2586	2844
W_w	1013	1056	3375	3483	2317	2729
W_f	122.9	98	249	177	269	115
Y	1195	1186	3718	3705	2839	2894
$\frac{u_1}{u}$	66.1	46.2	89.3	54.6	57.9	54.3

close to 15 months. This last result is, for example, very different from that obtained by Fredriksson and Holmlund (2001), who find an optimal duration of UI entitlement even shorter than the current duration in the U.S. (17 versus 26 months). This difference comes from the consideration of non-automatic eligilibity in our case.

In all three countries, not only it is optimal to impose a minimum employment duration for UI eligibility, but the optimal requirement is much stronger than the current one.[38] For example, French workers should be employed for 5.3 years (instead of 4 months) before gaining entitlement to UI, and U.S. workers for 3.6 years (instead of for 1 year). In our numerical illustration, the optimal requirement for entitlement is thus particularly long. This is likely to be related to our assumption of exogenous search intensity, in the sense that we ignore here how the length of the entitlement period affects job search decisions and job acceptance decisions. In other words, a shorter entitlement period may provide incentives to search more intensively for a job, something which is missing in this model.

In all three countries, all groups of workers would improve their situation by moving from the current to the optimal system. However, the welfare gains are much bigger in the U.S., where the shift to the optimal system is even Pareto-improving.[39]

8 Conclusion

Our paper analyzes the implications of non-automatic eligibility in an equilibrium matching model with Nash bargaining. We show that time-varying benefits and non automatic eligibility generate re-entitlement effects through wages, and end up producing a two-point equilibrium wage distribution. Moreover, as the wage differential exclusively comes from the re-entitlement effect, wage dispersion becomes a natural measure of the extent of re-entitlement effects

We simulate our model for France using transition probabilities and earnings estimated on the same individuals and the same period controlling for observed heterogeneity. We also calibrate our

[38] As a consequence of the stronger eligibility requirement, the proportion of the unemployed not entitled to UI is higher in the optimal system, but those unemployed are better-off since they receive a higher benefit.

[39] For the U.S., U_2 in the optimal system is larger than E_1 in the initial system.

model for Denmark and the US, two countries with strongly diverse unemployment compensation systems.

Next we quantify the size of the re-entitlement effect by comparing the impact of a same increase in benefit levels in our model and in a model in all points similar to ours except for time-varying benefits and non-automatic eligibility. We find that the re-entitlement effect lowers significantly the increase in wages and unemployment in all three countries considered.

Finally, we show that in all three countries the optimal compensation system is characterized by time-decreasing unemployment benefits and non-automatic eligibility for UI, with higher levels of both UI and UA benefits, a smaller decrease in benefits over time, and a longer employment requirement for UI eligibility than in the current system. However, while the welfare gains generated by moving from the current system to the optimal system are large for the U.S., they are found to be small in France and Denmark.

Appendix

Proof of Proposition 1 For $p < +\infty$, $b_1 > b_2$, and $0 < d < +\infty$, Proposition 1 is proved by contradiction. Assume $w_1 \leq w_2$. Subtracting (12) from (11) gives: $(r+p+s)(J_1 - J_2) = w_2 - w_1$. Then $w_1 \leq w_2$ implies that $J_1 \geq J_2$. The solutions to the Nash bargaining problems are given by: $E_1 - U_1 = (1-\tau)^{\eta}\left(\frac{\beta}{1-\beta}\right) J_1 w_1^{\eta-1}$ and $E_2 - U_2 = (1-\tau)^{\eta}\left(\frac{\beta}{1-\beta}\right) J_2 w_2^{\eta-1}$. Then subtracting the second equation from the first yields to: $E_1 - U_1 - E_2 + U_2 = (1-\tau)^{\eta}\left(\frac{\beta}{1-\beta}\right)\left[J_1 w_1^{\eta-1} - J_2 w_2^{\eta-1}\right]$. Since $\eta \leq 1$, the assumption $w_1 \leq w_2$ implies that $E_1 - U_1 - E_2 + U_2 \geq 0$.

