# A Transitional Model with a Sequential Exit[†].

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**Abstract**.

In this paper we characterize hazard models for administrative record data sets as models with a sequential exit. This sequential exit appears when two types of benefits compose the Unemployment Compensation System: insurance benefits and assistance benefits. In most OECD countries, all the workers when they exhaust their insurance benefits do not extend their unemployment spell duration with an assistance benefits and it cause in the information a sequential exit who nobody has considered until now. To incorporate this fact, we propose a hazard model with a sequential exit that include the effect of both types of benefits separately. We find that the probability of finding a job change dramatically when we consider a unemployment insurance hazard model, a complete unemployment benefits hazard model and a unemployment hazard model with a sequential exit. This last model has consistent estimations because its likelihood estimation is correctly specified.

Key words: unemployment spells, unemployment benefits, hazard models, gross hazard, sample selection, unobserved heterogeneity.

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# 1. Introduction.

The analysis of parameters effects in the Unemployment Compensation System (level of unemployment benefits and entitlement duration) over the behaviour of the unemployed individuals, exit rate from unemployment and unemployment duration under benefits are aspects of the contemporary economic literature widely studied, see Atkinson and Micklewright (1991) for a survey. The study of these effects in the empirical analysis is based on longitudinal data sets. On the one hand, longitudinal data sets may come from surveys, see Narendranathan and Nickell (1985a), Narendranathan et al. (1985b), Hunt (1995), Magnac and Robin (1994), Bover et al. (1997). On the other hand, administrative records data sets, see Cebrian et al. (1996a,b), Carling et al. (1996), Winter (1998), Bratberg and Vaage (2000) among others.

The objective of this paper is to characterise hazard models for administrative record data sets as models with a sequential exit. This sequential exit occurs when administrative data sets contain information about two types of benefits: insurance benefit (unemployment insurance, UI) and assistance benefit (unemployment assistance, UA). As in most OECD countries (see table 1) some workers when they exhaust their insurance benefit, extend their unemployment duration spell under benefits with an assistance benefits, and it cause a sequential exit that should be considered[1]. Even though, if we do not consider this additional information could provoke a sample selection in the analysis of the effect of the Unemployment Compensation System over the behaviour of the unemployed individual.

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[1] This sequential exit appears in administrative data sets of countries as Britain, Netherlands, Germany, Spain, Austria. Thus, as in panel data as the German Socioeconomic Panel Data (GSOEP), and even administrative USA data sets as the Continuouos Wage and Benefit History (CWBH) that contain insurance benefits and supplemental benefits data.

To incorporate this information we propose a likelihood function that includes the effect of both types of benefits, separately. We compare the results of our model, named unemployment hazard model with a sequential exit, with others models that include different information: an unemployment insurance hazard model that contains information about unemployment insurance benefits, and a complete unemployment benefits hazard model that includes jointly information of both types of benefits. We estimate the models by the non-parametric maximum likelihood estimator of Heckman and Singer (1984) using the Spanish longitudinal data sets that comes from administrative records contained in the Historical Integrates Benefits System (HSIPRE, Historico del Sistema de Prestaciones), collected by the Spanish Employment Agency (INEM, Instituto Nacional de Empleo).

The paper is organised as follows. In the next section we briefly describe the Spanish Unemployment Compensation System. We show in section 3 the sample selection in unemployment benefits hazard models for administrative record data set. In section 4, we present the model and the appropriate likelihood function for each type of benefits. In section 5, the data and the empirical results, and finally we summarise our findings in the last section with the conclusions. Among the main findings, we observe a high sensibility of the estimations in the models according to the likelihood function specified. The unemployment hazard model with a sequential exit presents consistent estimations because its likelihood function is correctly specified

## 2. The Unemployment Compensation System in Spain.

Before carrying out our analysis, it appears convenient to present concisely the main features of the Spanish Unemployment Compensation System (SIPRE, Sistema de Prestaciones por Desempleo). 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[2]. 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[3] 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). Unemployment insurance are 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 the unemployed person have 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 unemployment insurance, or who have exhausted their insurance benefit, unemployment assistance is

[2] Since 1992 a minimum of 12 months must have been worked during the last 72 months in order to receive any benefits.
[3] After 1992, the duration is calculated by dividing by 3 the number of months contributed, with the same constraint than before 1992.

available[4]. Unemployment assistance 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 requirement lowered to 75% of the SMW. In table 2 and 3 we show the entitlement duration benefits according to the period of contribution.

