

# **An extra-time duration model with application to unemployment duration under benefits in Spain<sup>\*</sup>**

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## **Abstract.**

Exploiting administrative unit-data records from the Spanish Employment Agency (INEM), we use a continuous mixed proportional hazard (mph) model that accounts for unobserved heterogeneity and sequential exit to analyse the transition rates from benefits to work for the unemployed receiving unemployment insurance (UI) and those receiving unemployment assistance (UA) after the UI exhaustion. We find theoretical arguments and empirical evidence on the bias in which the traditional likelihood function specification incurs. Specifically, the traditional approach to measure exit rates out of UI underestimates the expected UI duration. We observe that the greater is the size of the gap between the expected UI level and the expected UA level the greater is the probability of finding a job during UI entitlement duration for unemployed qualified for receiving UA. Finally, we notice unemployment insurance levels present an incentive effect for spell lengths less than 12 months and a disincentive effect onwards.

JEL classification: J64.

Key words: unemployment insurance, unemployment assistance, continuous mixed proportional hazard model, sequential exits, gross hazard rates, unobserved heterogeneity.

## **1. Introduction.**

The objective of this paper is to assess what can be learned about the influence of the Unemployment Compensation System (UCS) on the unemployment duration under benefits with administrative data records coming from an Unemployment Agency. As is well known, this type of administrative records data sets is very common in OECD and transition countries where the Welfare System for unemployed individuals is organised on the basis of two different benefits: Unemployment insurance (UI) and, mainly after UI exhaustion, unemployment assistance (UA). The existing vast literature on this subject is based either on Labour Force Surveys, among others for transition economies as Hungary, Micklewright and Nagy (1998), Poland, Gora and Schmidt (1998), Slovenia, Lubyova and Van Ours (1998), Czech Republic, Erbenova et al. (1998),

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Germany, Hunt (1995), or on administrative data sets, among others for Romania, Earle and Pauna (1998), Austria, Winter-Ebmer (1998), and Spain, Cebrian et al. (1996), and others countries as United Kingdom, Netherlands, France, etc.

In what concerns to duration analysis Figure 1 highlights the main features of administrative data on welfare recipients. There are unemployed individuals who receive UI and quit system to work “ $n_1$ ” or exhaust insurance benefits “ $m_1$ ”, and workers who exhaust their UI and quit the system to work during UA “ $n_2$ ” or exhaust UA “ $m_2$ ”. Then, firstly, if we consider unemployment under UI as a ruled period, in the sense that every unemployed entering the welfare system is qualified for UI, our data present an extra-time period, unemployment under UA. Secondly, conditions for the exhaustion of a ruled period and concession of an extra-time period are administrative, and only marginally depend on variables that affect events duration (censoring mechanism and extra-time are independents). Thirdly, exits out of welfare are produced sequentially with extra-time exits conditional on previous ruled period exhaustion. It is worth point out that the above characteristics are shared by others well known data coming from questions such as the exhaustion of a personal credit granted by a bank, the delay in the finalisation of public projects, heart transplant survival, etc.

Faced with that kind of data, the traditional approach to measure exit rates out of unemployment under benefits utilises either only information on UI durations or deals with UA durations as a mere extension of UI duration. However, this approach does not account for biases stemming from differences between sequential exits, one for unemployed who receive UI and another for UA recipients after UI exhaustion. In Arranz (1999) and Arranz et al. (2000), an extra-time duration model is introduced. It is a continuous mph model that accounts for unobserved heterogeneity and sequential exit. It also allows for different structural models that govern both ruled and extra-time periods. It is shown that the conditional probability of finding a job changes dramatically when we specify a traditional likelihood function, either a hazard model for UI information exclusively or with UI and UA information without separate their effects, instead of an extra-time duration model with sequential exit. The traditional approach underestimates the expected UI duration. Hence, we may affirm that administrative record data sets of most OECD and transition countries may be represented by this model because those unemployed who have not found a job when UI expires will usually continue in another benefit scheme, which may be different from UA. Otherwise, if we do not consider this additional information in a proper way it could provoke not only a misunderstanding of transition rates

from benefits to work but also a sample selection bias in the analysis of the effect of the UCS on the behaviour of the unemployed individual.

A simple empirical analysis with Spanish data from the National Institute of Employment (INEM) helps to appreciate the relevance of deals with UA information in a proper way. We may conclude looking at table 1 that UA duration is always longer than UI duration and unemployed individuals present higher exit rate out of UI than out of UA. The percentage of unemployed that exhausts UA is higher than the one of unemployed that exhausts UI. Hence, we generally can infer that unemployed who receive UA are a collective of recipients whose main objective is to exhaust benefits and not to find a job and, whatever is the entitlement and their level of benefits, they reach as far as the end of the entitlement period without getting a job. Besides, UA contribute to eliminate job-search incentives. If all that we have mentioned above is true, why is it necessary to maintain UA? This will be one of the objectives of our paper.

In our empirical analysis to study the influence of the UCS on the unemployment duration under benefits we utilise a longitudinal database that comes from administrative records contained in the Historical Integrated Benefits System (HSIPRE, Histórico del Sistema Integrado de Prestaciones) collected by the Spanish Employment Agency (INEM, Instituto Nacional de Empleo). We use a continuous mpm model that accounts for unobserved heterogeneity and sequential exit to analyse transition rates from benefits to work for unemployed receiving UI and those receiving UA after the exhaustion of UI. This model presents consistent estimations because it is correctly specified. We estimate the model by the non-parametric maximum likelihood estimator proposed by Heckman and Singer (1984c). We provide theoretical and empirical evidence on bias in which the traditional likelihood function specification incurs. The traditional approach to measure exit rates from UI underestimates the expected UI duration. Besides, we see that the greater is the size of the gap between the expected UI level and the expected UI level the greater is the probability of finding a job during entitlement duration for unemployed qualified for receiving UA. Finally, we observe that UI levels present an incentive effect for spell lengths less than 12 months and a disincentive effect onwards.

The paper is organised as follows. In the next section we briefly describe the UCS in Spain. In section 3, we formulate our hazard model and likelihood function. The data are presented in section 4. Variables and empirical results in section 5. Finally, we summarise our findings in the last section with the conclusions.

## 2. The UCS in Spain.

Before carrying out our analysis, it appears convenient to present concisely the main features of the UCS (SIPRE, Sistema de Prestaciones por Desempleo) in Spain. As in most OECD countries, there are basically two types of benefits in Spain: Unemployment insurance (UI) and Unemployment assistance (UA). An unemployed that loses a job and has a minimum contribution period of 6 months during the last 48 months receives unemployment insurance<sup>1</sup>. The entitlement duration is calculated by dividing by 2 the number of months contributed, with the constraints that the result has to be an integer multiple<sup>2</sup> of 2. As for the level of income provided for the unemployed, it was determined by multiplying the gross replacement rate by the average of the “regulatory base” (i.e. the wage base used to calculate contributions and equal in principle to total wages) in the six months before entering unemployment. The monthly amount receive is the 80 per cent during the first six months of benefits (70 per cent after 1992) of the previous 6 monthly wage, the 70 per cent from the seventh to the twelfth month (60 per cent after 1992) and the 60 per cent from the thirteenth month onwards (60 per cent after 1992). UI is also subject to a floor equal to the statutory minimum wage (SMW) and a ceiling equal to 170 per cent of the SMW, which could be increased to 190 and 220 percent if unemployed person has one child or more than one dependent children. These two factors implied that the “net” (i.e. after-tax) replacement rate could be much higher than the gross rates above, the difference being dependent upon the actual wages received while working. Since 1994 the minimum has been reduced to 75% of the SMW unless the recipient has dependent children in which case it is still 100 % of the SMW.

For those who have worked but not enough for UI, or who have exhausted their UI, UA is available<sup>3</sup>. 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 benefit equal to 75 per cent of the SMW was paid to all beneficiaries. Since 1993, these criteria have been tightened, as the notion of family has been restricted and the per member income

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<sup>1</sup> Since 1992 a minimum of 12 months must have been worked during the last 72 months in order to receive any benefits.

<sup>2</sup> After 1992, the duration is calculated by dividing by 3 the number of months contributed, with the same constraint than before 1992.

<sup>3</sup> Workers having contributed less than 6 months in pre-1992 period or 12 months in post-1992 period were not entitled to unemployment insurance but they could claim unemployment assistance if they had contributed at least 3 months and had family burdens.

requirement lowered to 75% of the SMW. In tables 2 and 3 we show the entitlement duration benefits according to the period of contribution.

