An extra-time duration model with application to unemployment duration under benefits in Spain*

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Abstract.
Exploiting administrative unit-data records from the Spanish Employment Agency, we use a continuous mixed proportional hazard model that accounts for unobserved heterogeneity and sequential exit to analyse the transition rates from unemployment benefits to work for the unemployed receiving unemployment insurance (UI) and those receiving unemployment assistance (UA) after UI has expired. We find theoretical arguments and empirical evidence on the bias in which the traditional likelihood function specification incurs. Specifically, the traditional duration model that consider only UI data undervalue the expected unemployment duration of the unemployed. We appreciate that unemployed characteristics such as gender (female), qualifications (worse) and age (older) present symmetric effects on the hazard (less) rates out of unemployment under UI and UA; however, the level of benefits and the entitlement duration effect present an asymmetric effect on the hazard rates. Finally, we detect that there is a group of unemployed qualified to UA that quit UI due to the paid fall that they will experience when pass from UI to UA.

JEL classification: J64.
Key words: unemployment insurance, unemployment assistance, mixed proportional hazard model, sequential exits, unobserved heterogeneity.

1. Introduction.

Unemployment benefit is the most common concern of empirical studies on unemployment duration and job search behaviour. The standard prediction is that unemployment benefits – level and entitlement duration- tend to increase the duration of unemployment[1]. This argument has been one of the most influential explanations of why unemployment rates are higher in Western Europe than in USA, where Unemployment Compensation System (UCS) is less generous, see Layard and Nickell (1986). Despite the important political influence of this view, the empirical evidence of level and entitlement duration benefits varies according to the countries[2]. For example, a

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[1] This prediction is based on two theories of the labour market: the job search and the efficiency wage theory. The job search theory predicts that unemployment benefit causes the unemployed are less eager to search for accepting jobs, increasing the unemployment duration. The efficiency wage theory says that unemployment benefits reduce the cost of being unemployed and the demand for labour decreases because workers ask for higher wages.
[2] Surveys of theories and results of benefit effects can be found in Atkinson and Micklewright (1991) and Pedersen and Westergard- Nielsen (1993).

number of microeconomic studies do not find effects of Unemployment Insurance (UI) level on the unemployment duration, see Lynch (1989) for USA, Hujer and Schneider (1989) for Germany and Groot (1990) for Netherlands. Other studies show that this effect is negative, see Katz and Meyer (1990) and Moffit (1985) for USA, Narendranathan et al. (1985) for UK, and Van den Berg (1990) for Netherlands. On the contrary, UI level increase the intensity of a job search by the unemployed, see Blau and Robins (1990) for USA and Wadsworth (1990) for UK. Finally, other studies take account of the possibility that the impact of UI level on the hazard rate depend on spell duration. Thus, Nickell (1979) for UK and Fallick (1991) for USA find that UI level effect disappears after 20 weeks.

Regarding the UI entitlement duration effect, Moffit and Nicholson (1982) for USA and Hunt (1995) for Germany detect that an increase in potential UI duration increases the mean length unemployment duration. However, generally hazard rates increase when UI exhaustion approach, see Meyer (1990) and Katz and Meyer (1990) for USA, Ham and Rea (1987) for Canada and Carling et al (1996) for Sweden. Nevertheless, other studies find that the tendency to leave unemployment increases at the end of unemployment benefits approaching is inaccurate. For example, Fallick (1991) and Narendranathan and Steward (1993) for UK find that the effect of unemployment benefits decrease over the time or Micklewright and Nagy (1998) for Hungary detect no rise in the hazard near the time of benefit exhaustion.

The studies that analyse the effect of unemployment assistance (UA) on the hazard rate are scarce. While Micklewright and Nagy (1999) find that UA level disincentive the search effort of the unemployed for Hungary ; Earle and Pauna (1998) detect that that effect is null for Romania. Finally, Erbenova et al. (1998) for Czech Republic and Earle and Pauna (1998) for Romania observe a work disincentive effect of UA entitlement duration on the hazard rates.

That the empirical evidence of those studies (among countries) appears to be different of the economic theory prediction is probably due to the discrepancy with the hypothesis of the theory and that the characteristics of UCS differ across countries. However, we think that differences can be also produced because many of those studies do not deal with UI and UA data in a proper way[3]. Our objective in this paper is to show that the hazard rate out of unemployment changes dramatically when we specify a

[3] Basically, those studies of OECD and transitions countries where the UCS is composed by UI and UA after UI has expired.

traditional duration model that takes account of only UI data, or deals UA as a mere extension of UI (UI+UA), instead of a extra time duration model that accounts separately for transitions rates from unemployment benefits to work of the unemployed who receive UI and those receive UA after UI has expired. We think that these differences may alter conclusions about the effect of unemployment benefits on unemployment duration where the latter model present consistent estimations because its likelihood functions accounts for the data in a proper way. Other objectives of the paper are to examine: why unemployed qualified for getting UA decided to quit the UCS while they were receiving UI, and to appreciate separately the determinants of transitions from unemployment benefits to work of the unemployed who perceive UI and UA in Spain[4]. Country that is frequently criticised for having a generous UCS[5].

The main idea of the paper can be summarise in Figure 1 that represents the unemployment durations of the unemployed on whatever administrative database of most OCDE and transition countries where the Welfare System is organised on the basis of two different unemployment benefits: UI and UA after UI has expired. In this figure we observe that there are unemployed who receive UI and quit the UCS to work "n_1" or exhaust UI "m_1" in a rule period, and unemployed who exhaust UI and enter an extra time period (UA) that drops it to work "n_2" or exhaust it "m_2". Faced with that kind of data we have the opportunity of making a traditional approach to measure exit rates out of unemployment under unemployment benefits utilising only information of UI or dealing with UA as a mere extension of UI (UI+UA) without separate the effects. However, we think that both approaches do not account for biases stemming from differences between sequential exits, one for the unemployed who receive UI and another for UA recipients after UI has expired. On the one hand, we suggest to estimate unemployment benefits effect separately (not as UI+UA approach) because hazard rates are produced sequentially during two periods (rule and extra) that correspond to

[4] We want to clarify that in this study we only take account transitions out of the unemployment for the unemployed who receive unemployment benefits because we do not have the possibility of getting information about those without access to unemployment benefits. However, as we know that the unemployed who do not receive benefits present higher hazard rates than those who receive benefits (see Bover et al (1987); it will be not difficult to interpret results concerning the role of unemployment benefits using only data for benefits recipients.

[5] There are not many studies in the Spanish literature that give information about the type of unemployment benefit that the unemployed are receiving in the Spanish UCS. In fact, they only focus in the impact of UI, or not distinguish the effect of the level and the entitlement duration of benefits. For example, Cebrián et al. (1996) use a temporal reduced version of the HSIPRE database, a sample that only contains UI beneficiaries, and find that unemployment benefits do not exert a clear negative influence on the job search behaviour of the unemployed. Bover et al. (1997) appreciate a negative influence of receiving benefits on the probability of leaving unemployment making use of a sample from the Spanish Labour Force Survey (EPA); a sample that contains information of all the unemployed but no about parameters of the UCS as the level and entitlement duration of UI and UA. Alba-Ramirez (1996) also finds

different unemployment benefits schemes where characteristics and objectives differ: Characteristics are different because while UI is perceived by the unemployed who worked a minimum contribution period and its level is a percentage of the worker's previous earnings; UA is perceived by the unemployed who exhausted UI which entitlement duration depend on age (less or more than 45 years old) or mainly to have or not family burdens, and UA level is based on the National Minimum Wage. Objectives stands out because while UI allows job seekers to receive offers with more attractive wages, and thus, in theory, to secure more productive jobs; UA is granted by the unemployed with low income to reconcile the objective of social equity in the society. On the other hand, if we measure the hazard rates out of unemployment with only UI data, we will undervalue the current unemployment duration because we do not take account of UA duration in those unemployed who exhausted UI. A simple analysis with our data helps to appreciate this evidence. Looking at Table 1 the current unemployment duration of the unemployed who receive UI is 8.69 months in 1991 that is prolonged until approximately 15.59 months adding UA data in the unemployed who exhausted UI. Therefore, the current unemployment duration is undervalue 6.9 months in our analysis because there is a percentage (36.3%) of the unemployed that remained in unemployment perceiving UA after UI has expired. This evidence is also produced the rest of years.

The rest of the paper is organised as follows. A briefly description of the Spanish UCS is presented in the next section. A theoretical framework about the effect of UI and UA on the behaviour of the unemployed is developed in section 3. The empirical model and likelihood function are presented in section 4. The data in section 5. Variables and empirical results appears in section 6. Finally, we summarise our findings in the last section.

2. The UCS in Spain.

In this section we present the main features of the UCS in Spain concisely. As in most OECD and transition countries, there are basically two types of unemployment benefits in Spain: UI and UA. The unemployed that lose a job and have a minimum contribution period of 6 months during the last 48 months receive UI[6]. The entitlement

with the EPA a negative effect of UI receipt on the re-employment probability and on withdrawal from the labour force.

[6] Since 1992 the unemployed must have been worked a minimum of 12 months during the last 72 months in order to receive UI.

duration (see appendix A1) of the unemployed is calculated by dividing by 2 (by 3 after 1992) the number of months contributed with the constraints that the result has to be an integer multiple of 2. The level of income provided for the unemployed is determined by multiplying the gross replacement rate by the average of the "regulatory base" (i.e. the gross earnings used to calculate UI contributions) in the six months before entering unemployment. The monthly amount to be received is equivalent to 80% of the person's last salary during the first six months of benefits (70% after 1992), 70% from the seventh to the twelfth month (60% after 1992) and 60% from the thirteenth month onwards (60% after 1992). UI is subject to a minimum equal to the Statutory Minimum Wage (SMW) and a maximum equal to 170% of the SMW, which could be increased to 190% and 220% if the unemployed have one child dependant or more than one. Since 1993 the minimum has been reduced to 75% of the SMW, unless the recipient has dependant children in which case it is still 100% of the SMW.

The unemployed who have worked a period not enough[7] for UI or have exhausted UI may access to UA. UA payments have no relation with the previous monthly wages. A family income criterion was also used whereby per capita family income could not exceed the SMW. A flat unemployment benefit equal to 75% of the SMW is paid to all beneficiaries. Since 1989, these criteria have been tightened because the notion of family has been restricted and the per member income requirement is lowered to 75% of the SMW for the unemployed with age less than 45 years old with one dependant. For those with more than 45 years old, a 100% and 125% of the SMW is given if they have two dependants or more than two, respectively.