## 3. Sample Selection Bias. (Optional).

Although the sample selection bias[5] is common in many areas, for example, in work offer models the equation of the number of hours is observed if the people work, and it is not observed when they do not work. Or in-migrants models the information of emigrants is only known for people when emigrate and not if they do not emigrate. This could be the first investigation, which try to characterise hazard models for administrative record data sets as models with a sequential exit and even as models with sample selection. This will be the objective of this section.

To simplify the exposition, we suppose that all the workers receive unemployment insurance and unemployment assistance when they exhaust their insurance benefit. The assistance benefits are perceived after workers exhaust their unemployment insurance benefits. The equations of unemployment benefits duration model are the followings

[4] 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.

[5] Sample selection bias has extensively been discussed in the literature, see Heckman (1976,1979,1990) and Manski (1989,1990,1995).

$$Y_{1i}=X_{1i}\beta_1+U_{1i}\,, \qquad (1)$$

$$Y_{2i}=X_{2i}\beta_2+U_{2i.} \qquad i=1,..., I. \qquad (2)$$

Where in (1), $Y_1$ is the unemployment insurance duration and $X_1$ is the set of covariates for workers who receive unemployment insurance. In the equation (2), $Y_2$ is the unemployment assistance duration and, $X_2$ the covariates of unemployed who receive unemployment assistance.

If we will analyze the unemployment duration under benefits, and we only consider unemployment insurance duration, the regression function for equation (1) could be written as

$$E(Y_1|X_1)=X_1\beta_1 \qquad i=1,...,I$$

Least square estimators may be used to estimate $\beta_1$ on the selected subsample, even with censored duration's if the mechanism of censored is ramdon. The only cost of having an incomplete sample is a loss in efficiency.

However, if the censored duration is known because workers access to unemployment assistance when they exhaust their insurance benefit. Then, $Y_2$ should be incorporate in the analysis of $Y_1$ if $Y_2>0$. While if $Y_2\leq 0$, there are no observations in $Y_1$. Therefore, the regression function

$$E(Y_1|X_1, Y_{2i}>0)=X_1\beta_1+E(U_1|X_{1i}, Y_{2i}>0)=$$
$$=X_1\beta_1+E(U_1|\, U_{2i}>-X_{2i}\beta_2) \qquad (3)$$

depends on $X_{1i}$ y $X_{2i}$. Regression estimators of equation (1) fit on the selected sample, omit the second term of equation (3) as a regressor so that the bias that results from using nonrandomly selected samples to estimate behavioural relationship is seen to arise from the ordinary problem of omitted variables. The parameters are biased and would be mistaken.

Heckman (1979) shows that the problem raised in the equation (3) when $E(U_1| U_{2i}>-X_{2i}\beta_2)\neq 0$, may be consider a specification error. From this point of view, Heckman propose enter a regressor in the equation (3), a term close to $E(U_1| U_{2i}>-X_{2i}\beta_2)$. To get this additional regressor, supposes that $U_1$ and $U_2$ assume a bivariate normal distribution with covariance $\sigma_{U1U2}$. The regressor is the hazard rate

$$\lambda_i=\frac{f(Z)}{F(Z))}$$

or the inverse of Mill´s ratio, where f and F are the density and distribution function for a standard normal variable, respectively, and

$$Z=-\frac{X_2 b_2}{s_{U2}}.$$

This additional variable $\lambda_i$, estimated from a probit model with the condition $Y_2>0$, guarantee that $E(U_1| U_{2i}>-X_{2i}\beta_2)=0$ in equation (3) and the consistence of the estimators. Nonetheless, this procedure to correct sample selection bias is not necessary in our case because we know the information of the unemployment assistance (see equation 2).