Next, subtracting (18) from (17) and rearranging gives:

$$(r+p+s)(E_1 - U_1 - E_2 + U_2) = v\left[w_1(1-\tau)\right] - v\left[w_2(1-\tau)\right] - (r+p)(U_1 - U_2) \qquad (30)$$

From (15) and (16) assuming that $b_1 > b_2$, we get: $U_1 - U_2 > 0$. Therefore if $w_1 \leq w_2$, it follows that the right-hand side of (30) is negative. This implies that $E_1 - U_1 - E_2 + U_2 < 0$, which is in contradiction with the assumption $w_1 \leq w_2$. Thus, $w_1 > w_2$ ■

Table A1 - Unemployment insurance rules in France

A – **January 1994 – December 1996**

Category	Contribution duration	Age	Duration at full rate (months)	Stage duration (months)	% of decrease	Compensation duration (months)
0	< 4 months during the last 8 months	Indifferent	0	0	0	0
1	4 months during the last 8 months	Indifferent	0	4	25	4
2	6 months during the last 12 months	Indifferent	4	4	15	7
3	8 months during the	< 50 years	4	4	17	15
4	last 12 months	≥ 50 years	7	4	15	21
5'	14 months during the	< 25 years	7	4	17	30
5	last 24 months	25-50 years	9	4	17	30
6		≥ 50 years	15	4	15	45
7	27 months during the	50-55 years	20	4	15	45
8	last 36 months	≥ 55 years	27	4	8	60

B – **January 1997 – June 2001**

Category	Contribution duration	Age	Duration at full rate (months)	Stage duration (months)	% of decrease	Compensation duration (months)
0	< 4 months during the last 8 months	Indifferent	0	0	0	0
1	4 months during the last 8 months	Indifferent	4	0	0	4
2	6 months during the last 12 months	Indifferent	4	6	15	7
3	8 months during the	< 50 years	4	6	17	15
4	last 12 months	≥ 50 years	7	6	15	21
5	14 months during the	< 50 years	9	6	17	30
6	last 24 months	≥ 50 years	15	6	15	45
7	27 months during the	50-55 years	20	6	15	45
8	last 36 months	≥ 55 years	27	6	8	60

Table A2 - Transitions

	s		$A\theta^{1/2}$		p		d	
Constant	-3.713	(0.045)	-2.215	(0.04)	-1.192	(0.048)	-3.156	(0.1)
Female	0.197	(0.034)	-0.313	(0.033)	0.019	(0.038)	0.185	(0.077)
Male	*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Age < 30	*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Age 30-40	-0.916	(0.046)	-0.361	(0.042)	0.021	(0.054)	0.050	(0.104)
Age 40-50	-1.436	(0.049)	-0.594	(0.046)	0.016	(0.056)	0.050	(0.107)
Age > 50	-1.647	(0.064)	-1.689	(0.07)	0.037	(0.075)	-0.237	(0.109)
No diploma	*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Vocational diploma	-0.254	(0.044)	0.324	(0.041)	0.045	(0.051)	-0.262	(0.09)
High school graduate	-0.465	(0.057)	0.298	(0.053)	0.028	(0.06)	-0.336	(0.128)
College graduate	-0.903	(0.057)	0.301	(0.052)	0.065	(0.059)	-0.639	(0.141)
No child	*Ref.*		*Ref.*		*Ref.*		*Ref.*	
1 child	-0.113	(0.045)	-0.136	(0.042)	-0.030	(0.05)	0.038	(0.099)
2 children	-0.145	(0.056)	-0.213	(0.052)	-0.009	(0.062)	-0.172	(0.124)
≥ 3 children	0.056	(0.084)	-0.266	(0.081)	-0.001	(0.087)	0.134	(0.173)
French citizenship	*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Other citizenship	0.026	(0.057)	0.010	(0.052)	0.056	(0.06)	-0.166	(0.121)
N° of individuals	9763							

Source: French sample of the ECHP, Insee, 1994-2000. Estimation by maximum likelihood. Standard errors are in parentheses. Reference: a man, aged less than 30, with no diploma, French citizen, and without children.

Table A3 - Wages and UI benefits

	w_1		w_2		b_1	
Constant	7.887	(0.266)	6.817	(0.243)	5.356	(0.15)
Female	-4.853	(0.181)	-2.107	(0.202)	-2.007	(0.116)
Male	*Ref.*		*Ref.*		*Ref.*	
Age < 30	*Ref.*		*Ref.*		*Ref.*	
Age 30-40	2.807	(0.254)	1.432	(0.291)	0.364	(0.152)
Age 40-50	5.744	(0.249)	1.495	(0.325)	1.753	(0.161)
Age > 50	8.117	(0.278)	2.260	(0.466)	2.913	(0.215)
No diploma	*Ref.*		*Ref.*		*Ref.*	
Vocational diploma	2.327	(0.243)	0.891	(0.251)	0.816	(0.147)
High school graduate	6.173	(0.3)	1.577	(0.315)	2.378	(0.189)
College graduate	10.855	(0.273)	4.149	(0.302)	4.198	(0.192)
No child	*Ref.*		*Ref.*		*Ref.*	
1 child	0.648	(0.23)	-0.255	(0.253)	0.298	(0.153)
2 children	0.562	(0.213)	-0.949	(0.361)	0.111	(0.184)
≥ 3 children	0.313	(0.472)	-1.296	(0.438)	-0.143	(0.285)
French citizenship	*Ref.*		*Ref.*		*Ref.*	
Other citizenship	-0.838	(0.365)	-0.375	(0.312)	-0.107	(0.21)
N° of individuals	6.7433					

Source: French sample of the ECHP, Insee, 1994-2000. Wages and benefits are in € divided by 100. Estimation by maximum likelihood. Reference: a man, aged less than 30, with no diploma, French citizen, and without children.