### 3. The model.

To study the determinants of the exit rate out of unemployment, we model the reemployment hazard of unemployment spells under benefits through a mph specification. The mph model, introduced by Lancaster (1979), is very popular in applied econometrics. The identification of this kind of models has been widely studied in the literature<sup>4</sup>. We use the following proportional hazard representation for the transition rates from unemployment under benefits into employment

$$h_{ij}(t_{ij} | X' \mathbf{b}_{ij}, c_{ij} \mathbf{q}) = \lambda_{0ij}(t_{ij}) f_{ij}(X' \mathbf{b}_{ij}) \Phi_{ij}(c_{ij} \mathbf{q}) \quad (1)$$

where  $t_{ij}$  is the duration of unemployment state  $i$  before exiting to the employment state  $j$ . The equation in (1) asserts that the rate of transition from unemployment under benefits  $i$  into employment  $j$  can be thought of as being influenced by three factors. All the three functions must be such that  $h_{ij}(t_{ij} | X' \mathbf{b}_{ij}, c_{ij} \mathbf{q})$  is non negative. Using an exponential representation for each function is the simplest way of ensuring this property. The function  $\lambda_{0ij}(\cdot)$  is called the baseline hazard function and captures the effect of the time elapsed in the unemployment state on the instantaneous probability of finding a job when all the factors held constant. The function  $f_{ij}(X' \mathbf{b}_{ij})$  expresses the influence of time invariant and time variant covariates on the transition rate from unemployment state  $i$  into employment state  $j$ . Finally, the function  $\Phi_{ij}(c_{ij} \mathbf{q})$  accounts for the effects of unobserved heterogeneity components. This function represents omitted individual specific effects, which influence the exit rate from unemployment in theory, but there are unobservable in the data, such as ability, attitudes, skills, etc. In (1)  $\beta_{ij}$  and  $c_{ij}$  are parameters to be estimated. The interpretation of  $\beta_{ij}$ , the coefficients of the covariates, is similar to that of a regression model, for each additional unit change in the value of  $X_{ij}$  the logarithm of the hazard changes by  $\beta_{ij}$ , *ceteris paribus*. A more intuitive interpretation is obtained by exponentiation the coefficient and computing the value  $\{\exp(\beta_{ij})-1\} \times 100$ . The interpretation is that for each unit change in the covariate  $X_{ij}$ , the rate of transition from unemployment state  $i$  into employment

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<sup>4</sup> For single spell models Elbers and Ridder (1982), Heckman and Singer (1984a), Ridder (1990). Extension for multiple spells multi state models can be found in Heckman and Singer (1984b) and Honore(1993).

state  $j$  changes by a percentage equal to  $\{\exp(\beta_{ij})-1\}$ . The parameter  $c_{ij}$  represents specific transition intensities between different states that are correlated across spells. Thus, 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.

### 3.1. The likelihood function and estimation method.

In the analysis of a sample of workers that enter at the same time into the Spanish UCS, the specification of the likelihood function contains completed and uncompleted unemployment durations. First, completed durations of workers that get a job. Second, uncompleted durations of workers who exhaust their entitlement period and disappear from the records forever. If we only consider, following the traditional approach, the effect of the unemployment insurance information on the unemployment duration of the recipients, the likelihood function will be, see appendix A.1,

$$L(t_1, t_2, X(t_{ij}), \theta) = \prod_{i=1}^n [f(t_{i1}, X(t_{i1}), \mathbf{q})]^{d_{i1}} \times [S(C_{i1}, X(t_{i1}), \mathbf{q})]^{(1-d_{i1})} \quad (2)$$

where  $d_{i1}$  is a variable dummy that discriminates censored and uncensored observations. The completed durations correspond to workers who quit the unemployment insurance to work ( $t_{i1}$ ) and uncompleted durations belong to workers who exhaust their unemployment insurance ( $C_{i1}$ ). The contributions to the likelihood function are the density function  $f(t_{i1})$  and the survival function  $S(C_{i1})$ , respectively. However, if we assume an independent censoring mechanism, and we know that workers who exhaust UI may access to UA, then estimators obtained by maximising (2) would be biased because the likelihood function would be uncompleted and should contain both types of benefits. We think that the correct likelihood function should be, see appendix A.2,

$$\begin{aligned} L(t_1, t_2, X(t_{ij}), \theta) = & \prod_{i=1}^n [f(t_{i1}, X(t_{i1}), \mathbf{q})]^{d_{i1}} \times [S(C_{i1}, X(t_{i1}), \mathbf{q})]^{d_{i2}(1-d_{i1})} \times \\ & \times \{ [f(t_{i2}, X(t_{i2}), \mathbf{q})] \times [S(C_{i1}, X(t_{i1}), \mathbf{q})] \}^{d_{i3}(1-d_{i1})(1-d_{i2})} \times \\ & \times \{ [S(C_{i2}, X(t_{i2}), \mathbf{q})] \times [S(C_{i1}, X(t_{i1}), \mathbf{q})] \}^{(1-d_{i1})(1-d_{i2})(1-d_{i3})} \end{aligned} \quad (3)$$

where  $d_{i1}$  is a dummy variable that distinguishes uncensored durations of UI recipients and quit the system to work, spell  $t_{i1}$ . The dummy variable  $d_{i2}$  discriminates censored durations of workers who exhaust their UI, spell  $C_{i1}$ . Finally, the dummy variable  $d_{i3}$  let separate between uncensored and censored durations of recipients who exhaust their insurance benefits and get assistance benefits. They can exhaust the UA or exit to a job,  $C_{i2}$  and  $t_{i2}$  spells respectively.

The contribution of  $t_{i1}$  in (3) is the value of the density function  $f(t_{i1})$ . The contribution of  $C_{i1}$  spell is the survival function  $S(C_{i1})$ , the contribution of the spell  $t_{i2}$  is the product of the density function  $f(t_{i2})$  and the survival function  $S(C_{i1})$ , and, finally, the contribution of the spell  $C_{i2}$  is composed of the product of two terms, the survival function  $S(C_{i2})$  and the density function  $S(C_{i1})$ . The first and the second term in (3) capture the impact of the UI and the third and fourth term the effect of the UA.

In the empirical analysis we estimate an extra-time model that includes different information about the type of benefits using the likelihood functions presented in (3) to analyse the effect of both types of benefits, separately. The estimation is carried out by the non-parametric maximum likelihood estimator of Heckman and Singer (1984) with a nonparametric distribution for the unobserved heterogeneity component and an exponential distribution for the baseline exit. Regards the unobserved heterogeneity component we use the approach of Heckman and Singer that does not require a prior parametric specification for unobserved heterogeneity components and approximate the unknown probability distribution by a finite support points, besides let use the data to determinate the location and the probability mass associated with each support point. The basic procedure is to estimate a model with  $i$  points of support, starting with  $i=1$  (which is just a model without heterogeneity), and adding points of support until the estimated model becomes singular. Because of the presence of an intercept and a factor loading we fix, without loss of generality, all the points to be on the unit interval and estimate the location and probability associated with each support point noting that the cumulative mass over all support points sum 1.

#### **4. The data set.**

Our sample consists of a random sample drawn from the HSIPRE (Histórico del Sistema de Prestaciones por Desempleo) data set that contains information on registered unemployed that receives all types of unemployment benefits from the National Institute of Employment (INEM). It registers claims of insurance and assistance benefits by all fully unemployed workers as well

as some of those partially unemployed (i.e. on short time work). The advantage of the HSIPRE data is to provide accurate information on days of UI and UA recipients, pre unemployment earnings, level of benefits, potential duration of benefits on time and information on several unemployment spells for the same individual. The importance of exact data is highlighted by the large amount of measurement error that has been found in the weeks of unemployment variable in some longitudinal surveys. Additionally, the UI and UA parameters, level of benefits and duration are often missing from other data sources, for example the Spanish Labour Force (EPA, Encuesta de Población Activa). Our data give precise information on these key variables. The disadvantage of the data is that it is not possible to determine the labour force status in the days after insurance and assistance benefits are exhausted and, unfortunately, does not include information about marital status, industry and size of the firm in the previous job.

To evaluate the effect of the benefits on the probability of finding a job, we consider a sample drawn from the inflow to the Spanish UCS in February 1987. We focus our study in one incidence and we consider assistance benefits when unemployed exhausted their insurance benefits. After making the sample selection described above our sample contains 12.140 observations. The duration of the spells is measured in days. Background variables like age, gender, family burdens, information about the UCS, job category and wages in the last job are registered at the beginning of the spell. Characteristics for the individuals who receive UI and UI or both types of benefits are reported in table 4 and 5, respectively.

We may observe that approximately a 57 % of UI entitlement spells are concentrated in periods with length less than 6 months. This percentage decreases until a 42% with the inclusion of UA data. With this supplementary information the percentages are redistributed up to longer entitlement periods. Thus, with the UA information (UI in brackets), the 36.2 % (28.1 per cent) are entitled between 15 and 24 months and the 10.5 (0 per cent)<sup>5</sup> per cent in more than 24 months.