## 4. The model.

To study the determinants of the exit rate from unemployment, we model the reemployment hazard of periods of unemployment under benefits with a mixed proportional hazard (mph) model. 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[6]. We use the following proportional hazard representation for the transition rates from unemployment under benefits

$$h_{ij}(t_{ij} \mid X'\beta_{ij}, c_{ij}\theta) = \lambda_{0ij}(t_{ij})\phi_{ij}(X'\beta_{ij})\Phi_{ij}(c_{ij}\theta) \qquad (4)$$

where $t_{ij}$ is the duration of unemployment state i before exiting to the employment state j. The specification given in equation (4) 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 $h_{ij}(t_{ij} \mid X'\beta, c_{ij}\theta)$ 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 states on the instantaneous probability of finding a job when all the factors held constant. The function $\phi_{ij}(X'\beta)$ express the influence of time invariant and time variant covariates on the rate transition from unemployment state i to employment state j. Finally, the function $\Phi_{ij}(c_{ij}\theta)$ accounts for the effects of unobserved heterogeneity components. This function refers to omit person 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 (4) $\beta_{ij}$ 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

[6] For single spell models Elbers and Ridders (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).

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 state j into changes by a percentage equal to $\{\exp(\beta_{ij})-1\}$ 100. 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 no $c_{ij}$ is negative or positive.

## 4.1. The likelihood function and estimation method.

In the analysis of a sample of workers that enter at the same time in the Spanish Unemployment Compensation System, the specification of the likelihood function contains completed and uncompleted unemployment duration. 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 the effect of the unemployment insurance information over the unemployment duration of the recipients, the likelihood function will be, see appendix A.1,

$$L(t_1,t_2,X(t_{ij}),\theta) = \prod_{i=1}^{n}\left[f(t_{i1},X(t_{i1}),q)\right]^{d_{i1}} \times \left[S(C_{ti1},X(t_{i1}),q)\right]^{(1-d_{i1})} \qquad (5)$$

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 ($C_{ti1}$). The contributions to the likelihood function are the density function $f(t_{i1})$ and the survival function $S(C_{ti1})$, respectively.However, if we assume a dependent censoring mechanism, and we know that workers who exhaust unemployment insurance may access to the unemployment assistance. Then estimators would be unbiased because the likelihood function (5) would be uncompleted and should contain both types of benefits. We think that the correct likelihood function should be, see appendix A,

$$L(t_1,t_2,X(t_{ij}),\theta) = \prod_{i=1}^{n}\left[f(t_{i1},X(t_{i1}),q)\right]^{d_{i1}} \times \left[S(C_{ti1},X(t_{i1}),q)\right]^{d_{i2}(1-d_{i1})} \times$$

$$\times\left[\{f(t_{i2},X(t_{i2}),q)\}\times\{S(C_{ti1},X(t_{i1}),q)\}\right]^{d_{i3}(1-d_{i1})(1-d_{i2})} \times$$

$$\times\left[\{S(C_{ti2},X(t_{i2}),q)\}\times\{S(C_{ti1},X(t_{i1}),q)\}\right]^{(1-d_{i1})(1-d_{i2})(1-d_{i3})} \qquad (5)$$

where $d_{i1}$ is a dummy variable that distinguishes uncensored durations of recipients who receive an insurance benefit and quit the system to work, spell $t_{i1}$ . The dummy variable $d_{i2}$ discriminates censored durations of workers who exhaust their insurance benefit, spell $C_{ti1}$. 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 assistance benefit or exit to a job, $C_{ti2}$ and $t_{i2}$ spells respectively. In figure 1, we present the type of observation of recipients who receive insurance and assistance benefits.

The contribution of $t_{i1}$ in (6) is the value of the density function $f(t_{i1})$. The contribution of $C_{ti1}$ spell is the survival function $S(C_{ti1})$, the contribution of the spell $t_{i2}$ is the product of the density function $f(t_{i2})$ and the survival function $S(C_{ti1})$, and finally the contribution of the spell $C_{ti2}$ is composed of the product of two terms, the survival function $S(C_{ti2})$ and the density function $S(C_{ti1})$. The first and the second term in (6) capture the impact of the insurance benefits and the third and fourth term the effect of the assistance benefits.