A version of Pissarides (2000) In the standard Pissarides model, workers are in one of two states: employed or unemployed. All the unemployed receive the same benefit b and all the employees are paid the same wage w. The expected discounted values of employment and unemployment

are respectively given by $rE = v\left[w(1-\tau)\right] + s(U-E)$ and $rU = v[b] + A\theta q(\theta)(E-U)$. Then in the steady-state equilibrium, $u = \frac{s}{s+A\theta q(\theta)}$, $e = \frac{A\theta q(\theta)}{s+A\theta q(\theta)}$, and $\tau = \frac{bs}{wA\theta q(\theta)}$.

Quantifying the re-entitlement effect for Denmark and the U.S. The equilibrium values in our model and in the equivalent Pissarides (2000) model are given in Tables 10 and 11:

Table 10: Comparison between our two-tier system and a unified system (Denmark)

	w	u	$A\theta^{\frac{1}{2}}$	E	U	W_w	W_f	W	Y	τ
Our model	3671	5.48	13.79	100.22	96.30	3375.71	248.79	3624.5	3718.5	2.49
Pissarides (2000)	3690.6	5.8	12.99	100.39	97.11	3388.93	241.47	3630.4	3717.9	2.62

Table 11: Comparison between our two-tier system and a unified system for the (U.S.)

	w	u	$A\theta^{\frac{1}{2}}$	E	U	W_w	W_f	W	Y	τ
Our model	2712.5	5.26	27.02	100.35	94.16	2316.72	269.48	2586.2	2839.3	1.32
Pissarides (2000)	2829.5	6.33	22.2	102.9	98.83	2440.12	232.48	2672.6	2882.9	1.53

Reforms to the Danish and US compensation systems ..

Table 12: Parameter values for the reforms to Danish unemployment compensation

Reform	before	after	% change
(i) 20€ increase in the UI benefit level	$b_1 = 1670$	$b_1 = 1690$	1.2
(ii) 22.51€ increase in UA benefit level	$b_2 = 768$	$b_2 = 790.51$	2.9
(iii) 4-month increase in UI benefit duration	$d = 1.5$	$d = 1.416$	-5.6
(iv) 20.5-week reduction in the employment spell required for UI	$p = 8.33$	$p = 13.28$	59.41

Table 13: Parameter values for the reforms to U.S. unemployment compensation

Reform	before	after	% change
(i) 30$ increase in the UI benefit level	$b_1 = 949.5$	$b_1 = 979.5$	3.16
(ii) 2.23$ increase in UA benefit level	$b_2 = 231.2$	$b_2 = 233.43$	0.96
(iii) 5-week increase in UI benefit duration	$d = 1.66$	$d = 1.63$	-2.16
(iv) 5.5-week reduction in the employment spell required for UI	$p = 8.33$	$p = 9.31$	11.79

Table 14: Reforming Danish unemployment compensation

	w_1	w_2	u	$\frac{u_1}{u}$	U_1	U_2	E_1	E_2	W_w	W	Y
initially	3680	2738	5.48	89.35	96.88	91.71	100.24	98.28	100	3624.5	3718.52
reform (i)	3683	2727	5.51	89.3	96.95	91.68	100.28	98.29	100.04	3625.6	3718.53
reform (ii)	3681	2766	5.5	89.32	96.91	91.94	100.26	98.38	100.02	3625.2	3718.53
reform (iii)	3681	2731	5.5	89.85	96.91	91.69	100.26	98.29	100.02	3625.1	3718.53
reform (iv)	3680.4	2601	5.54	89.57	96.89	92.03	100.24	98.75	100.01	3624.2	3718.52

Note: U_1, U_2, E_1, and E_2 are measured with respect to a reference value $v(W_w) \equiv 100$ before the reform.