In the same way, the average duration of unemployment under benefits, considering only UI information, what we have named ruled period duration, is approximately 227 days, and is longer with the inclusion of the UA information. Adding the latter the average duration of both benefits is about 347 days, where the average of the UA duration, what we have named extra-time period duration, is about 120 days. Differences in entitlement duration change in the same way. The average entitlement UI duration exclusive of UA is about 302 days, 452 days including the UA benefits information, where the entitlement UA duration is approximately 150 days. Therefore, if

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<sup>5</sup> The insurance entitlement duration does not exist by law for more than 24 months.



we do not consider the UA information we would be underestimating the longer entitlement duration and overestimating the shorter entitlement duration.

Censored and completed duration percentages also change with the inclusion of UA. Thus, we appreciate that a 30.6% of workers who receive UI exit to work, and a 69.4% exhausted their UI spells. With the information of the UA spells, the percentage of really censored observations in the UI spells decrease, and only a 43.3% of workers quit the System after UI exhaustion because a 26.1% accessed to an UA period. Concerning this group of unemployed who make longer their permanence in the System thanks to the UA, a 9.5% left the UA to work and a 16.5% exhausted it. Therefore, the UA data increase information about the number of individuals exposed to risk because decrease censored observations in the UI spells.

The rest of the covariates do not present outstanding alterations except family burdens variable. A 26.8% of workers who receive UI have family burdens, and this percentage increases until a 40.4% with UA information. Regards the cause of unemployment around a 95.5% of workers have entered unemployment by ending the contract in their last job.

To study in greater depth the patterns of months and the behaviour of the unemployed with only information of UI, or UI and UA we present two additional analyses. First, we show the habitual empirical hazard through Kaplan-Meier estimation and empirical survival probability in Figures 2 and 3. Finally, we present in table 6 an original presentation of the determinant features of unemployment duration based on the computation of gross hazard rates (ghr). For a complete illustration of this novel method see Muro (2000).

We see evidence in figure 2 that the empirical hazard of workers who experience UI under traditional UI model (only consider UI data) is overvalued compared to an extra-time duration model for UI data for all observed durations. In the opposite way, the survival probability for traditional UI model displayed in figure 3 is undervalued compared to the extra-time duration model for UI data. This evidence justifies the theoretical bias outlined through the above likelihood specifications: traditional hazard rates are overvalued and therefore survival rates are undervalued. Second, we observe several durations where the empirical hazard is noticeably higher than for surrounding periods. There is a relative high hazard until approximately three months, probably caused by the high concentration of short entitlement period mentioned above. Third, there are jumps in multiple of three months probably caused by benefits exhaustion<sup>6</sup>. Fourth, we appreciate positive duration dependence until the third month. After that there is negative duration dependence until the ninth month and constant from the tenth month onwards.

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<sup>6</sup> Before 1992 entitlement duration is multiple of three months.

In table 6 we present the determinants of the unemployment duration based on ghr for the traditional approach, and extra-time duration model (UI or UI and UA). This table contains for each model in the first column the ghr for unemployed individuals with a specific characteristic under the assumption that the hazard rate is constant along the unemployment spell. We define the gross hazard rate, measured in percentage, as the conditional probability that a worker finds a job given that has been unemployed until the previous month. This measure does not preserve the *ceteris paribus* condition. For a given characteristic it does not control for the effect that other variables or characteristics have on the conditional probability of finding a job. Thus, if the reader wants to calculate the gross hazard rate of an unemployed with more than one characteristic this result must not be inferred from this table. The second column presents the standard error for ghr estimates, and finally the third column shows a relative measure of the hazard rate for each category in a given variable in comparison to the hazard rate of whatever individual without a specific characteristic. We will initially present some general results on the ghr for the traditional approach and later we report results of individual and economic variables for the extra-time duration model.

As can be seen, in the traditional UI and extra-time duration model for UI data, the monthly ghr of an individual without any specific characteristic, named whatever individual, is 4,05% and 2,64% respectively. As an illustration let us assume there is a cohort of 100 unemployed individuals who starts the unemployment spell at the same time. From this cohort, a 4,05% of the individuals finds a job monthly for the traditional UI model and a 2,64% of UI recipients in the extra-time duration model. Thus, under the assumption of a constant exit rate implicit in ghr figures, we see in table 6 that a 50% of the unemployed individuals remain unemployed approximately 17 months in the traditional UI model and around 56 months a 10% of the unemployed. In the extra-time duration model around a 50% remain unemployed 26 months under UI and 87 months a 10%. The procedure is applied in the same way for the UA data of the extra time duration model. Thus, a 2,3% of the individuals find a job monthly when receiving UA. We can affirm that a 50% of the unemployed individuals under UA remain unemployed around 60 months and around 203 months a 10%.

As can be observed, we appreciate in the ghr figures the same result mentioned in previous Figures and previous sections. First, hazard rates arising from traditional UI are overvalued and therefore unemployment duration (see table 6) is undervalued. Second, hazard rates obtained from the extra-time duration model for UI data are lower than from traditional UI models. Third, the hazard rate for unemployed who receive UA is lower than the one for unemployed who

receive UI in the extra-time duration model, and therefore its unemployment under benefits duration remain longer.

From now on we only focus our comments in ghr figures for the extra-time duration model. The main conclusions suggested by ghr for personal variables as gender, age, job category are the following. In relation to gender, males present a higher probability of finding a job than females for recipients of UI and UA, being greater the gap for the latter. Ghr for males is 140.39% and 49.21% for females. Under UA the ghr is 114.67% for males and 70.72% for females. Concerning to the job category variables, we observe that workers who present better qualifications as high levels and associate professional technicians, foremen and supervisors have higher probability of finding a job than the rest of unemployed under UI. Thus, the ghr for these better-qualified unemployed is 190.56 % in contrast with the 76.36 for unskilled clerical unemployed. Regards the unemployed under UA, the semi-skilled clerical workers present the highest ghr with a 144.74%.

In relation to age, young workers among 18 and 25 years old and present higher hazard rate from unemployment under UI than in the rest of unemployed. The ghr for unemployed under UI with age among 18 and 25 years old is 129.65% under UI. The unemployed with the lowest ghr are more unemployed with age around 55 years old, thus the 50.06 % under UI. In relation to unemployed who receive UA, individuals between 18 and 35 and 40 and 45 years old, present higher ghr, around 115% in both groups of age.

Regards to unemployed who have registered in the UCS by the end of the contract, we observe that unemployed under UI have higher ghr than unemployed under UA. Thus, the percentage of the exit rate is the 102.45% for unemployed under UI and 97.03% for unemployed under UA.

Concerning to the variables that affect the reservation wage we have information on the last wage and family burdens. With regard to family burdens, we appreciate that unemployed who receive UI with family burdens present higher ghr than unemployed under UA. The ghr is a 105.79% for unemployed under UI and 94.50% for unemployed under UA. Regards to the wage in the last job, we observe that workers who perceived higher wages in the last job have higher ghr. The exit rate increases gradually when increase the amount of the wage in the last job, being lower for unemployed under UA. Thus, workers who earned more than 150 thousand ptas per month (ppm) in their last job have an ghr of 146.43 % under UI (118.30% under UA), 137.72 % (104.61 %) when earned among 125 and 150 thousand ppm and decreases continuously in all the

categories until the 87.86% (86.40%) for unemployed whose wages was less than 60 thousand ppm.

In relation to variables that affect the intensity of job-search as the level of benefits, we observe that UI present and incentive effect on the exit rate. The exit rate increases gradually when increase the amount of the wage in the last job. We appreciate that unemployed individuals who receive more than 100 thousand ppm have a ghr of 568.65% under UI, as opposite to workers who receive less than 60 thousand ppm whose exit rate is 82.97%. In the opposite way, the level of benefits for unemployed under UA disincentive search of a job, and those who receive less than 60 thousand ppm present higher ghr.

## **5. Empirical analysis.**

Before going further into the empirical results, we consider convenient a simple analysis in order to obtain information on the influence of our variables on the individual probability of leaving the UCS. Specifically, we are interested in trying to assess if the individuals face different probabilities and if there are factors that can explain it. According we will use the hazard model methodology. In the context of the search theory the exit probability of finding a job depends on choice and chance, see Mortensen and Neumann (1989). In other words, depends on the probability of receiving a job offer and the probability that an unemployed will accept such offer.