In the empirical analysis we will estimate three multivariate mixed proportional hazard models whose include different information about the type of benefits using the previous likelihood functions presented. A first model, named unemployment insurance hazards model based on (5) contains a set of covariates that capture the impact of the unemployment insurance on the probability of exiting unemployment under benefits. A second model, designated complete unemployment benefits hazard model based on (5), includes jointly information of both types of benefits. Finally, a third model, named unemployment hazard model with a sequential exit based on (6) analyze the effect of both types of benefits, separately. The parameters of the models are estimated by the non-parametric maximum likelihood estimator of Heckman and Singer (1984) with a nonparametric distribution for the unobserved heterogeneity component and a weibull distribution for the baseline exit[7]. Setting all elements of $\beta$ equal to zero except for the intercept $\beta_0$ and assuming $\Phi(c_{ij}\theta)=0$, the weibull hazard rate is $h(t)=\exp(\beta_0)t^{\gamma 1}$, where $\gamma_1 >0$ indicates positive duration dependence and $\gamma_1 <0$ negative duration dependence. 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.

# 5. An Empirical investigation.

## 5.1 The H.S.I.P.R.E. data set.

Our sample consist of a random sample drawn from the HSIPRE (Historico 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 (I.N.E.M.). 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 accurate information on days of unemployment insurance and assistance receipts, pre unemployment earnings, level of benefits, potential duration of benefits over time and information on several unemployment spells for the same individual. The importance of exact data is highlighted by the large agree of measurement error that has been found in the weeks unemployed variable in some household surveys. Additionally, the unemployment insurance and unemployment assistance parameters, level of benefits and duration are often missing from other data sources, for example the Spanish Labour Force (EPA, Encuesta de Poblacion Activa). Our data provides precise information on these key variables. The disadvantage of the data is that 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 over the probability of finding a job, we consider a sample drawn from the inflow to the Spanish Unemployment Compensation System in February 1987. We focus our study in one incidence and we consider assistance benefits when unemployed exhausted their insurance benefits[8]. 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 Unemployment Compensation System, job category and the wages in the last job are registered at the beginning of the spell. Characteristics for the individuals who receive unemployment insurance, and insurance benefits or both types of benefits are reported in table 4 and 5, respectively.

In these tables we observe that approximately the 57 % of unemployment insurance entitlement spells are concentrated in periods less than 6 months. These percentages are decrease until the 42% with the inclusion of the assistance benefits information. With this supplementary information the percentages are redistributed up to entitlement periods longer. Thus, with the unemployment assistance information (unemployment insurance in brackets), the 36.2 % (28.1 per cent) are entitled between 15 and 24 months and the 10.5 (0 per cent)[9] per cent in more than 24 months.

In the same way, the average of the current unemployment insurance duration is approximately 227 days, and is longer with the inclusion of the assistance benefits information. Thus, with the unemployment assistance information the average duration of both benefits is about 347 days, where the average of the current unemployment assistance duration is about 120 days. Regards, the entitlement duration, it happen the same. The average entitlement

[8] In future studies we will analyze the impact of the assistance benefits of workers that having contributed less than 6 months (12 months after 1992) were not entitled to unemployment insurance but they could claim unemployment assistance if they had contributed at least 3 months

[9] The insurance entitlement duration does not exist by law for more than 24 months.

insurance duration is about 302 days, 452 days including the unemployment assistance benefits information and where the entitlement assistance duration is approximately 150 days. Therefore, if we do not consider the assistance benefit information we would be underestimation the longer entitlement duration and overestimation the shorter entitlement duration.

The type of observation also change with the inclusion of the assistance benefit. Thus, we appreciate that the 30.6 per cent ($t_1$) of workers who receive unemployment insurance exit to work, and the 69.4 per cent ($C_{t1}$) exhausted their unemployment insurance spells. With the information of the unemployment assistance spells, the percentage of censored observations in the unemployment insurance spells decrease, and only the 43.3 per cent ($C_{t1}$) of workers exhausted their insurance benefits because the 26.1 per cent accessed to an unemployment assistance period. Concerning this group of unemployed who make longer their permanence in the System thanks to the assistance benefits, the 9.5 per cent ($t_2$) left the assistance benefit to work and the 16.5 per cent ($C_{t2}$) exhausted it. Figure 2 shows these percentages differences according the type of observation. Therefore, the assistance benefits data increase information about the number of individuals exposed to risk because decrease the censored observations in the unemployment insurance spells. This intuitive conclusion is appreciated in figure 3. In this figure, we appreciate that the number individuals exposed to risks with the unemployment assistance information is greater and present longer durations.