The UA entitlement duration vary according to the UI entitlement duration exhausted, to have or not family burdens and to be more or less than 45 years old. We see in tables of the Appendix A1 that before labour reform 1992, the unemployed with family burdens who exhausted entitlement UI periods multiple of 3 months (until 24 months) may access to UA entitlement duration between 18 and 24 months (with age less than 45 years old) or among 24 and 36 months (with age more than 45 years old). Nevertheless, if they do not have family burdens, only the unemployed with age greater than 45 years old who exhausted an entitlement UI period longer than 12 months receive between 6 and 12 months. In relation to the entitlement UA duration of the unemployed who were not qualified for UI because they do not have a minimum

[7] Workers having contributed less than 6 months in pre-1992 period or 12 months in post-1992 period are not entitled to UI, but they could claim UA if they have contributed at least 3 months and have family burdens.

contribution period of 6 months before 1992 (or 12 months after 1992), the entitlement duration changes among 3 and 5 months before 1992 to among 3 and 21 months after 1992 for those unemployed with family burdens, and is 6 months for those unemployed without family burdens only after 1992.

3. Theoretical framework.

In this section we revise theories that analyse the determinants of transitions from unemployment benefits to work of the unemployed. The unemployment benefit theory predicts that the higher the level and the entitlement duration of unemployment benefits the lower the hazard of leaving unemployment and, therefore the longer unemployment duration. In this context, unemployment spells under UI have been modelled in the literature in several ways. On the one hand, Mortensen (1977) develop a dynamic search model where the unemployed maximise the present value of expected utility, where utility is a function of leisure and income. They assume that there is a stationary known wage offer distribution and the arrival rate of job offers is constant over time for a given intensity of a job search by the unemployed. The probability that an unemployed get a job depend on the probability that an unemployed receives a job offer and the probability that a job is accepted. This probability increases with search intensity because the arrival of job offers increases and also rises as the reservation wage declines since the probability of accepting a job offer increases. Furthermore, the unemployed increase the intensity of a job search by the unemployed or decrease the reservation wage when UI exhaustion approach.

On the other hand, Moffitt and Nicholson (1982) analyse UI spells using a standard labour leisure choice framework. They assume that newly unemployed considers his budget constraint over a long planning horizon and chooses the number of months who want to work or to be unemployed. The unemployed maximise the utility that is a function of net income over the period and number of months of unemployment. Unemployment provides utility for two reasons: leisure time and opportunity for productive job search. Figure 2 shows the budget constraints, AZ and ACD show the trade-off between months of unemployment (U) and total net income (Y) in absence and presence of UI. If an unemployed does not receive UI, an additional month of unemployment low income by net wage (W), the net wage is portrayed by AZ. However, if the unemployed receive UI, each additional month of unemployment,

starting at point A, low income by $W\text{-}B_{ui}$, where B_{ui} is the level of UI across AC. This expression can be written as $W(1\text{-}R_{ui})$, where $R_{ui}=B_{ui}/W$ is the replacement ratio. The budget constraint has a convex kink in C at the month of unemployment benefit exhaustion because the unemployed cease to be subsidised. After the exhaustion of UI (U*), an additional month of unemployment reduces individual's income by the potential net wage W across CD. Prior to the exhaustion of UI, an additional month of unemployment reduces income by less than W, because UI benefits are received and $W(1\text{-}R_{ui})<W$.

The two frameworks make different hypothesis but they have similar predictions about the effects of UI on the unemployment duration of the unemployed. Firstly, both models predict greater hazard rate as the UI exhaustion approach because the intensity of a job search by the unemployed increases and the reservation wages decreases. After UI has been exhausted by the unemployed, hazard rates jump to a higher (or lower) level depending whether leisure and income are complements (or substitutes), remaining constant thereafter. Secondly, the effect of an increase of level or duration of UI is ambiguous. On the one hand, the level or duration of UI disincentive the probability of finding a job because the utility of the unemployed relative to the employed provoke that the reservation wages of workers increase and the intensity of a job search by the unemployed fall. On the other hand, an increase of level or duration UI makes more attractive to accept a job because to work is the only way to qualify for unemployment benefits at the future; this response is known as the entitlement effect. Furthermore, later works say that if there is a binding restrictions on the capacity of the unemployed finance search activity, UI will increase the resources devoted to search and thereby increase the probability of finding a job, see Tannery (1983), Ben Horim and Zuckerman (1987). All this theoretical indeterminacy about the effect of level or duration of UI on the hazard rates appears to be confirmed by the empirical evidence remarked in the introduction of this paper. However, given the conditions of most OECD countries where the unemployed may access UA after UI has expired, what is the effect of this supplemental unemployment benefit on the unemployment duration? In other words, how change the budget constraint of Figure 2 when some unemployed access UA after UI has expired around point C?

We may argue informally some comments following Moffit and Nicholson´s model. Firstly, there is a new budget constraint, ACC'D' that captures the behaviour of the unemployed who receive UI (budget AC), UA (budget CC') or non-receivers of

unemployment benefits (budget C'D'). Secondly, this new budget presents two kink points (C,C') and the hazard rates out of unemployment rise around the exhaustion of UI (point C) and UA (point C'). Thirdly, the slope of UA recipients, $W(1-R_{ua})$, is higher than the slope of UI recipients, $W(1-R_{ui})$, because $R_{ua} < R_{ui}$. Therefore, the behaviour of the unemployed under all these new additional features is the following: a non-exhausting of UI, without eligible conditions to access UA, is unaffected by the change of adding UA data, remaining along AC. It is uncertain when he will find a job and what the wage will be but he face income and leisure in the same direction that when we only consider UI data. A non-exhausting of UI, eligible to UA, may increase the intensity of a job search by the unemployed previously to the exhaustion of UI because prefer more income than leisure due to the paid fall that he will experience when pass from UI to UA. An exhausting of UI at the initial kink C stay at the kink or move to C' (if he is eligible for UA) experiencing several combinations of income and substitution effects, situated along CC' or C'D', increasing unemployment either case. All these statements assume that U is a normal good.

4. The empirical model.

The empirical model used to study the transition rates from unemployment benefits to work of the unemployed receiving UI and those perceiving UA is a continuous mixed proportional hazard[8] (mph) The hazard representation for the mph[9]. is the following:

$$h_{ij}(t_{ij} \mid X, è) = ë_{0ij}(t_{ij})ö_{ij}(X'â_{ij})Ö_{ij}(c_{ij}è) \qquad i≠j,\ i=1,2..\ N;\ j=1,2. \qquad (1)$$

where subscript i and j show the individual and the period of unemployment under benefits (j=1=UI, j=2=UA), respectively. The term t_{ij} is the current duration of i´s j´th unemployment period under benefits. This equation asserts that the hazard rate out of unemployment under benefits into employment is being influenced by three factors. The function $\lambda_{0ij}(t)$ named the baseline hazard function captures the effect of the time elapsed in the unemployment state over the instantaneous probability of finding a job when all the factors held constant. The function $\varphi_{ij}(X)$ presents the influence of time

[8] The advantage of this model is that may easily incorporate economic variables that change over time; it can incorporate incomplete (censored) unemployment periods, and finally, it allows one to examine how the probability of finding a job changes with the duration of the period

invariant and time variant variables on the hazard rate out of unemployment under benefits into employment. Finally, the function $\Phi_{ij}(\theta)$ accounts for the effects of unobserved heterogeneity components, such as ability, attitudes, skills, etc. on the affect the hazard rate out of unemployment. The effects of the unobserved heterogeneity components (θ) are captured by the use of c_{ij} parameter[10] given in the equation (1). We assume θ to be fixed across spells for a given individual and has a distribution G(.) across individuals. All the three functions must assure that expression (1) is non-negative. We guarantee this property using an exponential representation for each function.

4.1. The likelihood function and the estimation method.

The specification of a traditional likelihood function for a sample of unemployed that enter at the same time into the Spanish UCS contain complete and censored unemployment observations making use of UI or UI+UA data. Complete observations belong to the unemployed who quit the UCS making use of only UI or UI+UA data. Censored observations correspond to the unemployed who exhaust UI making use of UI data, or exhaust UI or UA managing UI+UA data. The specification of the traditional likelihood function is given by:

$$L(\vartheta|X,\theta) = \prod_{i=1}^{n} \left[f(t_{i1}, X_{i1}, q)\right]^{d_{i1}} \times \left[S(t_{i1}, X_{i1}, q)\right]^{(1-d_{i1})} \qquad (2)$$

where $\vartheta=(\beta_{ij}, c_{ij})$; the contribution to the likelihood function of the complete and censored observations are the density function $f(t_{i1})$ and survival function $S(t_{i1})$, respectively; d_{i1} is a variable dummy that takes value 1 when the unemployed quit the UCS to work, 0 the rest of the unemployed.

We think that this likelihood function would be incomplete and estimations obtained by maximising (2) may be biased due two reasons. Firstly, there are censored observations making use of only UI data that are complete because there are some unemployed that access UA after UI has expired. Secondly, if we deal UA duration as a

[9] The identification of this kind of models has been widely studied in the literature. For single spell models, see Lancaster (1979), Elbers and Ridder (1982), Heckman and Singer (1984a). Extension for multiple spells multi state models can be found in Heckman and Singer (1984b) and Honoré(1993).

[10] c_{ij} (factor loading) represents specific transition intensities between different unemployment states that are correlated across spells. For example, unobserved heterogeneity component may have a negative or positive correlated effect depending, respectively, on whether or not c_{ij} is negative or positive.

mere extension of UI duration (using UI+UA data) data, we will not let account for differences between sequential exits, one for the unemployed who receive UI and another for UA recipients. The, we develop a extra time likelihood function given by (see appendix A2.1) to cover this bias:

$$L(\vartheta|X,\theta) = \prod_{i=1}^{N} \underbrace{[f(t_{i1},X_{i1},q)]^{d_{i1}}}_{n_1} \times \underbrace{[S(t_{i1},X_{i1},q)]^{d_{i2}(1-d_{i1})}}_{m_1} \times$$

$$\times \underbrace{[\{f(t_{i2},X_{i2},q)\} \times \{S(t_{i1},X_{i1},q)\}]^{d_{i3}(1-d_{i1})(1-d_{i2})}}_{n_2} \times$$

$$\times \underbrace{[\{S(t_{i2},X_{i2},q)\} \times \{S(t_{i1},X_{i1},q)\}]^{(1-d_{i1})(1-d_{i2})(1-d_{i3})}}_{m_2} . \qquad (3)$$

This likelihood function contains four components: the first component captures the likelihood (density function $f(t_{i1})$) that the unemployed quit the UCS to work perceiving UI (n_1, see also figure 1 to understand our terminology) in time t_{i1}; the second component measures the likelihood (survival function $S(t_{i1})$) that the unemployed exhaust UI (m_1) disappearing of the records forever; the third and fourth component account the likelihood that the unemployed who access to UA (after UI has expired) may find a job (n_2) or exhaust UA (m_2). Those last two components cover the bias of equation (2) and are composed by the product of the density function $f(t_{i2})$ and $S(t_{i2})$ by the survival function $S(t_{i1})$.