Table 15: Reforming U.S. unemployment compensation

	w_1	w_2	u	$\frac{u_1}{u}$	U_1	U_2	E_1	E_2	W_w	W	Y
initially	2747	2214	5.26	57.9	95.89	91.87	100.45	98.86	100	2586.2	2839.3
reform (i)	2750	2208	5.27	57.8	95.98	91.89	100.52	98.90	100.07	2588.3	2840.1
reform (ii)	2748	2217	5.27	57.8	95.94	91.95	100.49	98.91	100.04	2587.5	2839.9
reform (iii)	2748.5	2210	5.27	58.3	95.95	91.88	100.5	98.89	100.05	2587.7	2840
reform (iv)	2747.7	2194	5.28	58.1	95.92	91.94	100.47	98.98	100.04	2587.1	2840.7

Note: U_1, U_2, E_1, and E_2 are measured with respect to a reference value $v(W_w) \equiv 100$ before the reform.

References

[1] Albrecht, J., Vroman S., 2005. Equilibrium Search with Time-Varying Unemployment Benefits. The Economic Journal 115, 631-648.

[2] Blanchard, O., Diamond P., 1989. The Beveridge curve. Brookings Papers on Economic Activity 1, 1-76.

[3] Burda, M., Wyplosz C., 1994. Gross worker and job flows in Europe. European Economic Review, 38, 1287-1315.

[4] Cahuc, P., Lehmann E., 2000. Should Unemployment Benefits Decrease with the Unemployment Spell?. Journal of Public Economics 77, 135-153.

[5] Cahuc, P., Malherbet F., 2004. Unemployment Compensation Finance and Labor Rigidity. Journal of Public Economics 88, 481-501.

[6] Coles, M., Masters A., 2004. Duration Dependence, Unemployment Insurance Payments and Equilibrium Unemployment. Economica 71, 83-97.

[7] Coles, M., Masters A., 2006. Optimal Unemployment Insurance in a Matching Equilibrium. Journal of Labor Economics 24, 109-138.

[8] Collin, C., 2000. Les ressources des allocataires du RMI : le rôle majeur des prestations sociales. Etudes et Résultats, n°62, DREES.

[9] Fallick, B., Fleischman, C. A., 2004. Employer to Employer Flows in the U.S. Labor Market: The Complete Picture of Gross Worker Flows. FEDS Working Paper n°2004-34.

[10] Fredriksson, P., Holmlund B., 2001. Optimal Unemployment Insurance in Search Equilibrium. Journal of Labor Economics 19, 370-399.

[11] Hopenhayn, H., Nicolini J.P., 1997. Optimal Unemployment Insurance. Journal of Political Economy 105, 412-438.

[12] Hosios, A., 1990. On the Efficiency of Matching and Related Models of Search and Unemployment. The Review of Economic Studies 57, 279-298.

[13] Hugues J.J., Peoples J., Perlman R., 1996. The differential impact of unemployment insurance on unemployment duration by income level. International Journal of Manpower 17, 18-33.

[14] Lentz, R., 2009. Optimal Unemployment Insurance in an Estimated Job Search Model with Savings. Review of Economic Dynamics, January 2009, vol. 12(1), pp. 37-57.

[15] Lollivier, S.,Rioux L., 2010. An Empirical Examination of the Sources of Changes Over Time in the Job Finding Rate Using Reservation Wages and Rejected Wage Offers. International Economic Review, forthcoming.

[16] Mortensen, D., 1977. Unemployment Insurance and Labor Supply Decisions. Industrial and Labor Relations Review 30, 505-517.

[17] Pavoni, N., 2007. On Optimal Unemployment Compensation. Journal of Monetary Economics 54, 1612-1630.

[18] Pavoni, N., 2009. Optimal Unemployment Insurance, with Human Capital Depreciation, and Duration Dependence. International Economic Review 50, 323-362.

[19] Pellizzari, M., 2006. Unemployment Duration and the Interactions between Unemployment Compensation and Social Assistance. Labour Economics 13, 773-798.

[20] Pissarides, C. A., 2000. Equilibrium Unemployment Theory. Second edition, MIT Press.

[21] Rioux, L., 2001a. Recherche d'emploi et insertion professionnelle des allocataires du RMI. Economie et Statistique 346-347, 13-32.

[22] Rioux, L., 2001b. Salaire de réserve, allocation chômage dégressive et revenu minimum d'insertion. Economie et Statistique 346-347, 137-160.

[23] Rosholm, M., Svarer M., 2004. Wages, Training and Job Turnover in a Search-Matching Model. Labour Economics, 11, 623-645.

[24] Schmitt, J., Wadsworth J., 1993. Unemployment benefit levels and search activity. Oxford Bulletin of Economics and Statistics 55, 1-24.

[25] Wang, C., Williamson S. D., 2002. Moral Hazard, Optimal Unemployment Insurance, and Experience Rating. Journal of Monetary Economics 49, 1337-1372.