The rest of the covariates do not present outstanding alterations except the family burdens variable. The 26.8 per cent of workers who receive unemployment insurance have family burdens, and this percentage increases until the 40.4 per cent with the unemployment assistance information. Regards the cause of unemployment, the 95.5 percent of workers have entered unemployment by ending the contract in their last job. Finally, the region variable is a dummy that classifies Spanish regions by its economic structure. We have considered three categories: agricultural, services and industrial. The percentages are approximately 37.5 per cent for industrial regions and 28 and 34.5 per cent in services and agricultural regions, respectively.

A more completed illustration of the patterns of months and the behaviour of the unemployed including the unemployment assistance benefits can be seen in figure 4. Figure 4 shows the survival profiles of a sample of workers who receive unemployment insurance and a sample or workers who receive unemployment insurance and both types of benefits. The survival profiles let analyze the proportion of individuals that are unemployed perceiving insurance benefits and insurance benefits or both benefits. Among the main findings we see that whatever analysis on unemployment benefits based in information of insurance benefits will be truncated because does not contain all the information about the duration of unemployment spells. Furthermore, the survival profiles for unemployed who receives unemployment insurance and assistance are similar until the month 12. After this month, the percentage of individuals unemployed is lower and longer with the inclusion of the assistance benefits data. It is lower because the censored observations decrease with the assistance benefits data and longer because by law the unemployment insurance entitlement duration is less equal to 24 months.

To know the behaviour of the individuals, who exit from the Unemployment Compensation System, we represent in figures 5, 6 and 7 the duration until the exhaustion of a sample of workers who receive unemployment insurance, both types of benefits and assistance benefits. In these figures, the escape from unemployment is apparent increasing for insurance benefits recipients and unemployment insurance and assistance benefits around the time of exhaustion. However, the exit to the employment decreases in unemployment assistance recipients when there are many months to the end of the benefit.

## 5.2 Probabilities of exiting from unemployment benefits.

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 Unemployment Compensation System. Specifically, we are interested in trying to assess if the individuals face different probabilities and if there are factors which 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 Neuman (1989). In other words, depends on the probability of receiving job offer and the probability than such offer will be accepted by an unemployed.

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 is 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 also include in our model a quadratic term 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 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 over the exit probability of finding a job, we think that 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 registered in the Unemployment Compensation System by the end of the contract have two different effects on the probability of finding a job: First, the unemployed who entered by this cause start to search a new job before the end of the contract because know the date of the extinction of his job. Second, he could probably access to benefits at the future, and this helps him 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 the duration of unemployment spells. In our data the entitlement period goes from three months until twenty-four months for the unemployment insurance spells and may extend until forty eight months when the workers access to unemployment assistance (after they exhaustion of the unemployment insurance). As we can expect, the probability of finding a job will be higher among workers who have longer entitlement period because have more time to search, to assess and to accept job offers. However, some empirical studies, among them Meyer (1990), consider than 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 unlineal 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 analyze separately the effect of the time varying unemployment benefits[10] and the wage of the last job. This type of specification has previously utilized by Meyer (1990), and Katz and Meyer (1990). 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.

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 reflects 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

[10] We have include the level of benefits as time varying covariate 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.

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 insurance benefits 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 included in our models the GDP growth rate (quarterly) to control for business cycle influence and the factor loading that captures the sign of the effect of the unmeasured variables. We expect that the GDP will have a positive effect on the exit rate from unemployment. Concerning the factor loading of the omitted person specific effect, may differ across consecutive spells of unemployment builds in the possibility of state dependence in the distribution of unobservables. The factor loading may be different in the employed state than in the unemployed state. For example, if the omitted person specific effect is ability, is plausible that have a positive effect on transitions out of unemployed and a negative effect on transitions out of employment.