In (3) d_{i1} d_{i2}, d_{i3} are dummy variables; d_{i1} takes value 1 when the unemployed exit to a job perceiving UI (0 the rest); d_{i2} is equal 1 when the unemployed exhaust UI disappearing of the records for ever (0 the rest), and finally, d_{i3} lets separate between uncensored and censored durations of recipients who get UA after the UI exhaustion. It takes value 1 when the unemployed exit to a job, 0 when they exhaust it.

The parameter estimates are obtained by maximising the next likelihood function across all N unemployed:

$$L(\vartheta|X) = \prod_{i=1}^{N} \left[\int_{\Theta} L_i(J \mid X,q)\, dG(q) \right] \qquad (4)$$

where $G(\theta)$ is the distribution function for θ, Θ is the range of θ and $L(\vartheta|X,\theta)$ is given by (3)

To complete the specification of this likelihood function, we specify the distribution function $G(\theta)$ for the unobserved heterogeneity. Following to Heckman and Singer (1984c)[11], we use a non-parametric method that approximate the unknown probability distribution by a finite number of support points, and use the data to estimate the location and the probability mass associated with each support point. The basic procedure is to estimate a model with a finite number of support points, starting with one (which is just a model without heterogeneity), and adding support points until the estimated model becomes singular. As we have an intercept and a factor loading we restrict all the points to be on the unit interval. In particular, we constrain one point of support to be 0 and one to be 1 and estimate the location and probability mass associated with each support points noting that the cumulative mass over all support points must sum 1. The rest of the points will be estimated on the interval (0,1). We use the CTM program to estimate the parameters of the model, see Yi, Honoré and Walker (1987). This program estimates jointly the values of the parameter vector ϑ and the support points that characterise the underlying distribution of the unobserved heterogeneity component θ by an iterative maximum likelihood method[12]. The maximum likelihood estimates of ϑ conditional on the number of support points have all the properties of an extremum estimator, see Amemiya (1985).

5. The data.

The data used in this analysis come from the HSIPRE[13] (Histórico del Sistema de Prestaciones por Desempleo) administrative database. It contains information of the unemployed that receive UI and UA from the Spanish Employment Agency (INEM, Instituto Nacional de Empleo). The advantage of the HSIPRE database is that provide accurate information[14] of the level of benefits, the current and the entitlement unemployment duration (on days) under benefits and information of several unemployment benefit periods for the same individual. The disadvantage is the lack of information about the labour force status the days after UI and UA are exhausted by the

[11] Another approach could be assume a parametric distribution for the unobserved heterogeneity component. However, Heckman and Singer (1984c) have shown that this type of specification may provoke inconsistent estimations of the effects of duration terms and variables on the hazard rates.
[12] This estimation procedure has been used before by Heckman, Hotz and Walker (1985) with demography data, and Vilcassim and Jain (1991) with marketing data.
[13] See Cebrián et al. (1996) for a complete description of this database.
[14] This type of information is not available in other Spanish sources, for example the Spanish Labour Force Survey (EPA).

unemployed and, unfortunately, it does not include information about marital status, labour market situation of the spouse industry and size of the firm in the previous job.

Our sample is drawn from the inflow to the registers unemployment of the unemployed with age between 18 and 59 years old[15] that enter the Spanish UCS during February 1987. We focus our analysis on the unemployed entitled to UI and UA, where UA is perceived by the unemployed after the exhaustion of UI. We follow those unemployed until they escape from unemployment or exhaust the unemployment benefits. The resulting sample contains 11,668 unemployed who received UI whose 3,077 unemployed received UA.

Table 2 gives descriptive statistics on a variety of characteristics for the unemployed of this sample. The first column of Table 2 presents characteristics of the unemployed who receive UI or both types of unemployment benefits making use of information jointly (UI+UA data). The second column separates characteristics of the unemployed who perceive UI or UA. We focus our comments on this last column because accounts for differences in the characteristics of the unemployed who receive UI or UA. Moreover, the conclusions about the characteristics of those unemployed may present outstanding alterations making use of unemployment benefits data separately or jointly. For example, we may say that the unemployed remain longer current unemployment periods on UA (around 461.15 days) than on UI (approximately 217.69 days), and receive lower UA level (36.50 thousand pesetas per month) than UI level (60.44 thousand pesetas per month); however, those evidences are not appreciated using data jointly because the current unemployment duration (339.95 days) and the level of benefits (54.68 thousand pesetas per month) are a mixture of both types of unemployment benefits. Furthermore, if we do not use data in a proper way, the percentages of the unemployed who exit of the UCS will be very different. Thus, a 58.9% of the unemployed exhaust unemployment benefits and a 41.1% get a job making use of unemployment benefits data jointly; however, if we use unemployment benefits data separately: 31.3% of the unemployed get a job receiving UI and only 42.2% exhaust UI because 26.5% access to UA. Concerning this last group of the unemployed who make longer the permanence on the UCS thanks to the UA, 36.8% (9.8% of the entire sample) get a job receiving UA and 63.2% (16.7% of the entire sample) exhaust UA. Making a properly reading of Table 2, we may say that the

unemployed who receive UI[16] are on average younger, higher fraction of males, have higher net wages in the last job as well as higher level of benefits, have less family burdens and remaining shorter periods in unemployment than those unemployed who receive UA.

Now, we present two additional analyses to study in greater depth the determinants of transitions from unemployment benefits to work of the unemployed using only UI data (traditional UI duration model, tdm), UI+UA data (complete benefits model duration model[17], cbm) and unemployment benefits data separately (an extra time duration model, etdm). Firstly, Figures 3 and 4 show the habitual empirical hazard through Kaplan-Meier estimation and empirical survival probability, respectively. The empirical hazards of the unemployed on the tdm (see Figure 3) are overvalued compared to the etdm for UI data (UI seq). In the opposite way, the survival probability of the tdm displayed in Figure 4 are undervalued compared to the etdm for UI data (UI seq). This empirical evidence justifies a theoretical bias outlined through the mentioned likelihood specifications: the traditional hazard rates are overvalued and therefore the traditional survival rates are undervalued. We also observe in Figure 3 a phase with increasing exit rates during the first months of unemployment approximately until the second month (a positive duration dependence), followed by a phase of declining rates until the ninth month (a negative duration dependence) and constant from the tenth month onwards.

Secondly, Table 3 presents an original presentation of the determinants of unemployment based on the gross hazard rates (ghr), see Muro (2001). This novel method calculates correlations between the hazard rates and the characteristics of the unemployed that may help to specify the variables introduced in the estimations of the next section. The first column of each model contains the ghr[18] of the unemployed assuming a constant hazard rate on the unemployment period. The second column

[15] The reason for the age limit is to exclude older unemployed (aged 59 or older) that may report problems because they may possibly access to the retirement receiving benefits. Moreover, we want to clear up that we are not considering the regime of pre-jubilation that exist for workers aged more than 52 in the Spanish UCS.

[16] The variables of a sample with only UI data and a sample that separate UI and UA present the same descriptive statistics variables for UI recipients except for the exit of the UCS variable. Thus, while a sample with only UI data 31.3% of the unemployed get a job and 68.7% exhaust UI; a sample with information of unemployment benefits data separately present a percentage of the unemployed who exhaust UI lower (42.2%) because 26.5% (68.7%-42.2%=26.5%) access to UA

[17] The traditional duration model that contains UI+UA data is defined as a complete benefits duration model (cbm) to make easier the notation of this section and the rest of the paper.

[18] The ghr are defined in percentages as the probability of worker finding a job conditional that the worker has been unemployed until the previous month. This measure does not preserve the ceteris paribus condition. In other words, it does not control the effect that other variables have over the conditional probability of finding a job on the

shows a relative measure of the ghr of each characteristics compared to the ghr of the reference individual (without any specific characteristic). Finally, the third column presents ghr parameters significant at the 1% level. We initially present some general results to understand the meaning of ghr parameters, and later, we shall report of personal and economic variables on the etdm.

We appreciate that the unemployed monthly ghr without any specific characteristic (reference individual) is 4.05% on the tdm, 3.48% on the cbm and 2.64% on the etdm (for UI data). This means that considering a cohort of 100 unemployed who starts the unemployment spell at the same time: 4,05% find a job using the tdm; 3.48% on the cbm and 2,64% on the etdm. In terms of expected unemployment duration, the unemployed are 24 months on the tdm and 28 and 37 months on the cbm and etdm[19], respectively. We observe the same evidence previously mentioned in Figures 2 and 3: the traditional approach overvalue the hazard rates of UI recipients and therefore, undervalue the unemployment duration. This evidence is also appreciated on the rest of variables. Applying the ghr procedure for the UA recipients with the etdm, we see that those unemployed remaining longer unemployment periods than UI recipients because the expected unemployment duration is longer, approximately 88 months. This result, just like before, is produced in all the variables.

In relation to the effect of personal and economic variables on the ghr using the etdm, we appreciate that the UI recipients such as males, younger (between 18-25 years old), better educated (job category group 1), with family burdens, enter the UCS by the end of a contract and have higher net wages (more than 150 thousand ptas per month) as well higher benefits level (more than 100 thousand ptas per month) remain shorter periods in unemployment than the reference individual. On the other hand, females who receive UA, with family burdens, enter the UCS by the end of a contract, with age between 30 and 35 years old, better educated (job category group 1) and semi-skilled production worker and with lower net wage (less than 60 thousand ptas month) as well as higher level of benefits (between 60-80 thousand ptas month) remain longer durations in unemployment.

unemployed. Therefore, if the reader wants to calculate the ghr of an unemployed with more than one characteristic, it must not be inferred from Table 3.

[19] These estimates exceed the observed means durations because of censoring.

6. Empirical results.

The discussion of this section is separated in four parts. Firstly, we examine the expected influence of variables on the hazard rates out of unemployment of the unemployed. Secondly, we deal the estimation effects of variables on the hazard rates using the three models previously described. Thirdly, we discuss the estimates of the baseline exit and finally, we evaluate the impact of unobserved heterogeneity on the hazard rates.

The expected influence of variables on the hazard rates.