The probability of receiving job offers will depend on personal characteristics as gender, age and educational level or qualification. Specifically, we can expect that age be related to the probability of finding a job with an inverted U form if the youngest and the oldest group have lower productivity with respect to the wages paid. We have included dummies variable by age in intervals of five years to capture an inverted U form on the probability of finding a job. The job category is a variable of the National Insurance contribution group, which combines occupation and education. We have classified the job category in seven levels: High levels and associate professional technicians, foremen and supervisors; technical assistants and skilled clerical workers; semi-skilled clerical workers; unskilled clerical workers; skilled production workers; semi-skilled production workers; unskilled production workers. We expect that workers who present better qualifications have higher probability of finding a job because can receive more labour offers. With respect to the effect of the gender on the exit probability of finding a job, we think that it is ambiguous.

The probability of receiving job offers will also depend on variables that indicate the local labour market conditions to the individual. We can try to measure the labour market conditions with two variables. The regional unemployment rate (quarterly) and the cause of unemployed whether end of contract or other (layoffs, etc) let give us an idea about the state of the labour demand. The regional unemployment rate indicates the local labour market conditions to the workers. We expect that workers who live in regions with lower regional unemployment rate have higher probability of finding a job because there are more vacancies. To have been registered in the UCS by the end of the contract have two different effects on the probability of finding a job: First, unemployed who entered by this cause start to search a new job before the end of the contract because they know the date of the extinction of his job. Second, they could probably access to benefits at the future, and this helps them to search with intensity.

In addition, the intensity of job search is an important variable to explain the probability of receiving job offers. In this respect, the income that an individual can earn in unemployment and the entitlement duration (in days) are element that may influence the search effort and therefore, the probability of finding a job and unemployment spells duration. In our data the entitlement duration goes from three months until twenty-four months for the UI spells and may extend until fifty-four months (see tables 2 and 3) when workers access to UA (after they exhausted UI). As we can expect, the probability of finding a job will be higher 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 probability is constant or decreasing in the earlier unemployment months and rises dramatically just prior to benefits lapse because the value of being unemployed and the reservation wage decrease. The disincentive effect is produced at the beginning of the unemployment spells and will be dominated by the incentive effect. To know the temporal exit to job, we have included in the model a variable to capture the effect of the days before the entitlement period expires. This variable is the duration until the exhaustion of the entitlement duration (subtraction between entitlement and true unemployment duration under benefits). Furthermore, we have included a quadratic form to get no lineal effect on the exit rate.

In relation to the income of the unemployed, we can obtain the replacement rate dividing the benefit during the unemployment episode by the income they received as a wage during their last employment spell. However, due to short variability of the replacement rate, we analyse

separately the effect of the time varying unemployment benefits<sup>7</sup> and the wage of the last job. The level of benefits predicts a double effect on intensity of search, and on the probability of leaving unemployment. First, incentive effect occurs when the amount of benefits increases the intensity of search and the reemployment hazards, see Tannery (1983). Second, a disincentive effect occurs when high benefits causing the unemployed to be less willing to accept jobs. To analyse the influence of level of benefits on the unemployment duration on the intensity of search of unemployment we have included an interaction between the level of benefits and unemployment duration for durations less than 6 months, between 6 and 12 months, between 12 and 18 months, and more than 18 months for unemployed who receive UI. However, we have only included the level of benefits without interaction with the unemployment duration for unemployed who receive UA because they receive the same level of benefits along the unemployment duration.

Moreover, the probability that a worker may accept job offer will depend on the factors that affect his reservation wage. Concerning to the variables that affect the reservation wages we have information of the last wage and family burdens. The income of the employed reflect the incentive or disincentive effect on search and acceptance of job offer when they are unemployed, see Lancaster (1979). So, workers with higher (lower) wages in their last job have a negative effect (positive) on the reemployment hazard because have a higher reservation wage. With regard to the family burdens (which is defined in terms of the number of dependent people-spouse or other relation- if the total income of household divided by the number of members is below the minimum wage), this variable is very important because one situation in which recipients can get assistance benefits is when they exhaust UI and have family burdens. Then, we can expect that having family burdens reduce the probability of finding a job because workers know that may obtain a new benefit and no accept uninteresting jobs. In the opposite sense to have family burdens increase search effort and the acceptability of a given offer.

Finally, we have considered a variable that analyse the gap between the expected UI level and the expected UA level for unemployed who may have received UA and they did not decide to access UA. We think that the greater is the size of the gap between the expected UA level and the expected UI level the greater is the probability of finding a job during entitlement duration for unemployed qualified for receiving UA because they will lose money whether access to UA, and therefore increase their intensity of exiting from the UCS.

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<sup>7</sup> We have include the level of benefits as time varying variables because decrease with the unemployment duration spell: 80 per cent during the first six months of benefits, 70 per cent from the seventh to the twelfth month and 60 per cent from the thirteenth month onward.

With the variables described in the previous section, we have estimated a likelihood function for the extra time duration model by the non-parametric maximum likelihood estimator of Heckman and Singer (1984c). Table 7 and 8 present results for males and females that receive UI or UI and UA. Table 9-14 estimations of males and females that receive UI or UI and UA separated in three job category groups<sup>8</sup>. Three support points are sufficient to approximate the distribution of the unobserved heterogeneity components. The quarterly regional unemployment rate, level of benefits, duration until the exhaustion of the benefits (and quadratic form), gap between expected UI and expected UA level of unemployed who may have received UA and they decide not to access to UA, and interaction between the level of benefits and unemployment duration are included as time varying covariates. The variable unemployment duration and duration until the exhaustion of the benefits (and quadratic form) are measured in days. The reference individual is an unemployed with age between 35 & 40 years old, skilled clerical workers without family burdens who enters unemployment for other reasons (not end of contract).

We observe in all estimations (except females by job category groups) that UI level presents an incentive effect on the probability of exiting from unemployed during the first twelve months of unemployment and a disincentive effect onwards. The incentive effect of UI during the first twelve months could be justified by the two following arguments: First, benefits increase resources devoted to search and hence increase the probability of return to work as Tannery (1983), Ben Horim and Zuckerman (1987) commented. Second, given the characteristics of the Spanish UCS where the UI level decreases with the unemployment duration per periods of six months, being higher during the first twelve months. The recipients, who search with more intensity and get a job sooner, receive higher benefits than others do because are less penalised due to their shorter unemployment durations. In relation to UI level (after twelve months) and UA level, we appreciate that unemployed who receive higher amount of benefits present a disincentive effect and remains longer duration in unemployment than those who receive less amount of benefits.

Concerning to the influence of the last wage on the probability of finding a job, we see that the wage in the last job has a negative and significant effect in males and individuals of job category group 3 who received UI. This means that male with higher reservation wages

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<sup>8</sup> We have recoded seven job category groups in three groups. High levels, associate professional technicians, foremen and supervisors, technical assistants and skilled clerical workers compose group 1. Unskilled clerical workers and unskilled production workers, semi-skilled clerical workers and group 3 by skilled production workers and semi-skilled production workers compose group 2.

demanding better labour offers and are less likely to exit from the UCS. However, we see that workers with higher earnings in past employment are associated with an increase of the probability of receiving job offers and, *ceteris paribus*, with a positive effect on the exit rate. Therefore, our model let observe a change in the reservation wage. It could be reasonable because unemployed when receive UI demand better offer jobs and have higher reservation wages, but after the exhaustion of UI access to UA and their reservation wage decrease because continue unemployed and then increase their intensity of search a job demanding worse labour offers to escape quickly out of unemployment.

In relation to the parameter of the regional unemployment rate that indicates the local labour market conditions for unemployed individuals. We observe a negative and significant effect in all the estimations that suggest that workers who live in regions with higher regional unemployment rate have less probability of finding a job because there are fewer vacancies.

Regards, the effects of the variable that measure the gap between the expected UI level and expected UA level for unemployed who may have received UA and decided exit to a job before accessing UA. We observe that the greater is the size of the gap between the expected UI level and the expected UA level the greater is the probability of finding a job during UI entitlement duration for unemployed qualified for receiving UA because they would have suffered a loss in income whether they had accessed to UA, and therefore increased their intensity of search a job.

Age is entered using a set of age group dummies, with the aged 35-40 as reference. The estimations in table 7 show that there is a negative association between age and hazard rate for male and females who receive UI. Younger people (among 18 and 30 years old in males, and 18 and 25 years old in male) remain shorter duration UI than reference individual. Older people more than 55 years old presents less probability of finding a job under UI and UA. For this older group of unemployed, the reduction of the hazard in males under UI is a 20.82% higher than females. In opposite way, the reduction of the hazard in females under UA is a 29.39% higher than males.

Regards to the variable days until the exhaustion of the benefits and the quadratic form, we observe that recipients raise their probability of finding a job just prior to benefits lapse, as Meyer (1990) mentioned.