## 5.3 Results.

With the variables described in the previous section we have estimated two models based on the likelihood function (5) and (6) by the non-parametric maximum likelihood estimator of Heckman and Singer (1984c). Table 6 present the results. The first column and second show the joint estimations results. The first and second columns in the tables refer to the result estimation of the insurance and complete benefits hazard models based on the likelihood function (5). The third column present results estimation of the

Unemployment hazard model with a sequential exit based on the likelihood function (6). Three support points are sufficient to approximate the distribution of the unobserved heterogeneity components. The age (and quadratic form), quarterly regional unemployment rate, quarterly GDP rate, level of benefits and duration until the exhaustion of the benefits (and quadratic form) are included as time varying covariates.

Examining the effects of the covariates on the transition rates, we observe that there is a high sensibility of the estimations according to the likelihood function specified. The level of benefits has an incentive in all the models except for workers who receive assistance benefits in the unemployment hazard model with a sequential exit. For example, we apreciate that in the unemployment hazard model with a sequential exit for every 10 % decrease in the insurance benefits increase the logarithn of the rate of transition by 0.0835 (0.0867 in the unemployment insurance hazard model), but for every 10% decrease in the assistance benefits the logarithm of the rate of transitions increase by 0.3393. A more intuitive understanding of the estimates effect of the covariates is obtained by examinating the estimates elasticities. A 10% decrease insurance benefits increases the rate of transition to employment by 8.70% (9.05% in the unemployment insurance hazard model) and a 10 % increase in the assistance benefits decreases the rate of transition to employment by the 40.39%. In the complete benefits hazard model a 10% increase in the amount of benefits increase the rate of transition to a job by the 5.31%. However, the results in this model must observe carefully because the level of benefits is a mixture of insurance and assistance benefits.

Althought the standard results is that high benefits causing the unemployed to be less willing to accept jobs and continue longer periods unemployed. The incentive effect of the insurance benefit could be justified by the two following arguments: First, the benefits increase the resources devoted to search and hence increase the probabity of return to work, see Tannery (1983), Ben Horim and Zuckerman (1987). Second, given the characteristics of the Spanish Unemployment Compensation System, as the amount of benefits decrease with the unemployment duration, the recipients who search with more intensity and get a job sooner, receive higher benefits than others because they are less penalized due to the shorter unemployment durations.

Concerning to the influence of the last wage on the probability of finding a job, we see that in all the models, except in workers who receive assistance benefits in the unemployment hazard model with a sequential exit, workers who received high wages in the last job present low probability of finding a job when perceive benefits. However, workers who receive assistance benefits in the unemployment hazard model with a sequential exit workers who perceived higher wages in the last job present higher probability of finding a job. Thus, a 10% increase of the wages in the last job decrease the logarithm of the rate of transition to a job by the 5.34% for unemployed who receive insurance benefits and increase by 0.70% when receive assistance benefits. This let observe a change in the reservation wage. It could be reasonable because the unemployed when receive insurance benefits demand better offer jobs and have higher reservation wages, but after the exhaustion of the insurance benefits and access to assistance benefits, their reservation wage decrease because continue in unemployment increase their intensity of search and demands worse labour offers to escape quickly out of the unemployment.

Regards to the variable days until the exhaustion of the benefits and the quadratic form, we observe that the effects continue being different in the estimations. For example, in all the models, except in the unemployment hazard model with a sequential exit for recipients of assistance benefits, we appreciate that the variable days until the exhaustion of the benefits and the quadratic form keep a relation in $\cap$ form. This means that the recipients leave the Unemployment Compensation System during the intermediate months of the benefits. However, for the unemployed who receive assistance benefits in the unemployment hazard model with a sequential exit, we observe a positive effect when receive assistance benefits. This means that recipients when receive assistance benefits they increase the search intensity when the duration is far to the end of the benefits.

The variable family burdens have a negative effect on the probability of finding a job in the insurance and complete benefits hazard model. But in the unemployment hazard model with a sequential exit, we appreciate that this effect is not significant. If we do not separate the effect of the benefits, we could say that family burdens reduce the probability of finding a job because workers know that may obtain a new benefit and no accept uninteresting jobs. However, thanks to the unemployment hazard model with a sequential exit, the conclusion is totally different, and to have family burdens does not influence in the search effort and the acceptability of a given offer.

Finally, we observe that in the complete benefits hazard model, controlling, the unemployment duration has not influence on the logarithm of the rate of transition to a job. However, in the unemployment insurance hazard model and unemployment hazard model with a sequential exit there is a positive duration dependence, the exit grows with the unemployment duration under benefits because unemployed increase their intensity of search or decrease their reservation wage. This effect is dramatically higher in recipient of assistance benefits.