Before going to the estimations results, a look over the expected influence of variables on the hazard rates of finding a job is instructive. Specifically, we are interested in trying to assess if the unemployed face different probabilities and if there are variables that may explain it. In the context of the search theory, the hazard rates out of unemployment depends on the probability of receiving a job offer and the probability of accepting such offer. The probability of receiving a job offer depend on variables such as gender, age, educational levels, the state of the labour market demand and the parameters of the UCS (i.e. the level and entitlement duration of benefits). Age variable is related to the hazard rate out of unemployment with an inverted U form if the youngest and the oldest group have lower productivity with respect to the wages paid. Eight dummies age variables are introduced in our models by intervals of five years to capture this inverted U form on the hazard rates. A job category variable[20] is introduced in the models as a proxy of educational level. We expect that the unemployed with better qualifications have higher hazard rates out of unemployment than unskilled workers because they may receive more and better labour offers. We think that the effect of gender variable on the hazard rates out of unemployment is ambiguous.

The state of the labour market demand is measured in our models with two variables: the quarterly regional unemployment rate and the cause of unemployment (end of contract or others -layoffs, etc.-). The quarterly regional unemployment rate indicates the local labour market conditions of the unemployed. We expect that those who live in regions with a lower regional unemployment rate have a higher hazard rate out of unemployment because there are more vacancies in the firms. To have been registered at the UCS by the end of the contract have two different effects on the hazard

[20] We have coded this variable in seven groups from the National Insurance contribution group (see Table 2).

rate of finding a job. On the one hand, they may start to search a new job before the end of the contract because they know the date of the extinction of their job. On the other hand, the unemployed could probably gain access to the unemployment benefits in the future and this helps them to search a job with more intensity.

The income that an unemployed earn in unemployment and the entitlement duration are variables that have influence on the search effort and therefore, the hazard rates out of unemployment. The hazard rates would be lower among workers who have longer entitlement duration because they have more time to search, to assess and to accept job offers. However, some empirical studies, among them Meyer (1990), consider that the hazard rates out of unemployment are constant or decreasing in the earlier unemployment months and rises dramatically just prior to when unemployment benefits lapse because the value of being unemployed and the reservation wage decrease. A disincentive effect is produced at the beginning of the unemployment period and an incentive effect at the end. This tendency to leave unemployment the days before the entitlement period expires is captured in our models by a variable that is a subtraction between entitlement and current unemployment duration. Furthermore, we have included a quadratic form to get a no linear effect on the hazard rates out of unemployment.

In relation to the income of the unemployed, we may obtain the replacement rate dividing the level of benefits during the unemployment period by the income received during the last employment period. However, we analyse separately the effect of the level of benefits and the net wage of the last job because we have found a short variability of the replacement rate variable. The level of benefits predicts a double effect on the intensity of a job search by the unemployed. Firstly, an incentive effect occurs because the level of benefits increases the intensity of a job search by the unemployed and the probability of finding a job on the unemployed, see Tannery (1983). Secondly, a disincentive effect is produced because high benefits level cause on the unemployed to be less willing to accept jobs. Four variables, interactions between UI level and to be unemployed with a specific unemployment duration (among 0-6, 7-12, 13-18 and more than 18 months) are included in our estimations. With those variables, we try to measure the impact of UI level on the escape from unemployment across unemployment spells. The level of UA is not included as an interaction with the unemployment duration variable because there is a short variability across unemployment spells.

The probability that an unemployed accept a job offer depends on variables that affect his reservation wage. Among those variables, we have information of the net wages of the last job and family burdens variable. On the one hand, the net wage of the last job reflects the incentive or disincentive effect on search and acceptance of job offers by the unemployed, see Lancaster (1979). So, the unemployed with higher (lower) net wages in the last job present a negative effect (positive) on the hazard rate out of unemployment because they have a higher reservation wage. On the other hand, to have family burdens may present an incentive or disincentive effect on the hazard rates of finding a job. A disincentive effect is produced when the unemployed with family burdens reduce the hazard rates because they know that may obtain a new unemployment benefit (UA) at the future and therefore they do not accept uninteresting jobs. In the opposite sense, to have family burdens increase the search effort and the acceptability of a given offer by the unemployed.

Finally, we have included in our models a variable ((UI^e -UA^e) benefits) that represent the gap between the expected UI and UA level to capture why there is unemployed qualified to get UA that decided to quit the UCS while were receiving UI. We expect the higher the gap between the expected UI and UA level the higher the hazard rates out of unemployment on this type of unemployed because they increase the intensity of a job search by the unemployed due to the big loss of income[21] that they experience when pass from UI to UA. In other words, they change job (more income) by leisure (unemployment).

Variables.

The estimation results of a tdm, cbm and etdm are analysed in this sub-section. The first two models are estimated through the traditional approach (likelihood function (2)) that measures the hazard rates of finding a job using only UI data or UA data as extension of UI data. The third model, estimated through the likelihood function (3), accounts separately transition rates from UI and UA to work. Table 4 and 5 present the estimations results of those models without and with unobserved heterogeneity effects, respectively. The unobserved heterogeneity terms are controlled by the non parametric procedure described in section 4.1. The method of estimation is the non-parametric maximum likelihood estimator (NPMLE) developed by Heckman and Singer (1984c).

[21] We expect this effect because a feature of the Spanish UCS is that the level of benefits fall when the unemployed pass from UI to UA.

The estimation[22] coefficients of Table 5 confirm our expectations. The impact of variables on the hazard rate change in magnitude and significance across the three models. We first compare estimation results among models. Later, we describe transitions from UI and UA to a job using the etdm.

Considering results of the tdm and etdm for UI recipients, we appreciate that most variables present hazard rates overvalued on the tdm. Other variables present strong sensibility. We comment results of a few variables. For example, an increase of a woman in the UCS decrease the logarithm of the hazard rate by 0.797 on the tdm and less on the etdm, around 0.497. Likewise, the presence of an unemployed more with age between 18 and 25 years old increase the logarithm of the hazard rate by 0.256 (relative to an unemployed with age between 35 and 40 years old) on the tdm and by a lower magnitude (0.144) on the etdm. Another way to observe the overvalued effect of parameters on the tdm appears when we calculate elasticities[23] and expected unemployment durations in Table 6. The probability of exiting from unemployment of females are 54.91% lower than males making use of the tdm; however, the magnitude of this estimate effect continue being lower using the etdm. Thus, the tdm overvalue the minor effect of hazard rates of females approximately 15.74% compared to the etdm. In the same way, the rest of variables present overvalued effects of elasticities on the tdm. For example, the unemployed with age between 18 and 25 years old have higher hazard rates of finding a job than the reference individual but overvalue 13.75% on the tdm, 10.93% the unemployed with age between 25 and 30 years old, 15.85 % the best qualified (job category group 1) unemployed, etc. Therefore, if tdm overvalue the hazard rates out of unemployment, it will undervalue the expected unemployment duration. Thus, the magnitude of the expected unemployment duration is undervalued 8.16 months on females, 7.40 months on the unemployed with age between 18 and 25 years old, 7.03 months on the best qualified unemployed, etc. On average, the expected unemployment duration is undervalue around 7 months across females, group of age and job category variables.

[22] The quarterly regional unemployment rate, the level of benefits, the duration until the exhaustion of benefits (and its quadratic form), the gap between the expected UI and UA level, the interaction between the level of benefits and the unemployment duration variable are included as time varying variables in our estimations. The reference individual is an unemployed with age between 35 and 40 years old, skilled clerical workers without family burdens who entered to the UCS by other reasons (not end of contract).

[23] For dummy variables, exp (β) gives the relative hazard corresponding to the value of a dummy variable. For example, if gender variable is female (value 1), the presence of a woman increases the hazard rates out of unemployment in a percentage equal to (exp(β)*100%)-100%. Then, as elasticities are unit free, we may compare them across variables.

There are two variables that present strong sensibility in the estimations: the UI level and the days before the exhaustion of the benefits (and its quadratic form). UI level present a positive effect on the hazard rates making use of the tdm which disappear after six months; that effect is lengthened until the twelfth month using the etdm. The days before the exhaustion of the benefits variable (and its quadratic form) and the hazard rates out of unemployment present a $\cap$ and $\cup$ form relation using the tdm and the etdm for UI recipients, respectively. The tdm says that the unemployed increase the hazard rates up to 250 days before the exhaustion of UI and thereafter decreases them. However, the etdm argues that the unemployed decrease the hazard rates at the beginning and increase (since 410 days before the end) when UI exhaustion approach.

Comparing the effects of variables on the hazard rates using the cbm and etdm, we see that both models display differences based on the different specification of the likelihood function. While the etdm captures sequential exits, one for the unemployed who receive UI and another for UA recipients after UI has expired; the cbm model measures the hazard rates of the unemployed who receive unemployment benefits without separating the effects. This different way of making use of unemployment benefits data provoke that the hazard rates of both models change considerably. For example, we may say making use of the cbm that the level of benefits incentive the intensity of a job search by the unemployed during eighteen months and disincentive onwards; where we do not know if this effect is produced by the UI or UA level. However, we may separate the effect of each type of unemployment benefits thanks to the etdm: while UI level increase the hazard rates of the unemployed during twelve months disappearing onwards, UA level disincentive the intensity of a job search by the unemployed.

There are more variables that present mistaken reading of the effects on the hazard rates comparing estimations results of the cbm and etdm. For example, the unemployed with family burdens and enter the UCS by the end of a contract decrease the hazard rates out of unemployment using the cbm; nevertheless, this effect is not appreciated neither on recipients of UI nor on recipients of UA using the etdm. Other variables significantly affect the hazard rates out of unemployment on the etdm, but not on the cbm. Thus, while recipients of UI and UA with age between 18 and 25 years old present higher hazard rates than the reference individual making use of the etdm; the effect is not appreciated on the cbm. Finally, Table 6 show that the expected unemployment duration of variables on the cbm are shorter than on the etdm.