Finally, we see from table 7 that the coefficient of the unobserved heterogeneity is positive for unemployed who receive UI and negative in unemployed who receive UA in all the estimations except females of the job category group 1. Therefore, unmeasured individual characteristics influence the probability of finding a job when unemployed receive UI and UA.



## 6. Conclusions.

The motivation of this paper is to understand what is the influence of the UCS on the unemployment duration under benefits with administrative data records coming from Unemployment Agencies. This type of administrative data records is common in OECD and transition countries where there are basically two types of benefits: UI and basically UA after the exhaustion of UI. Exploiting administrative data records from the Spanish Employment Agency (INEM), we use a continuous mpm model that accounts for unobserved heterogeneity and sequential exit to analyse the transition rates from benefits to work for unemployed receiving UI and those receiving UA after the exhaustion of UI. We estimate the model by the non-parametric maximum-likelihood estimator proposed by Heckman and Singer (1984). Our estimations are done by gender and by three job category groups (by gender). Above the main findings, we appreciate theoretical arguments and empirical evidence on the bias in which the traditional likelihood function specification incurs. Specifically, the traditional approach to measure exit rates from UI underestimates the expected UI duration. Second, we observe that the greater is the size of the gap between the expected UI level and the expected UI level the greater is the probability of finding a job during entitlement duration for unemployed qualified for receiving UA. Third, we observe that UI levels present an incentive effect for spell lengths less than 12 months and a disincentive effect onwards. Fourth, we see a change in the reservation wage when unemployed individuals receive UI or UA. Specifically, we appreciate that unemployed when receive UI demand better offer jobs and have higher reservation wages. However, whether they access to UA after the exhaustion of UI, their reservation wage decrease because remain unemployed, increasing their intensity of search a job and demanding worse labour offers to escape quickly out of unemployment.

Finally, we appreciate that UA present inefficiency in the labour market and disincentive job search in unemployed individuals because whatever is the entitlement duration and their level of benefits, they reach as far as the end of the entitlement period without getting a job. Nevertheless, we think that the objective of UA should give a redistribute effect on the society in unemployed that have not the possibility of getting a job.

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**Table 1.** Descriptive statistics for variables of recipients who receive UI and UA after the exhaustion of UI. Years 1991-93.

	1991			1992			1993		
	%	Mean	Std.	%	Mean	Std.	%	Mean	Std.
<b>UI.</b>									
Current unempl. (months).		8.69	7.13		9.87	6.97		9.55	6.98
Entitlement unempl. (months).		10.42	7.50		11.71	7.20		11.98	7.52
Level of UI. (Thous. pts. month).		79.10	18.31		77.97	24.03		83.82	26.36
<b>Type of observation UI data.</b>									
Get a job when receive UI.	21.5			21.4			26.9		
Exhaust UI.	78.5			78.5			73.2		
<b>UI and UA.</b>									
Current unempl. Durat. (months).		15.59	13.40		16.11	12.60		12.97	10.36
Entitlement unempl. Durat (months)		18.30	13.28		19.05	12.54		16.13	10.73
Current assist. Durat. (months).		18.96	7.21		18.83	7.77		16.17	8.24
Entitlement assist. Durat..(months).		21.69	4.64		22.14	5.19		19.63	6.83
UI level.		79.10	18.31		77.97	24.03		83.82	26.36
UA Level.		48.60	7.32		52.80	7.61		54.72	9.99
<b>Type observ. with UI and UA</b>									
Get a job when receive UI.	21.5			21.4			26.9		
Exhaust UI.	42.2			45.4			52		
Get a job when receive UA.	8.2			8.9			6.1		
Exhaust UI and UA	28.1			24.2			15.1		
<b>Sample.</b>		61.019			49.326			44.558	

**Table 2.** Pre 1992 period.

Contribution period (C). (Over the last 4 years)	Entitlement UI (2 × integer (C/3))	Unemployment assistance after the exhaustion of UI			
		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 12months	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	6+30 months	-	6+6 months
> 52 years	-	Up to retirement			

**Table 3.** Post -1992 period.

Contribution period (C) (over the last 6 years).	Entitlement U. I. (2 × integer (C/6))	Unemployment assistance after exhausted U.I.			
		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	6 months	24 months	30 months	-	-
From 24 to 29	8 months	24 months	30 months	-	-
From 30 to 35	10 months	24 months	30 months	-	-
From 36 to 41	12 months	24 months	30 months	-	6 months
From 42 to 47	14 months	24 months	30 months	-	6 months
From 48 to 53	16 months	24 months	30 months	-	6 months
From 54 to 59	18 months	24 months	30 months	-	6 months
From 60 to 65	20 months	24 months	30 months	-	6 months
From 66 to 71	22 months	24 months	30 months	-	6 months
72 months	24 months	24 months	6+30 months	-	6+6 months
> 52 years	-	Up to retirement			
Others	-	18 months			

**Table 4.** Descriptive statistics for variables in UI spells.

<b>Variables.</b>	<b>Dummy</b>	<b>Mean.</b>	<b>Std.</b>	<b>Sample (%).</b>
<b>Gender.</b>				
Male.	*			66.4
Female.	*			33.6
<b>Age.</b>				
Entry age (years).		32.90	11.51	100
Exit age (years/10).		3.35	1.17	100
Exit Age Square (years/1000).		1.26	0.93	100
<b>Family burdens.</b>				
With.	*			26.8
Without.	*			73.2
<b>Type of observation.</b>				
Uncompleted duration.	*			69.4
Completed duration.	*			30.6
<b>Entitlement period.</b>				
From 0 to 6 months.		3.81	1.33	57.3
From 6 to 15 months.		11.41	2.34	14.6
From 15 to 24 months.		22.17	2.57	28.1
More than 24 months.		0	0	0
<b>Duration. (Months).</b>				
Current true duration.		227.18	223.65	100
Entitlement duration.		302.31	246.64	100
Duration until exhausted.		75.07	163.38	100
(Duration until exhausted /10) <sup>2</sup> .		323.25	912.01	100
<b>Net wage</b> (thousand pts /month).		67.04	22.16	100
<b>Benefits</b> (thousand pts /month).		60.66	14.48	100
<b>Cause of unemployment.</b>				
End of contract.	*			95.5
Others.	*			4.5
<b>Exit of the system</b>				
Job.	*			30.6
Benefits exhausted.	*			69.4
<b>Job Category.</b>				
1	*			7.7
2	*			9
3	*			4.5
4	*			11.7
5	*			22.1
6	*			18.1
7	*			26.9

**Legend for category.** 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

**Table 5.** Descriptive statistics for variables in UI spells or UI and UA spells.

<b>Variables.</b>	<b>Dummy</b>	<b>Mean.</b>	<b>Std.</b>	<b>Sample (%).</b>
<b>Gender.</b>				
Male.	*			66.4
Female.	*			33.6
<b>Age.</b>				
Entry age (years).		32.91	11.51	100
Exit age (years/10).		3.39	1.17	100
Exit Age square (years/1000).		1.28	0.94	100
<b>Family burdens.</b>				
With.	*			40.4
Without.	*			59.6
<b>Type of observations.</b>				
Completed duration.	*			30.6
Uncompleted duration.	*			43.3
Completed duration.	*			9.5
Uncompl. Duration	*			16.5
<b>Entitlement period.</b>				
From 0 to 6 months.		3.84	1.35	42.0
From 6 to 15 months.		11.29	2.35	11.3
From 15 to 24 months.		21.89	2.17	36.2
More than 24 months.		40.59	7.42	10.5
<b>Duration (months).</b>				
Current true duration.		347.34	359.71	100
Entitlement duration.		452.58	366.30	100
Duration until exhausted.		105.24	182.08	100
(Duration until exhausted /10) <sup>2</sup> .		442.24	991.58	100
<b>Current true assistance duration.</b>		120.06	227.76	100
<b>Entitlement assistance duration.</b>		150.23	257.75	100
<b>Net wage</b> (thous.pts./month).		67.04	22.16	100
<b>Benefits UI+UA</b> (thous.pts. /month)		54.99	17.13	100
<b>Assistance benef.</b> (Thous. pts./month).		36.478	5.425	100
<b>Cause of Unemployment.</b>				
End of contract.	*			95.5
Others.	*			4.5
<b>Exit of the system</b>				
Get a Job when receive U.I.	*			30.6
Exhaust Unempl. Insurance.	*			43.3
Get a job when receive UA.	*			9.5
Exhaust UI and UA.	*			16.5
<b>Job Category.</b>				
1	*			7.7
2	*			9
3	*			4.5
4	*			11.5
5	*			21.9
6	*			17.9
7	*			27.5

**Legend.** See Job category table 4.

**Table 6** Gross hazard rate from unemployment under benefits. Entire Sample. February 1987. Unemployment duration in days.