# 6. Conclusions.

In this paper we characterize hazard models for administrative records data sets as models with a sequential exit. This sequential exit occurs when two types of benefits compose the Unemployment Compensation System: assistance benefits and insurance benefits. In most OECD countries, some workers when they exhaust their insurance benefits, extend their unemployment duration spell under benefits with an assistance benefits and it causes a sequential exit that should be considered. To incorporate this information we propose an unemployment hazard model with a sequential exit that let separate the impact of both benefits. Using a sample of registered unemployed comes from the Spanish longitudinal data set HSIPRE in February 1987, we compare the results of this model with an unemployment insurance hazard model (include only insurance benefits data) and a complete benefits hazard model (data of both types of benefits without separate their effects). The parameters of the model have been estimating by the non-parametric maximum likelihood estimator of Heckman and Singer (1984b) controlling the unobserved heterogeneity component and including time varying covariates. Among the main findings, we observe a high sensibility of the estimations in the models according to the likelihood function specified. The unemployment hazard model with a sequential exit presents consistent estimations because its likelihood function is correctly specified.

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# Appendix.

## A.1 Likelihood function for the unemployment insurance hazard models.

If the probability of a complete unemployment spell under benefits is

$$\Pr(T,d_1=1)=\Pr(T=t_1|d_1=1)\times\Pr(d_1=1)=\Pr(t_1=T|t_1\leq C_{t1})\times\Pr(t_1\leq C_{t1})=$$

$$=\left[\frac{f(t)}{1-S(C_{t1})}\right]\times(1-S(C_{t1}))=f(t_1)$$

(A)

where $d_1=1$ indicates that the spell is uncensored and the probability of a censored unemployment spell under insurance benefit is

$$\Pr(T,d_1=0)=\Pr(T=Ct_1|d_1=0)\times\Pr(d_1=0)=\Pr(d_1=0)=\Pr(t_1>C_{t1})=S(C_{t1}). \qquad \text{(B)}$$

where $d_1=0$ indicates that the spell is censored. Then, the likelihood function for "n" individual is

$$L=\prod_{i=1}^{n}\Pr(t_{i1},d_{i1})=\prod_{i=1}^{n}\left[f(t_{i1})\right]^{d_{i1}}\left[S(C_{ti1})\right]^{1-d_{i1}}. \qquad \text{(C)}$$

which has completed spells contributing a density term $f(t_{i1})$ and censored spells contributing a probability $S(C_{ti1})$.

## A.2 Likelihood function for unemployment hazard models with sequential exit.

If administrative record data sets contain information of insurance benefit and assistance benefits, we can observe four types of spells, two complete spells ($t_1$, $t_2$) and two censored spells ($C_{t1}$, $C_{t2}$). The complete spells $t_1$ and $t_2$ represent the uncensored spells for individuals who perceive insurance and assistance benefits. The censored spells $C_{t1}$ and $C_{t2}$ are the uncensored durations of recipients who exhaust insurance and assistance benefits, respectively. Three dummy variables, $d_1$, $d_2$ and $d_3$ may represent the durations for these observations. Thus,

If $d_1=1$ $\longrightarrow$ Distinguish complete durations for recipients who receive unemployment insurance

If $d_1=0,d_2=1$ $\longrightarrow$ Discriminate censored durations for recipients who receive unemployment insurance

If $d_1=0,d_2=0,d_3=1$ $\longrightarrow$ Distinguish complete durations for recipients who exhaust unemployment insurance, access to an assistance benefit and exit to a job.

If $d_1=0,d_2=0,d_3=0$ $\longrightarrow$ Discriminates censored durations for recipients who exhaust unemployment insurance and assistance.