Now, we start to comment the transitions rates from UI and UA to a job using the etdm. Overall, recipients of UI and UA present similar effects on the hazard rates on variables such as gender, group of age and job category but asymmetric effects on the level of benefits, the net wage of the last job and the days before the exhaustion of the unemployment benefits variable (and its quadratic form). For example, males[24] present greater hazard rate out of UI and UA than females; however, the magnitude of the estimate is greater for UA recipients. Thus, the probability of exiting from UI of males is 64.37% greater than the hazard of females, increasing until 146.77% when they perceive UA. Age variable and hazard rates present a negative association when the unemployed receive UI and UA: while younger unemployed (among 18 and 30 years old for UI recipients, and 18 and 25 years for UA recipients) remain shorter unemployment periods than the reference individual; older people (more than 55 years old) present less probability of finding a job when receive whatever type of unemployment benefit. Then, we do not detect a demotivating effect of unemployment benefits on the probability of young persons exiting to employment[25]. The pattern of job category coefficients (proxy of qualifications or educational level) indicate that unemployment benefits have an incentive effect for UI recipients with the highest qualifications; while have an disincentive effect for UI and UA recipients with the worst qualifications. For UI recipients, the hazard rates out of unemployment with the highest level of qualifications (high levels and associate professional technicians, foremen and supervisors) is 30.62% higher than the hazard of the reference job category group (skilled production workers); whereas the hazard rates of the semi-skilled and production workers is lower around 9.89% and 13.54%, respectively. For UA recipients, the results show that the best qualified unemployed does not affect the hazard rates; however, the effect of the unemployed with the lowest educational level present a negative impact on the hazard rates, around 27.50% and 18.71% for unskilled and semiskilled production workers, respectively.

[24] The fact that males appear to have different hazard rates than females has motivated us to estimate separate models for males and females. The precision of these estimates (not reported) is the same that for the entire sample, similar effects on the hazard rates on variables such as gender, group of age and job category and asymmetric effects of the level of benefits, the net wage of the last job and the days before the exhaustion of the unemployment benefits variable (and its quadratic form) variable.

[25] This result is not a surprise because Lynch (1985) detected no evidence of a significant benefit effect on the behaviour of London Youth.

The level of benefits affect the hazard rates of finding a job for UI and UA recipients differently. For UI recipients, the level of benefits presents a positive effect[26] (not very strong) on the hazard rates during the first twelve months and is not significant onwards. For UA recipients, the level of benefits present a stronger disincentive effect on the hazard rates. These findings imply that a 10% increase in unemployment income will decrease the expected duration of UI spells by 1.2% during the first six months and 0.3% from 6-12 months; however, it will increase the expected duration of UA spells by 47.6%[27].

The net wage of the last job variable have a negative and positive effect on the hazard rates of UI and UA recipients, respectively. For UI recipients, the unemployed who perceived higher net wages on the last job present lower hazard rates because demand better offer jobs (higher reservation wages). For UA recipients, the unemployed increase the intensity of a job search to escape quickly of the unemployment because better offers are associated with the highest educated unemployed that in his turn time are associated with the unemployed who received the highest net wages in the last job.

The tendency to leave unemployment the days before the entitlement period expires is very different on recipients of UI and UA: while UI recipients decrease the hazard rates up to 413 days before UI exhaustion approach, and thereafter increases them; the hazard rates of UA recipients do not rise near the time of exhaustion because increases up to 380 days before the UA exhaustion approach, and thereafter decreases them.

Finally, the results show that the $((UI^e - UA^e)$ variable present a positive and significant effect on the hazard rates of the unemployed. This finding has two implications. On the one hand, a significant effect of this variable imply that all the unemployed qualified to get UA do not access to this supplemental benefit because there is a group of unemployed[28] that decided to quit the UCS while were receiving UI.. On the other hand, a positive effect means that the higher is the paid fall from UI to UA the higher is the hazard rates out of unemployment of this type of recipients because

[26] This incentive effect of UI level has been detected previously by Tannery (1987) and Ben Horim and Zucherman (1987). They justify this evidence saying that the level of benefits may increase resources devoted to search and hence increase the probability of return to work. However, we think that there is another reason for the positive correlation between hazard rates and UI level during the first twelfth months which is based on the characteristics of the Spanish UCS. The unemployed with the highest hazard rates detected on periods less than 12 months (see Figure 3) corresponds to the unemployed who receive greater level of benefits (80% and 70% of the wage of the last job) because are less penalised by the UCS due to the shorter unemployment periods.

[27] Despite of the negative effect of UA level, we want to remember that UA level is on average lower than UI level. Moreover, UA is only granted for the unemployed with a low income to reconcile the objective of social equity in the society.

[28] This group of unemployed is 21.09% of the entire sample. On average they remain 225.41 days on UI and quit UCS 180.32 days before the exhaustion.

they search a job with more intensity. Thus, for example, a 10 thousand ptas per month increase on the paid fall from UI to UA increase the hazard rates by 0.14. At the mean length of UI of this group is around 255.41 days, this corresponds to an increase in days of unemployment under UI of (0.14)*(255)=35.17.

Baseline hazard rate.

An exponential distribution for the baseline hazard rate is assumed in all estimations. This means that the unemployment duration does not affect the hazard rates of the unemployed across unemployment spells. In other words, the baseline hazard function is constant and reflects no duration dependence. This assumption is not flexible but we are interested to illustrate with a single distribution (only one parameter for the baseline hazard rate- exp(intercept)) that: the baseline hazard rate on the tdm is higher (overvalue in magnitude) than on the etdm for UI recipients; the baseline hazard rate of the unemployed on the etdm is lower than on the cbm; and finally, UA recipients present lower baseline hazard rate than UI recipients making use of an etdm.

Unobserved heterogeneity.

The coefficients of unobserved heterogeneity components are significantly different from zero at the 1% level in all estimations. Moreover, three support points are sufficient to approximate the probability distribution of the unobserved heterogeneity components. The estimated support points for the tdm (cbm in brackets) are 0 (0), 0.85 (0.5) and 1(1) with associated probability masses 0.48 (0.22), 0.32 (0.57) and 0.20 (0.21), respectively. For the etdm, the estimates support points are 0, 0.79 and 1 having probability masses 0.12, 0.68 and 0.20. We appreciate comparing estimation results without and with unobserved heterogeneity components (Tables 4 and 5) that the estimated coefficients and the value of the log-likelihoods are affected by the inclusion of controls for unobserved heterogeneity. On the one hand, the unobserved heterogeneity component increase the log-likelihood values in the estimations, and therefore improving the fits of the models. On the other hand, there are specially differences in the baseline hazard rates and some variables on the tdm. For example, the magnitude of the baseline parameter decrease in magnitude in the estimations with the

inclusion of unobserved heterogeneity[29]; and variables such as to have family burdens, to enter the UCS and the level of benefits change the significant on the hazard rates. The rest of variables does not present specially outstanding alterations in the estimations.

6. Conclusions.

This paper has used administrative data set from the Spanish Labour Office to show that the influence of unemployment benefits on the hazard rates changes considerably when we make use of a traditional duration model that use only UI data, or deals with UA as a mere extension of UI, instead of an extra time duration model that accounts separately for transitions rates from unemployment benefits to work of the unemployed who receive UI and those receiving UA after UI has expired. Specifically, the traditional approach to measure exit rates from UI undervalue the expected UI durations. This novel finding evidenced with this database may be common in other database of OECD and transition countries where there are basically two types of unemployment benefits: UI and UA after the exhaustion of UI.

Among other results of the paper, we observe that there are characteristics of the unemployed that present symmetric effects on the hazard rates on characteristics such as gender, qualifications and age. Thus, women, worse qualified and older unemployed present less hazard rates from UI and UA to a job. However, the level of benefits and the entitlement duration variable affect asymmetrically the hazard rates: while UI levels incentive the hazard rates during the first twelfth months and is insignificant onwards; UA level affect negatively the transitions rates from UA to a job. Concerning the tendency to leave the unemployment the days before the end of unemployment benefits, the unemployed who receive UI increase the hazard rates when UI exhaustion approach; while UA recipients escape quickly at the beginning of UA and do not rise the hazard rates near the time of the exhaustion. Finally, we have detected that there is a group of unemployed qualified to UA that decided to quit UCS while were receiving UI of which reason is the loss of income that they experience when pass from UI to UA.

[29] This empirical result is consistent with the theoretical findings of Heckman and Singer (1985) that failure to control for unobserved heterogeneity leads to a bias in the baseline hazard function.

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Table 1. Descriptive statistics. Benefits recipients [UI and UA (after UI exhaustion)]. 1991-93.

	Year 1991			Year 1992			Year 1993		
UI data	**%**	**Mean**	**Std**	**%**	**Mean**	**Std**	**%**	**Mean**	**Std**
Unemployment duration (months)									
Current		8.69	7.13		9.62	6.77		9.55	6.98
Entitlement		10.42	7.50		11.48	7.06		11.98	7.52
UI level (euros per month)		475.4	110.0		465.5	143.0		503.8	158.4
Type of observation									
Get a job under UI (uncensored)	21.5			21.8			26.9		
Exhaust UI (censored)	78.5			78.2			73.2		
UI and UA data									
Unemployment duration (months)									
Current (UI+UA)		15.59	13.40		15.96	12.67		12.97	10.36
Entitlement (UI+UA)		18.30	13.28		18.95	12.64		16.13	10.73
Current UA		18.96	7.21		18.85	7.71		16.17	8.24
Entitlement UA		21.69	4.64		22.19	5.00		19.63	6.83
Level of benefits (euros per month)									
UI		475.4	110.0		465.5	143.0		503.8	158.4
UA		292.1	44.0		316.7	45.3		328.9	60.0
UI+UA		432.6	135.8		423.9	144.2		482.3	162.2
Type of observation									
Get a job under UI (uncensored)	21.5			21.8			26.9		
Exhaust UI (censored)	42.2			44.6			52		
Get a job under UA (uncensored)	8.2			9.1			6.1		
Exhaust UA (censored)	28.1			24.5			15.1		
Sample	61,019			47,875			44,558		

Source: HSIPRE database.

Table 2. Descriptive statistics. Benefits recipients. Entire sample

	UI+UA data.			Benefits separately					
				UI			UA		
Variables	**Mean.**	**Std.**	**Sample (%)**	**Mean.**	**Std.**	**Sample (%)**	**Mean.**	**Std.**	**Sample (%)**
Gender									
Male			65.8			65.8			53.7
Female			34.2			34.2			46.3
Age (years)									
Entry age	31.80	10.23	100	31.80	10.23	100	33.64	9.91	100
Exit age	32.75	10.41	100	32.4	10.36	100	34.92	9.90	100
Exit age square	1180.8	793.95	100	1157.6	785.28	100	1317.9	772.9	100
Family burdens									
With			40.4			27.3			86.9
Without			59.6			72.7			13.1
Unemployment duration (days)									
Current	339.95	360.17	100	217.69	215.44	100	461.15	205.82	100
Entitlement	447.83	369.08	100	294.72	242.46	100	577.52	96.25	100
Duration until the exhaustion	107.88	183.58	100	77.03	165.06	100	116.36	179.83	100
(Duration until the exhaustion /10)^2	453.37	1001.6	100	331.77	922.54	100	458.70	850.55	100
Net wage (euros per month)	401.2	131.8	100	401.1	131.8	100	379.7	99.0	100
Level of benefits(euros per month)	328.6	101.9	100	363.3	86.3	100	219.4	32.5	100
Cause of unemployment									
End of contract			95.9			95.9			95.7
Others			4.1			4.1			4.3
Exit of the UCS									
Get a Job			41.1			31.3			36.8 (9.8)*
Exhaust benefits			58.9			42.2			63.2(16.7)*
Job category									
1			7.6			7.7			3.2
2			8.8			8.9			8.4
3			4.5			4.5			3.6
4			11.9			12			12.1
5			21.5			21.7			20.2
6			18			18.2			18.5
7			27.7			27.1			34.2
Sample	11,668			11,668			3,077		

Legend. Job category variable: 1. High levels and associate professional technicians, foremen and supervisors; 2. Technical assistants and skilled clerical workers; 3. Semi-skilled clerical workers; 4. Unskilled clerical workers; 5. Skilled production workers; 6. Semi-skilled production workers; 7. Unskilled production workers.