	Traditional UI model.			Completed benefits model			Extra time duration model.					
	Gross hazard	UI (%)	E.S.	Gross hazard	UI+UA (%)	E.S.	Gross rate	UI C.Indiv. (%)	E.S.	Gross rate	UA C.Indiv. (%)	
<b>Covariates.</b>												
Whatever indiv.	4.050	100.000	0.060	3.480	100.000	0.060	2.640	100.00	0.030	1.134	100.000	
<b>Sex</b>												
Male.	5.250	130.163	0.090	4.830	138.935	0.090	3.720	140.399	0.060	1.300	114.670	
Female.	2.220	54.613	0.090	1.770	51.054	0.060	1.290	49.213	0.060	0.802	70.727	
<b>Job Category.</b>												
1	6.090	150.479	0.300	5.730	165.040	0.270	5.040	190.561	0.240	0.930	82.003	
2	2.940	72.603	0.150	2.610	75.188	0.120	2.130	80.145	0.120	0.965	85.126	
3	4.470	110.619	0.360	4.350	125.753	0.300	3.180	119.940	0.240	1.640	144.648	
4	3.180	78.672	0.180	2.730	79.137	0.120	2.010	76.369	0.120	1.171	103.293	
5	4.740	117.149	0.150	4.260	122.963	0.120	3.210	121.837	0.090	1.347	118.753	
6	3.540	87.811	0.150	2.910	83.614	0.090	2.280	86.591	0.090	0.925	81.529	
7	3.540	87.811	0.150	3.390	97.600	0.090	2.370	90.063	0.090	1.165	102.718	
<b>Family Burdens.</b>												
With.	4.440	110.101	0.120	3.810	110.047	0.090	2.790	105.790	0.090	1.072	94.506	
Without	3.870	95.544	0.090	3.300	95.303	0.060	2.580	97.293	0.060	1.344	118.540	
<b>Enter to the system.</b>												
End of the contract.	4.200	103.893	0.060	5.940	171.374	0.090	2.700	102.455	0.060	1.100	97.036	
Others.	2.430	60.166	0.180	0.180	5.222	0.000	1.860	70.253	0.120	1.654	145.854	
<b>Age.</b>												
>=18 & <=25 years.	5.490	136.157	0.180	4.410	126.823	0.150	3.000	129.655	0.150	1.304	115.019	
>25 & <=30 years.	4.470	110.796	0.150	3.630	104.708	0.060	2.790	105.027	0.060	1.140	100.564	
>30 & <=35 years.	3.960	97.935	0.150	3.300	95.506	0.060	2.550	96.209	0.060	0.958	84.487	
>35 & <=40 years.	3.870	95.973	0.210	3.420	98.534	0.060	2.430	92.048	0.060	1.145	100.947	
>40 & <=45 years.	3.840	95.009	0.210	3.330	95.774	0.120	2.400	90.584	0.120	1.309	115.406	
>45 & <=50 years.	4.500	111.259	0.300	3.960	114.335	0.060	3.030	114.088	0.060	1.126	99.327	
>50 & <=55 years.	4.740	116.944	0.330	3.900	112.560	0.060	3.030	114.467	0.060	1.024	90.297	
>55 years.	1.560	38.555	0.120	1.620	46.412	0.120	1.320	50.068	0.120	1.235	108.899	
<b>Wage last job/1000.</b>												
<= 60 per month..	3.960	97.734	0.120	3.090	89.054	0.090	2.310	87.862	0.060	0.980	86.400	
>60 & <=75 per month.	4.320	106.557	0.120	3.750	108.475	0.090	2.760	104.915	0.060	1.289	113.678	
>75&<=100 per month.	3.690	91.502	0.150	3.510	100.898	0.120	2.730	103.619	0.120	1.370	120.850	
>100&<=125 per month.	3.750	92.605	0.270	3.510	101.098	0.240	3.060	115.315	0.210	1.040	91.735	
125 & <=150 per month.	4.050	100.201	0.420	3.990	114.656	0.420	3.630	137.702	0.390	1.187	104.651	
>150 per month.	4.200	103.614	0.480	4.170	120.412	0.450	3.870	146.634	0.450	1.342	118.301	
<b>Level of benefits/1000.</b>												
>30 & >=40 th. Month												
>40 & <=60 per month.	3.480	86.301	0.060	3.000	86.065	0.060	2.190	82.977	0.060	2.323	204.849	
>60 & <=80 per month.	4.500	111.296	0.150	4.200	121.273	0.120	3.270	123.999	0.120	0.369	32.576	
>80 & <=100 per month	8.130	201.197	0.390	7.140	205.659	0.300	6.210	234.990	0.300			
>100 per month.	23.700	586.453	2.910	16.410	473.022	1.920	15.030	568.645	1.860			



**Table 7.** Parameters estimates and their standard errors by gender.

	Male				Female			
	UI		UA		UI		UA	
<b>Covariates.</b>	<b>Param.</b>	<b>S.E.</b>	<b>Param.</b>	<b>S.E.</b>	<b>Param.</b>	<b>S.E.</b>	<b>Param.</b>	<b>S.E.</b>
<b>Intercept</b>	2.0345	0.3679	7.8844	0.8162	-6.4350	11.2567	10.0899	1.3722
<b>Age.</b>								
>=18 & <=25 years.	0.2390	0.0940	0.1534	0.2029	0.2673	0.1674	0.2493	0.3305
>25 & <=30 years.	0.2779	0.0857	0.1325	0.1809	0.0457	0.1598	0.1017	0.2980
>30 & <=35 years.	0.1317	0.0898	0.0068	0.1908	-0.1684	0.1838	-0.0671	0.3105
>35 & <=40 years. (&)								
>40 & <=45 years.	-0.0497	0.1020	-0.2303	0.2043	0.0858	0.2301	0.0932	0.4087
>45 & <=50 years.	-0.0544	0.1108	-0.0755	0.2138	0.0474	0.2603	0.2154	0.4858
>50 & <=55 years.	0.0353	0.1110	-0.2731	0.2354	0.2804	0.2957	-1.3567	0.7899
>55 years.	-1.0669	0.1120	-0.5934	0.2243	-0.5936	0.3015	-1.3457	0.6481
<b>Job category.</b>								
1	0.2439	0.0937	-0.1798	0.2938	0.7882	0.2048	0.8297	0.4995
2	-0.2600	0.0823	-0.2207	0.2396	0.1979	0.1763	0.2140	0.4114
3	-0.1802	0.1292	0.4451	0.2664	0.4769	0.2110	0.3718	0.5435
4	-0.2970	0.0964	-0.1396	0.2345	0.1567	0.1555	0.3841	0.3483
5(&)								
6	-0.1117	0.0672	-0.2739	0.1713	-0.0069	0.1584	0.1388	0.3492
7	-0.2251	0.0626	-0.3538	0.1268	0.0729	0.1595	-0.0689	0.3445
<b>Family burdens (with).</b>	-0.0313	0.0695	-0.0574	0.1587	-0.3236	0.1608	0.4698	0.2533
<b>End of the contract</b>	0.0704	0.0986	-0.4197	0.2877	0.0242	0.1893	-0.5960	0.3715
<b>Reg. Unempl. Rate, TVC.</b>	-0.0071	0.0040	-0.0178	0.0080	-0.0057	0.0067	-0.0183	0.0161
<b>Dur. Until exhaust, TVC (days/10)</b>	0.0202	0.0037	-0.0076	0.0129	0.0071	0.0070	0.0017	0.0183
<b>Dur until exhaust, TVC (days/1000).</b>	-0.0003	0.0001	-0.0001	0.0002	-0.0003	0.0001	-0.0001	0.0003
<b>Net wages (Th. Pts. Month).</b>	-0.0030	0.0019	0.0109	0.0033	0.0012	0.0039	0.0155	0.0064
<b>Benefits TVC (Th.pts/month).</b>	-	-	-0.1084	0.0129	-	-	-0.2192	0.0238
<b>duration &amp; level of benefits, TVC.</b>								
From 0 to 6 months.	0.0124	0.0011	-	-	0.0148	0.0021	-	-
From 7 to 12 months.	0.0046	0.0017	-	-	0.0078	0.0034	-	-
From 13 to 18 months.	-0.0244	0.0044	-	-	-0.0157	0.0087	-	-
More than 18 months.	-0.0216	0.0049	-	-	-0.0287	0.0107	-	-
<b>(UI<sup>e</sup> -UA<sup>e</sup>) benefits. TVC (th.pts.month).</b>	0.0192	0.0026	-	-	0.0115	0.0078	-	-
<b>Factor loading</b>	2.2874	0.3116	-2.5686	0.3573	8.9478	10.9757	-2.9143	0.4350
<b>Sample.(censored)</b>	8006(3395)		1699(844)		4062(1804)		1449(1157)	
<b>Log Likelihood.</b>	-7628.617				-1365.450			

**Legend.** Job category in table 4. & Indicates the characteristics of the reference individual. TVC means time varying covariates.

**Table 8.** Support points that approximate the probability distribution of the unobserved heterogeneity component corresponding to estimation of table 7.

Support points.	Male			Female		
	Localiz.	Prob.	Sign.	Localiz.	Prob.	Sign.
First point.	0.00	0.42	***	0.00	0.30	***
Second point.	0.80	0.38	***	0.8	0.25	***
Third point.	1.00	1.00	***	1.00	0.45	***

**Legend.** \*\*\* (0,01 significant); \*\* (0,05 significant); \* (0,1 significant).

**Table 9.** Parameters estimates and their standard errors. Gender and job category group1 (recoded as high levels, associate professional technicians, foremen, supervisors, technical assistants and skilled clerical workers).

	Male group1				Female group 1			
	UI		UA		UI		UA	
Covariates	Param.	E.S.	Param.	E.S.	Param.	E.S.	Param.	E.S.
<b>Intercept</b>	2.2961	0.4814	11.0435	2.3363	1.3513	0.6617	-6.7315	6.0144
<b>Age.</b>								
>=18 & <=25 years.	0.6668	0.2890	0.0890	1.4136	1.1171	0.3888	0.7191	1.2257
>25 & <=30 years.	0.7135	0.1960	-0.5449	0.6637	0.9143	0.2913	1.3482	0.8774
>30 & <=35 years.	0.4208	0.1819	-0.7222	0.6167	0.4641	0.3378	0.4485	0.8714
>35 & <=40 years. (&)	-	-			-	-	-	-
>40 & <=45 years.	0.0124	0.1909	-1.1195	0.6481	0.7546	0.4352	0.7504	1.0545
More than 45 years old.	-0.6881	0.1796	-0.5297	0.5687	-0.6297	0.5437	-1.2426	1.3102
<b>Family burdens (with).</b>	0.0031	0.1408	0.0693	0.5567	-0.4895	0.3440	0.6870	0.7368
<b>End of the contract</b>	-0.1426	0.1649	0.7670	1.0530	0.1124	0.4076	-1.9811	0.8053
<b>Reg. Unempl. Rate, TVC.</b>	0.0033	0.0105	-0.0577	0.0287	-0.0159	0.0128	-0.0109	0.0479
<b>Dur. until exhaust, TVC (days/10)</b>	0.0102	0.0094	-0.0100	0.0366	0.0186	0.0144	-0.0202	0.0506
<b>Dur. until exh.,TVC(days/1000)</b>	-0.0001	0.0001	0.0001	0.0005	-0.0004	0.0002	-0.0001	0.0008
<b>Benefits, TVC (Th.pts/month).</b>	0.0000	0.0000	-0.1914	0.0420	0.0000	0.0000	-0.2924	0.0716
<b>Net wages (Th. Pts. month).</b>	0.0027	0.0025	0.0009	0.0060	0.0086	0.0046	0.0207	0.0112
<b>Duration &amp; level of benefits,TVC.</b>								
From 0 to 6 months.	0.0074	0.0020	-	-	0.0112	0.0030	-	-
From 7 to 12 months.	0.0031	0.0027	-	-	0.0065	0.0058	-	-
From 13 to 18 months.	-0.0175	0.0073	-	-	-0.0075	0.0129	-	-
More than 18 months.	-0.0133	0.0087	-	-	-0.0115	0.0154	-	-
<b>(UI<sup>e</sup> -UA<sup>e</sup>) benefits, TVC. (th.pts.month).</b>	0.0163	0.0043	--	-	0.0071	0.0123	-	-
<b>Factor loading</b>	1.0980	0.1635	-1.977	0.694	-1.7985	0.4382	24.5841	6.7150
<b>Sample.</b>	1210(500)		173(91)		810(378)		209(154)	
<b>Log Likelihood.</b>	-678.271				-437.032			

**Legend.** Job category in table 4. & Indicates the characteristics of the reference individual. TVC means time varying covariates.

**Table 10.** Support points that approximate the probability distribution of the unobserved heterogeneity component corresponding to estimation of table 9.

Support points.	Male			Female		
	Localiz.	Prob.	Sign.	Localiz.	Prob.	Sign.
First point.	0.00	0.10	***	0.00	0.42	***
Second point.	0.80	0.58	***	0.8	0.55	***
Third point.	1.00	0.32	***	1.00	0.03	***

**Legend.** \*\*\* (0,01 significant); \*\* (0,05 significant); \* (0,1 significant).

**Table 11.** Parameters estimates and their standard errors. Gender and job category group 2 (recoded as unskilled clerical workers, unskilled production workers and semi-skilled clerical workers)

Covariates.	Male group2				Female group 2			
	UI		UA		UI		UA	
	Param.	E.S	Param.	E.S	Param.	E.S	Param.	E.S
<b>Intercept</b>	1.6476	0.6304	6.8374	1.1515	-4.3590	1.4626	8.1880	1.8960
<b>Age.</b>								
>=18 & <=25 years.	0.1425	0.1750	0.0072	0.2696	-0.0830	0.2403	0.5899	0.4287
>25 & <=30 years.	0.1878	0.1739	0.0622	0.2572	-0.1312	0.2358	0.2668	0.3987
>30 & <=35 years.	0.0624	0.1759	-0.0276	0.2859	-0.5847	0.2841	-0.0736	0.4070
>35 & <=40 years. (&)	-	-	-	-	-	-	-	-
>40 & <=45 years.	-0.2569	0.2134	-0.2426	0.3099	-0.1663	0.3720	-0.2823	0.6617
More than 45 years old.	-0.3478	0.1791	-0.6564	0.2662	-0.5130	0.3196	-0.2703	0.4843
<b>Family burdens (with).</b>	0.1281	0.1324	0.0795	0.2154	-0.5636	0.2505	0.7312	0.3151
<b>End of the contract</b>	0.2457	0.2333	-0.4764	0.5045	-0.3076	0.3166	-1.1034	0.5933
<b>Reg. Unempl. Rate. TVC.</b>	-0.0097	0.0065	-0.0178	0.0110	-0.0017	0.0098	-0.0131	0.0196
<b>Dur. until exhaust. TVC (days/10)</b>	0.0327	0.0069	-0.0109	0.0163	0.0091	0.0098	0.0168	0.0250
<b>Dur until exhaust. TVC (days/1000).</b>	-0.0006	0.0001	0.0000	0.0002	-0.0003	0.0002	-0.0003	0.0004
<b>Benefits TVC (Th.pts/month).</b>	-	-	-0.0928	0.0182	0.0000	0.0000	-0.1964	0.0292
<b>Net wages (Th. Pts. month).</b>	-0.0032	0.0048	0.0138	0.0053	-0.0053	0.0081	0.0281	0.0081
<b>Duration &amp; level benefits TVC</b>								
From 0 to 6 months.	0.0131	0.0022	-	-	0.0094	0.0034	-	-
From 7 to 12 months.	0.0073	0.0035	-	-	0.0052	0.0055	-	-
From 13 to 18 months.	-0.0220	0.0093	-	-	0.0031	0.0150	-	-
More than 18 months.	-0.0270	0.0112	-	-	-0.0172	0.0192	-	-
<b>(UI<sup>e</sup> -UA<sup>e</sup>) benefits. TVC. (th.pts.month).</b>	0.0219	0.0053	-	-	0.0223	0.0136	-	-
<b>Factor loading</b>	2.0238	0.4844	-2.6537	0.6850	7.3368	1.4249	-9.4773	6.2109
<b>Sample.</b>	3161(1430)		773(394)		2036(916)		737(580)	
<b>Log Likelihood.</b>	-2604.9078				-678.271			

**Legend.** Job category in table 4. & Indicates the characteristics of the reference individual. TVC means time varying covariates.

**Table 12.** Support points that approximate the probability distribution of the unobserved heterogeneity component corresponding to estimation of table 12.

Support points.	Male			Female		
	Localiz.	Prob.	Sign.	Localiz.	Prob.	Sign.
First point.	0.00	0.48	***	0.00	0.45	***
Second point.	0.80	0.33	***	0.8	0.1	***
Third point.	1.00	0.20	***	1.00	0.55	***

**Legend.** \*\*\* (0,01 significant); \*\* (0,05 significant); \* (0,1 significant).

**Table 13.** Parameters estimates and their standard errors. Gender and job category group 3 (recoded as skilled production workers and semi-skilled production workers).