* We present in brackets the percentage of the unemployed who access to UA: 9.8% (of 11,668 unemployed) get a job receiving UA and 16.7% exhaust UA.

Table 3. Gross hazard rates (ghr). Traditional duration model (tdm); Complete benefits model (cbm) and Extra-time duration model (etdm). Entire sample.

	tdm			cbm			etdm					
	UI			UI+UA.			UI			UA		
	ghr	(%)	Sign	ghr	(%)	Sign	ghr	(%)	Sign	ghr	(%)	Sign
Variables												
Reference individual	4.05	100	***	3.48	100	***	2.64	100	***	1.13	100	***
Gender												
Male	5.25	130.16	***	4.83	138.94	***	3.72	140.40	***	1.30	114.67	***
Female	2.22	54.61	***	1.77	51.05	***	1.29	49.21	***	0.80	70.73	***
Job Category												
1	6.09	150.50	***	5.73	165.04	***	5.04	190.56	***	0.93	82.00	***
2	2.94	72.60	***	2.61	75.19	***	2.13	80.14	***	0.96	85.13	***
3	4.47	110.62	***	4.35	125.75	***	3.18	119.94	***	1.64	144.65	***
4	3.18	78.67	***	2.73	79.14	***	2.01	76.37	***	1.17	103.29	***
5	4.74	117.15	***	4.26	122.96	***	3.21	121.84	***	1.35	118.75	***
6	3.54	87.81	***	2.91	83.61	***	2.28	86.59	***	0.92	81.53	***
7	3.54	87.81	***	3.39	97.60	***	2.37	90.06	***	1.16	102.72	***
Family Burdens												
With	4.44	110.10	***	3.81	110.05	***	2.79	105.79	***	1.07	94.51	***
Without	3.87	95.54	***	3.30	95.30	***	2.58	97.29	***	1.34	118.54	***
Enter the UCS												
End of the contract	4.20	103.89	***	5.94	171.37	***	2.70	102.45	***	1.10	97.04	***
Others	2.43	60.17	***	0.18	5.22	***	1.86	70.25	***	1.65	145.85	***
Age (years)												
>=18 & <=25	5.49	136.16	***	4.41	126.82	***	3.00	129.65	***	1.30	115.02	***
>25 & <=30	4.47	110.80	***	3.63	104.71	***	2.79	105.03	***	1.14	100.56	***
>30 & <=35	3.96	97.93	***	3.30	95.51	***	2.55	96.21	***	0.96	84.49	***
>35 & <=40	3.87	95.97	***	3.42	98.53	***	2.43	92.05	***	1.14	100.95	***
>40 & <=45	3.84	95.01	***	3.33	95.77	***	2.40	90.58	***	1.31	115.41	***
>45 & <=50	4.50	111.26	***	3.96	114.33	***	3.03	114.09	***	1.12	99.33	***
>50 & <=55	4.74	116.94	***	3.90	112.56	***	3.03	114.46	***	1.02	90.30	***
>55	1.56	38.55	***	1.62	46.41	***	1.32	50.07	***	1.23	108.90	***
Net wage (thousand ptas)												
<= 60 per month	3.96	97.73	***	3.09	89.05	***	2.31	87.86	***	0.98	86.40	***
>60 & ≤75 per month	4.32	106.56	***	3.75	108.47	***	2.76	104.91	***	1.29	113.68	***
> 75 & ≤100 per month	3.69	91.50	***	3.51	100.90	***	2.73	103.62	***	1.37	120.85	***
> 100 & ≤125 per month	3.75	92.61	***	3.51	101.10	***	3.06	115.31	***	1.04	91.73	***
> 125 & ≤150 per month	4.05	100.20	***	3.99	114.65	***	3.63	137.70	***	1.18	104.65	***
>150 per month	4.20	103.61	***	4.17	120.41	***	3.87	146.63	***	1.34	118.30	***
Benefits (thousand ptas)												
>40 & <=60 per month	3.48	86.30	***	3.00	86.06	***	2.19	82.98	***	2.32	204.85	***
>60 &<=80 per month	4.50	111.0	**	4.20	121.27	**	3.27	123.99	**	0.37	32.57	***
>80 & <=100 per month	8.13	201.20	***	7.14	205.66	***	6.21	234.99	***	-	-	
>100 per month	23.70	586.45	***	16.41	473.02	***	15.03	568.64	***	-	-	

Legend. Job category variable see Table 2; *** means significant at 1% level.

Table 4. Parameters estimates without unobserved heterogeneity and standard errors. Tdm, cbm and etdm models.

	tdm			cbm			etdm					
	UI			UI+UA.			UI			UA		
Variables	**Param**	**S.E**	**Sign**	**Param**	**S.E**	**Sign**	**Param**	**S.E**	**Sign**	**Param**	**S.E**	**Sign**
Gender (female)	-0.841	0.044	***	-0.776	0.038	***	-0.497	0.042	***	-0.882	0.078	***
Age (years).												
>=18 & <=25	0.252	0.065	***	-0.036	0.059		0.137	0.061	**	0.236	0.124	*
>25 & <=30	0.227	0.060	***	0.093	0.054	*	0.123	0.055	**	0.157	0.111	
>30 & <=35	0.091	0.066	***	-0.013	0.058		0.029	0.061		0.065	0.118	
>35 & <=40 (&)	-	-	-	-	-	-	-	-	-	-	-	-
>40 & <=45	-0.063	0.076		-0.011	0.067		-0.055	0.070		-0.018	0.136	
>45 & <=50	-0.076	0.083		-0.036	0.075		-0.027	0.078		0.065	0.151	
>50 & <=55	-0.051	0.083		-0.047	0.076		-0.063	0.078		-0.271	0.170	
>55	-0.607	0.096	***	-0.579	0.087	***	-0.487	0.089	***	-0.541	0.196	***
Job category												
1	0.369	0.069	***	0.257	0.062	***	0.268	0.065	***	0.030	0.164	
2	-0.185	0.067	***	-0.108	0.059	*	-0.112	0.063	*	0.044	0.146	
3	0.038	0.091		0.040	0.080		0.059	0.087		0.221	0.152	
4	-0.196	0.069	***	-0.114	0.060	*	-0.112	0.065	*	0.066	0.122	
5(&)	-	-		-	-		-	-		-	-	-
6	-0.188	0.056	***	-0.142	0.049	***	-0.108	0.052	**	-0.199	0.110	*
7	-0.223	0.051	***	-0.274	0.043	***	-0.147	0.047	***	-0.314	0.088	***
Family burdens (with)	-0.168	0.052	***	-0.092	0.044	**	-0.026	0.045		0.055	0.092	
End of the contract	0.109	0.078	***	-0.166	0.069	**	0.103	0.074		-0.202	0.180	
Log reg. unemploy. rate[a,b]	-0.009	0.003	***	-0.009	0.003	***	-0.005	0.003	**	-0.017	0.005	***
Duration until exhaustion (days/10)[a]	0.021	0.003	***	-0.017	0.002	***	-0.209	0.029	***	0.203	0.077	***
(Duration until exhaustion)^2 (days/100)[a]	0.000	0.000		0.000	0.000		0.025	0.005	***	-0.026	0.013	**
Log net wages (Th. ptas/ month)[b]	-0.466	0.131	***	0.183	0.077	**	-0.259	0.119	**	0.612	0.154	***
Log benefits (Th.ptas/ /month)[a]	-	-		-	-	-	-	-	-	-4.754	0.299	***
Duration & log level of benefits[a]												
From 0 to 6 months	0.228	0.014	***	0.186	0.012	***	0.113	0.013	***	-	-	-
From 7 to 12 months	0.060	0.022	***	0.085	0.016	***	0.042	0.019	**	-	-	-
From 13 to 18 months	0.046	0.029		0.099	0.017	***	-0.038	0.024		-	-	-
More than 18 months	-0.350	0.192	*	-0.653	0.084	***	-0.111	0.174		-	-	-
(UI^e -UA^e) benefits (th.pts.month)[a]	0.023	0.002	***	0.004	0.002	***	0.015	0.002	***	-	-	-
Sample (% censored)	11,688(68.7)			11,688(58.9)			11,688(42.2)			3,077(63.2)		
Negative log likelihood	8,698.8152			8,631.7772			14,207.9934					

Legend. Job category in Table 2; & Indicates the characteristics of the reference individual; "th. ptas/ month "means thousand ptas per month; *** significant at 1% level, ** significant at 5 % level and *significant at 10% level.
[a]: time varying covariate. All variables derived from HISPRE database , except [b]: quarterly regional unemployment rate (source: Spanish Labour Force Survey, EPA), and tax liabilities on earnings to give net wages rather than gross earnings (author´estimates).

Table 5. Parameters estimates with unobserved heterogeneity and standard errors. Tdm, cbm and etdm models.

	tdm			cbm			etdm					
	UI			UI+UA.			UI			UA		
Variables	**Param.**	**S.E.**	**Sign.**	**Param.**	**S.E.**	**Sign.**	**Param.**	**S.E.**	**Sign.**	**Param.**	**S.E.**	**Sign.**
Gender (female)	-0.797	0.048	***	-0.778	0.039	***	-0.497	0.043	***	-0.903	0.079	***
Age												
>=18 & <=25	0.256	0.082	***	-0.035	0.059		0.144	0.066	**	0.242	0.126	*
>25 & <=30	0.218	0.076	***	0.094	0.054	*	0.126	0.060	**	0.165	0.113	
>30 & <=35.	0.050	0.082		-0.014	0.059		0.029	0.065		0.066	0.119	
>35 & <=40 (&)	-	-	-	-	-	-	-	-	-	-	-	-
>40 & <=45	-0.049	0.093		-0.011	0.068		-0.048	0.074		-0.022	0.138	
>45 & <=50	-0.064	0.102		-0.036	0.076		-0.017	0.083		0.066	0.153	
>50 & <=55	0.041	0.103		-0.046	0.077		-0.051	0.083		-0.278	0.172	
>55	-0.557	0.116	***	-0.579	0.087	***	-0.469	0.094	***	-0.563	0.199	***
Job category												
1	0.382	0.082	***	0.259	0.062	***	0.267	0.068	***	0.039	0.166	
2	-0.242	0.075	***	-0.108	0.059	*	-0.114	0.065	*	0.038	0.148	
3	0.016	0.104		0.039	0.080		0.059	0.090		0.225	0.155	
4	-0.203	0.076	***	-0.114	0.061	*	-0.109	0.067	*	0.062	0.123	
5(&)	-	-	-	-	-	-	-	-	-	-	-	-
6	-0.172	0.063	***	-0.142	0.049	***	-0.104	0.053	**	-0.207	0.112	*
7	-0.221	0.057	***	-0.275	0.044	***	-0.146	0.049	***	-0.322	0.089	***
Family burdens (with)	-0.078	0.063		-0.092	0.044	**	-0.013	0.047		0.060	0.094	
End of the contract	0.108	0.090		-0.167	0.069	**	0.112	0.077		-0.205	0.181	
Reg. Unemployment rate	-0.008	0.004	**	-0.009	0.003	***	-0.005	0.003	**	-0.018	0.005	***
Duration until exhaustion (days/10)	0.015	0.003	***	-0.017	0.002	***	-0.0240	0.0030	***	0.0198	0.0078	***
(Duration until exhaustion)^2, (days/100)	-0.0003	0.0001	***	0.001	0.001		0.00029	0.0001	***	-0.00026	0.0001	***
Log net wage (Th. ptas/ month)	-0.517	0.147	***	0.184	0.077	**	-0.274	0.124	**	0.614	0.158	***
Log benefits (Th. ptas/ Month)	-	-	-	-	-	-	-	-	-	-4.770	0.302	***
Duration & level of benefits												
From 0 to 6 months	0.178	0.015	***	0.186	0.012	***	0.106	0.013	***	-	-	-
From 7 to 12 months	0.026	0.023		0.084	0.016	***	0.038	0.020	*	-	-	-
From 13 to 18 months	0.032	0.030		0.099	0.017	***	-0.036	0.024		-	-	-
More than 18 months	-0.115	0.216		-0.654	0.085	***	-0.070	0.180		-	-	-
(UI^e –UA^e) benefits. (th. Ptas/month)	0.016	0.002	***	0.004	0.002	***	0.014	0.002	***	-	-	-
Heterogeneity component	2.246	0.241	***	0.233	0.046	***	-1.347	0.214	***	-1.869	2.049	***
Sample (% censored)	11,688(68.7)			11,688(58.9)			11,688(42.2)			3,077(63.2)		
Negative log –likelihood	8,890.583			8,931.982			14,520.414					

Legend. See Table 5

Table 5.1. Support points that approximate the probability distribution of the unobserved heterogeneity component corresponding to estimation of Table 5.

	tdm			Cbm			etdm		
Support points	**localiz**	**prob**	**sign**	**localiz**	**prob**	**sign**	**localiz**	**Prob**	**Sign**
First point	0	0.48	***	0	0.22	***	0	0.12	***
Second point	0.85	0.32	***	0.5	0.57	***	0.79	0.68	***
Third point	1	0.20	***	1	0.21	***	1	0.20	***

Legend. ***** significant at 1% level, ** significant at 5 % level and *significant at 10% level.

Table 6. ***E****lasticities* (elast). Variables corresponding to estimations in Table 5.

tdm			**cbm**		**etdm**			
	UI.		**UI+UA.**		**UI.**		**UA.**	
	elast	**sign**	**elast**	**sign**	**elast**	**sign**	**elast**	**sign**
Gender (female)	-54.91	***	-54.06	***	-39.17	***	-59.48	***
Age (years)								
>=18 & <=25	29.21	***	-3.39		15.47	**	27.37	*
>25 & <=30	24.35	***	9.84	*	13.42	**	17.95	
>30 & <=35	5.16	***	-1.34		2.97		6.80	
>35 & <=40 (&)	-	-	-	-	-	-	-	-
>40 & <=45	-4.81		-1.09		-4.72		-2.22	
>45 & <=50	-6.23		-3.51		-1.68		6.78	
>50 & <=55	4.21		-4.52		-5.01		-24.27	
>55	-42.70	***	-43.98	***	-37.43	***	-43.04	***
Job category								
1	46.46	***	29.54	***	30.62	***	4.02	
2	-21.49	***	-10.27	*	-10.80	*	3.82	
3	1.64		3.94		6.08		25.26	
4	-18.40	***	-10.79	*	-10.36	*	6.34	
5(&)	-	-	-	-	-	-	-	-
6	-15.83	***	-13.26	***	-9.89	**	-18.71	*
7	-19.85	***	-24.02	***	-13.54	***	-27.50	***
Family burdens (with)	-7.54	***	-8.80	**	-1.24		6.22	
End of the contract	11.45	***	-15.38	**	11.86		-18.52	

Legend. Job category in Table 2; & Indicates the characteristics of the reference individual; *** significant at 1% level, ** significant at 5 % level and *significant at 10% level.

Figure 1. Unemployment duration of the unemployed using administrative database.

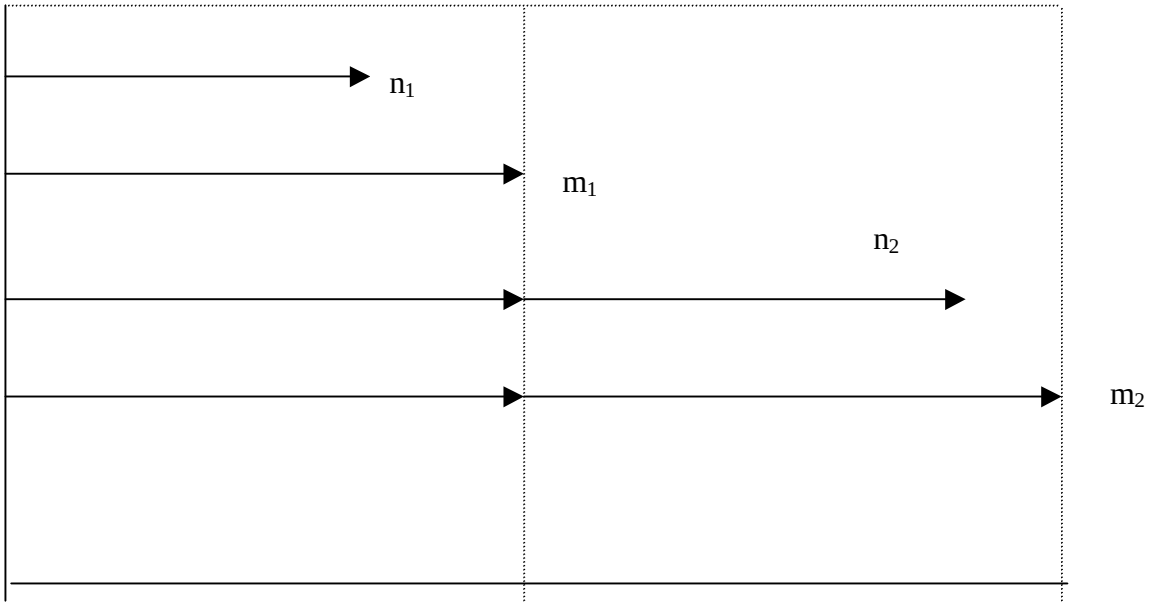


Figure 2. Budget constraint for the unemployed who receive UI and UA.

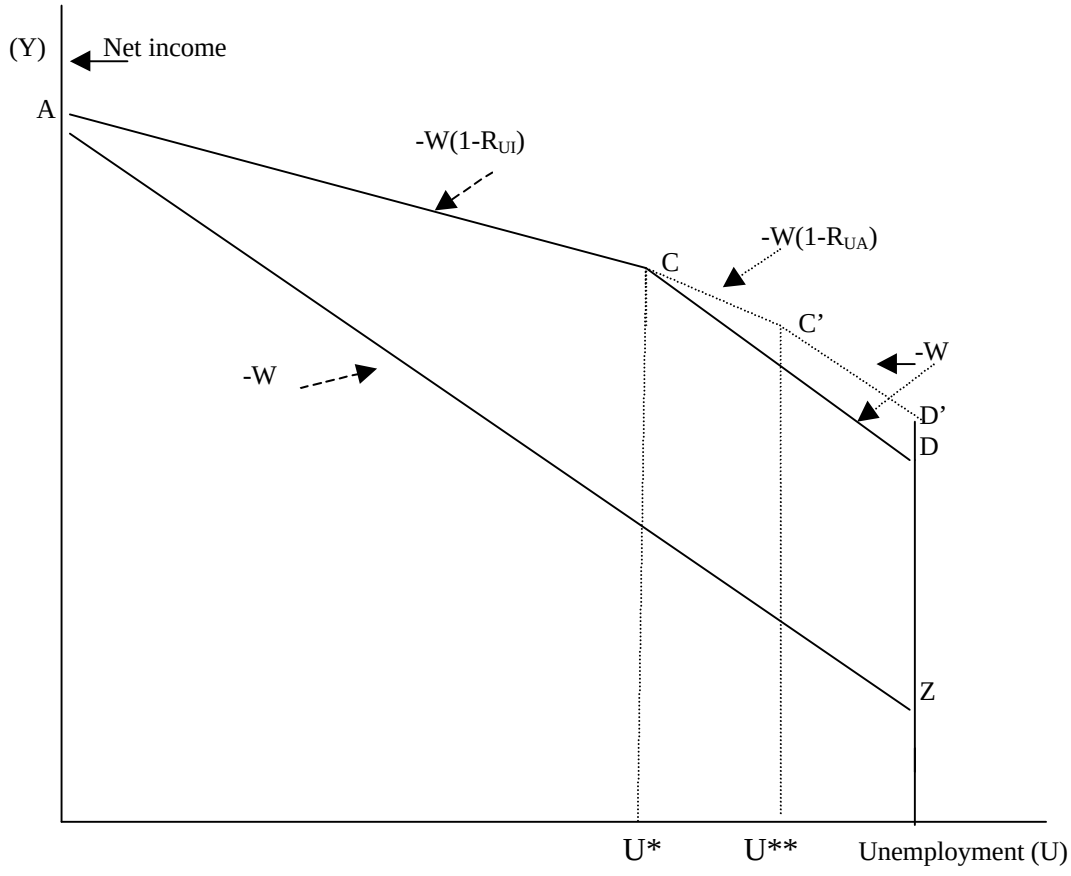


Figure 3. Empirical hazard rate of the unemployed making use of a traditional UI duration model (UI) and an extra time duration model for UI recipients (UI seq).