	Male group3				Female group 3			
	UI		UA		UI		UA	
Covariates.	Param	E.S	Param	E.S	Param	E.S	Param	E.S
<b>Intercept</b>	2.7945	0.4198	8.1101	1.1787	-1.0171	3.4491	10.0866	2.8825
<b>Age.</b>								
>=18 & <=25 years.	0.1286	0.1353	0.3220	0.3271	0.1428	0.3495	-0.1089	0.6151
>25 & <=30 years.	0.1733	0.1191	0.1222	0.2811	-0.2275	0.3603	-0.2091	0.5453
>30 & <=35 years.	0.0244	0.1383	-0.0639	0.2816	-0.1722	0.3825	-0.1631	0.5463
>35 & <=40 years. (&)	-	-	-	-	-	-	-	-
>40 & <=45 years.	0.0370	0.1470	-0.2754	0.2925	-0.1564	0.4351	0.9687	0.7966
More than 45 years old.	-0.3171	0.1254	-0.1322	0.2569	0.2592	0.3776	-0.5613	0.7864
<b>Family burdens (with).</b>	0.0212	0.0919	-0.0886	0.2547	0.0610	0.3072	0.1132	0.4986
<b>End of the contract</b>	0.1762	0.1301	-0.6779	0.4002	0.1782	0.3825	0.9607	0.8698
<b>Reg. Unempl. Rate, TVC.</b>	-0.0101	0.0060	-0.0142	0.0126	0.0010	0.0156	0.0067	0.0310
<b>Dur. Until exhaust., TVC (days/10)</b>	0.0165	0.0052	-0.0142	0.0207	-0.0054	0.0160	-0.0297	0.0409
<b>Dur until exhaust., TVC(days/1000).</b>	-0.0002	0.0001	-0.0001	0.0003	-0.0001	0.0003	0.0003	0.0006
<b>Benefits TVC (Th.pts/month).</b>	-	-	-0.1230	0.0191	-	-	-0.2688	0.0432
<b>Net wages (Th. Pts. month).</b>	-0.0170	0.0045	0.0186	0.0055	-0.0265	0.0155	0.0300	0.0172
<b>Duration &amp; level benefits.TVC</b>								
From 0 to 6 months.	0.0150	0.0017	-	-	0.0256	0.0066	-	-
From 7 to 12 months.	0.0054	0.0028	-	-	0.0021	0.0079	-	-
From 13 to 18 months.	-0.0183	0.0080	-	-	-0.0072	0.0282	-	-
More than 18 months.	-0.0185	0.0088	-	-	-0.0231	0.0314	-	-
<b>(UI<sup>e</sup> -UA<sup>e</sup>) benefits. TVC. (th.pts.month).</b>	0.0192	0.0044	-	-	0.0090	0.0207	-	-
<b>Factor loading</b>	1.8717	0.2875	-3.1657	0.7444	4.8662	3.4639	-4.438	1.256
<b>Sample.</b>	3635(1465)		763(359)		1216(510)		503(423)	
<b>Log Likelihood.</b>	-3749.364				-294.2506			

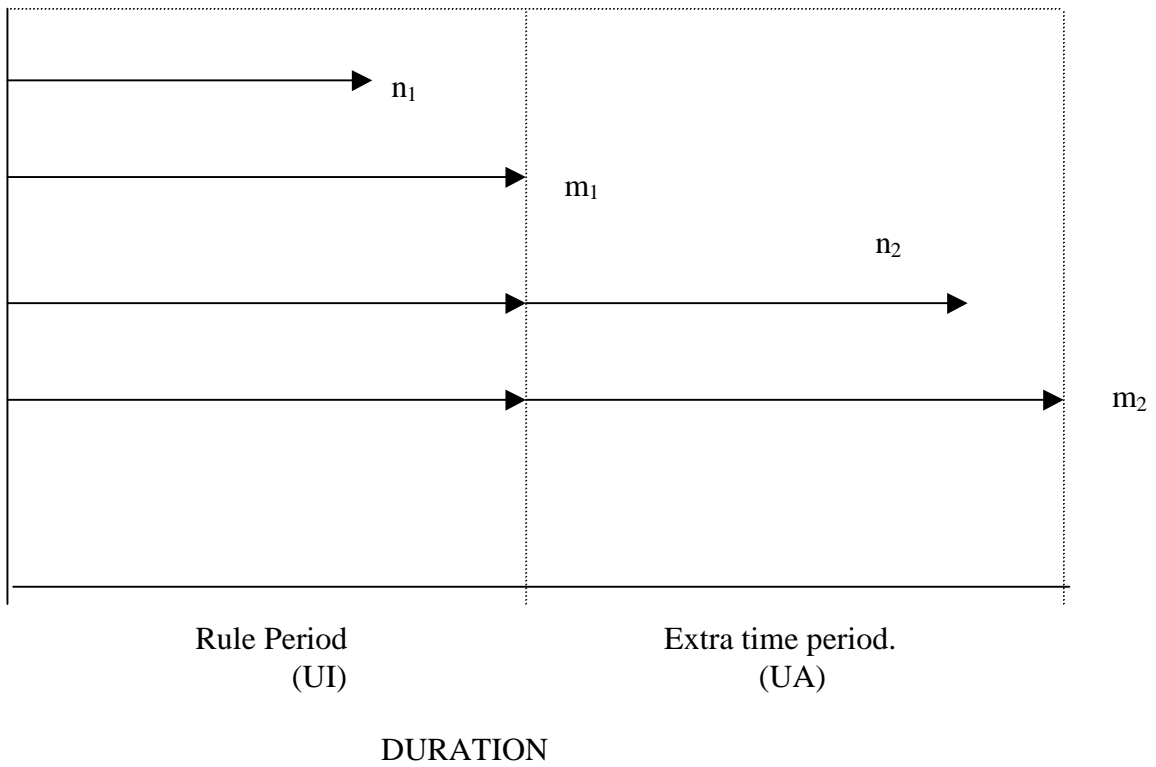
**Legend.** Job category in table 4. & Indicates the characteristics of the reference individual. TVC means time varying covariates.

**Table 14.** Support points that approximate the probability distribution of the unobserved heterogeneity component corresponding to estimation of table 13.

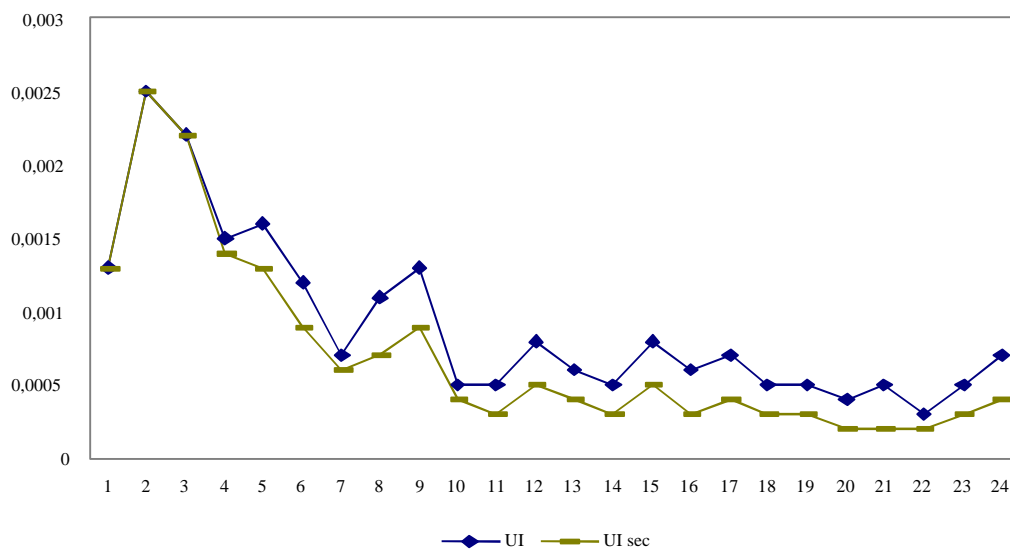
Support points.	Male			Female		
	Localiz.	Prob.	Sign.	Localiz.	Prob.	Sign.
First point.	0.00	0.48	***	0.00	0.46	***
Second point.	0.80	0.33	***	0.8	0.1	***
Third point.	1.00	0.20	***	1.00	0.44	***

**Legend.** \*\*\* (0,01 significant); \*\* (0,05 significant); \* (0,1 significant).

**Figure 1.** Unemployment administrative data observations.



**Figure 2.** Empirical hazard rate of the UI model and the extra time duration model for UI recipients. (UI sec).



**Figure 3.** Empirical survival probability for the UI model (UI) and extra time duration model for the UI recipients (UI sec).