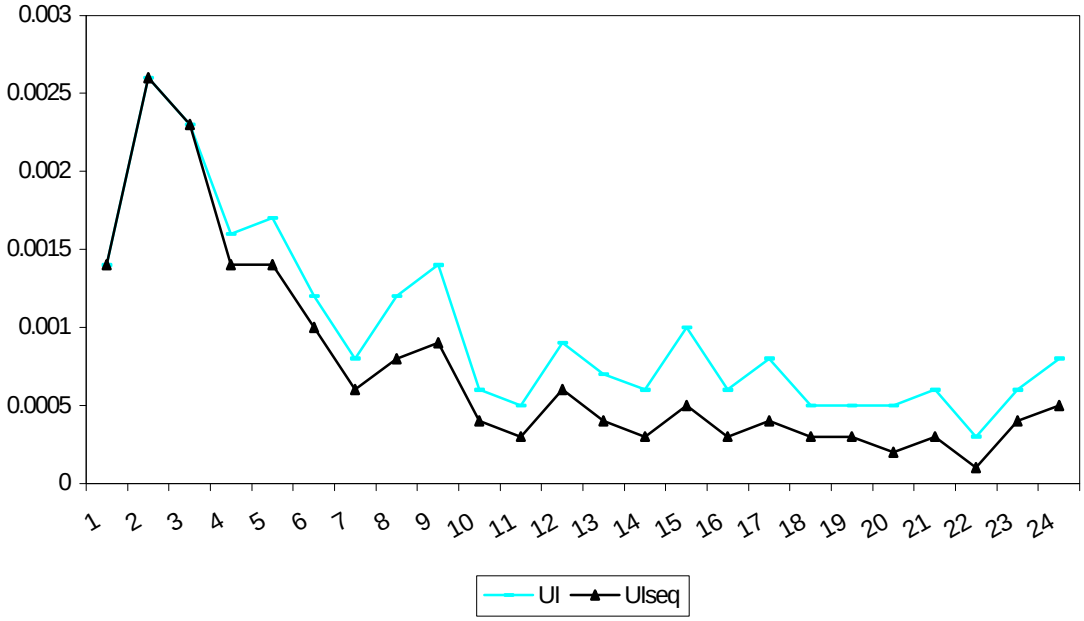
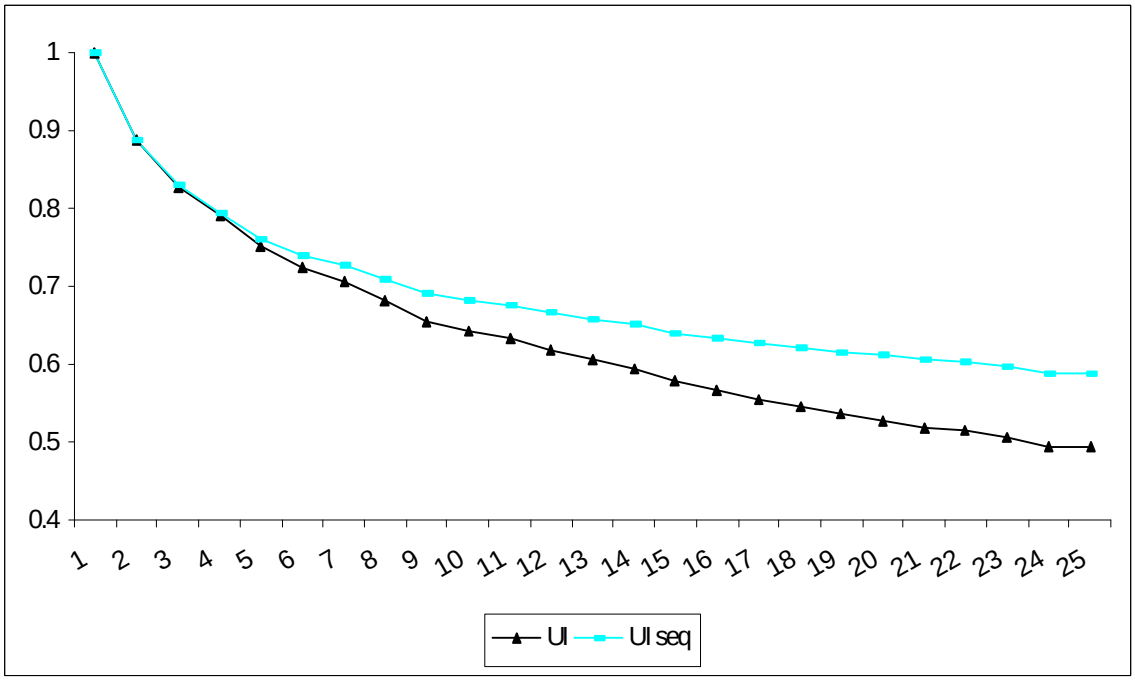


Figure 4. Empirical survival probability of the unemployed making use of a traditional UI duration model (UI) and an extra time duration model for UI recipients (UI seq).



Appendix A1.

Table A1.1. Pre-1992 period.

Contribution period (C) (Over the last 4 years)	**Entitlement UI ($2 \times$ integer (C/3))**	**UA after the UI exhaustion**			
		With family burdens		**Without family burdens**	
		< 45 years	**≥ 45 years**	**<45 years**	**≥45 years**
3 months	-	3 months	3 months	-	-
4 months	-	4 months	4 months	-	-
5 months	-	5 months	5 months	-	-
From 6 to 12 months	3 months	18 months	24 months	-	-
From 12 to 18 months	6 months	24 months	30 months	-	-
From 18 to 24 months	9 months	24 months	30 months	-	-
From 24 to 30 months	12 months	24 months	30 months	-	6 months
From 30 to 36 months	15 months	24 months	30 months	-	6 months
From 36 to 42 months	18 months	24 months	30 months	-	6 months
From 42 to 48 months	21 months	24 months	30 months	-	6 months
48 months	24 months	24 months	36 months	-	12 months

Table A1.2 Post-1992 period.

Contribution period (C) (over the last 6 years)	**Entitlement UI ($2 \times$ integer (C/6))**	**UA after the UI exhaustion**			
		With family burdens		**Without family burdens**	
		< 45 years	**≥45 years**	**<45 years**	**≥45 years**
3 months	-	3 months	3 months	-	-
4 months	-	4 months	4 months	-	-
5 months	-	5 months	5 months	-	-
From 6 to 11 months	-	21 months	21 months	6 months	6 months
From 12 to 17 months	4 months	18 months	24 months	-	-
From 18 to 23 months	6 months	24 months	30 months	-	-
From 24 to 29 months	8 months	24 months	30 months	-	-
From 30 to 35 months	10 months	24 months	30 months	-	-
From 36 to 41 months	12 months	24 months	30 months	-	6 months
From 42 to 47 months	14 months	24 months	30 months	-	6 months
From 48 to 53 months	16 months	24 months	30 months	-	6 months
From 54 to 59 months	18 months	24 months	30 months	-	6 months
From 60 to 65 months	20 months	24 months	30 months	-	6 months
From 66 to 71 months	22 months	24 months	30 months	-	6 months
72 months	24 months	24 months	36 months	-	12 months

A2.2 Likelihood function of the extra time duration model.

The likelihood function of the extra time duration model present four types of spells when administrative record databases contain information of UI and UA: two complete spells (n_1, n_2) and two censored spells (m_1, m_2). Three dummy variables, d_1, d_2 and d_3 may represent the durations for these observations. Thus,

If $d_1=1$ ⟶ It distinguishes complete durations of the unemployed that get a job while are receiving UI.

If $d_1=0$, $d_2=1$ ⟶ It discriminates censored durations of the unemployed that exhaust UI.

If $d_1=0,d_2=0,d_3=1$ ⟶ It distinguishes complete durations of the unemployed who exhaust UI and exit to a job while are perceiving UA.

If $d_1=0,d_2=0,d_3=0$ ⟶ It discriminates censored durations of the uneployed who exhaust UI and UA.

The likelihood function for this type of data would be:

$$Pr(n_1, m_1, n_2, m_2) = P_1(n_1,m_1)\times P_2(n_2,m_2|n_1,m_1)=$$

$$=Pr(T=n_1,d_1=1)\times Pr(T=m_1,d_1=0,d_2=1)\times Pr(T=t_2,d_1=0,d_2=0,d_3=1)\times$$

$$\times Pr(T=m_2,d_1=0,d_2=0,d_3=0).$$

Where the first term is:

$$Pr(T=n_1,d_1=1)=Pr(T=n_1|d_1=1)\times Pr(d_1=1)=Pr(T=n_1|t_1\leq m_1)\times Pr(n_1\leq m_1)= f(t_1).$$

The second term is:

$$Pr(T=m_1,d_1=0,d_2=1)= Pr(T=m_1|d_1=0,d_2=1,)\times Pr(d_1=0,d_2=1)= S(t_1).$$

The third term is:

$$Pr\ (T=n_2,d_1=0,d_2=0,d_3=1)= Pr(T=n_2|d_1=0,d_2=0,d_3=1)\times Pr(d_1=0,d_2=0,d_3=1)=$$

$$= f(t_2)\times S(t_1).$$

And finally, the last term is:

$$Pr\ (T=m_2,d_1=0,d_2=0,d_3=0)= Pr(T=m_2|d_1=0,d_2=0,d_3=0)\times Pr(d_1=0,d_2=0,d_3=0)=$$

$$= S(t_2)\times S(t_1).$$

Regrouping the terms, the likelihood function for "n" individual on the extra time duration model is:

$$L(t_{ij}) = \prod_{i=1}^{N} \underbrace{\left[f(t_{i1})\right]^{d_{i1}}}_{n_1} \times \underbrace{\left[S(t_{i1})\right]^{d_{i2}(1-d_{i1})}}_{m_1} \times \underbrace{\left[\left\{f(t_{i2})\right\} \times \left\{S(t_{i1})\right\}\right]^{d_{i3}(1-d_{i1})(1-d_{i2})}}_{n_2} \times$$

$$\times \underbrace{\left[\left\{S(t_{i2})\right\} \times \left\{S(t_{i1})\right\}\right]^{(1-d_{i1})(1-d_{i2})(1-d_{i3})}}_{m_2}.$$