The likelihood function for this type of data would be

$$\Pr(t_{1,} C_{t1;}\ t_2, C_{t2}) = P_1(t_1, C_{t1}) \times P_2(t_2, C_{t2} | \ t_{11}, C_{t1}) =$$
$$= \Pr(T=t_1, d_1=1) \times \Pr(T=C_{t1}, d_1=0, d_2=1) \times \Pr(T=t_2, d_1=0, d_2=0, d_3=1) \times$$
$$\times \Pr(T=C_{t2}, d_1=0, d_2=0, d_3=0)$$

where the first term is

$\Pr(T=t_1|d_1=1)\times\Pr(d_1=1)=\Pr(t_1=T|t_1\leq C_{t1})\times\Pr(t_1\leq C_{t1})=$

$$=\left[\frac{f(t)}{1-S(C_{t1})}\right](1-S(C_{t1}))=f(t_1).$$

The second term

$\Pr(T=C_{t1},d_1=0,d_2=1)=\Pr(T=C_{t1}|\ d_1=0,d_2=1,)\times\Pr(d_1=0,\ d_2=1)=$

$=\Pr(t_1>C_{t1})=S(C_{t1}).$

The third term

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

$=\Pr(t_2<C_{t2})\times\Pr(t_1>C_{t1})=f(t_2)\times S(C_{t1}).$

And finally, the last term

$\Pr(T=C_{t2},d_1=0,d_2=0,d_3=0)=\Pr(T=C_{t2}|d_1=0,d_2=0,d_3=0)\times\Pr(d_1=0,d_2=0,d_3=0)=$

$=\Pr(t_2>C_{t2})\times\Pr(t_1>C_{t1})=S(Ct_2)\times S(C_{t1}).$

Regrouping the terms, the likelihood function for "n" individual would be

$$L(t_1,t_2,X(t_{ij}),\theta)=\prod_{i=1}^{n}\left[f(t_{i1},X(t_{i1}),q)\right]^{d_{i1}}\times\left[S(C_{ti1},X(t_{i1}),q)\right]^{d_{i2}(1-d_{i1})}\times$$

$$\times\left[\{f(t_{i2},X(t_{i2}),q)\}\times\{S(C_{ti1},X(t_{i1}),q)\}\right]^{d_{i3}(1-d_{i1})(1-d_{i2})}\times$$

$$\times\left[\{S(C_{ti2},X(t_{i2}),q)\}\times\{S(C_{ti1},X(t_{i1}),q)\}\right]^{(1-d_{i1})(1-d_{i2})(1-d_{i3})}\qquad(5)$$

**Table 1.**

UNEMPLOYMENT INSURANCE AND ASSISTANCE IN THE OECD

Unemployment insurance (UI) only

Belgium, Canada, Denmark, Iceland, Italy, Japan, Luxembourg, Norway, Switzerland, United States.

Unemployment insurance (UI) and Unemployment Assistance (UA).

Austria, Finland, France, Germany, Greece, Ireland, Netherlands, Portugal, Spain, Sweden, United Kingdom.

Unemployment Assistance (UA) only.

Australia, New Zealand.

No UI nor UA scheme
Turkey.

Source OECD (1988, p.114).

**Table 2.** Pre - 1992 period.

| Contribution period (C). (Over the last 4 years) | Entitlement U. I. (2 × integer (C/3)) | Unemployment assistance after exhausted U.I. | | | |
|---|---|---|---|---|---|
| | | With family burdens | | Without family burdens | |
| | | **< 45 years** | **≥ 45 years** | *<45 years* | *³45 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 fam. 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 the insurance unemployment spells. (U.I.)

| Variables. | Dummy | Mean. | Std. | Sample (%). |
|---|---|---|---|---|
| **Gender.** | | | | |
| Male. | * | | | 66.4 |
| Female. | * | | | 33.6 |
| **Age.** | | | | |
| 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 |
| **Region.** | | | | |
| Agricultural region. | * | | | 34.4 |
| Services region. | * | | | 28.0 |
| Industrial region. | * | | | 37.6 |
| **Family burdens.** | | | | |
| With. | * | | | 26.8 |
| Without. | * | | | 73.2 |
| **Type of observation.** | | | | |
| Uncompleted duration. ($C_{t1}$) | * | | | 69.4 |
| Completed duration. ($t_1$) | * | | | 30.6 |
| **Entitlement period.** | | | | |
| 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 |
| **Duration.** (Months). | | | | |
| 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)$^2$. | | 323.25 | 912.01 | 100 |
| **Wage** (thousand pts /month). | | 67.04 | 22.16 | 100 |
| **Benefits** (thousand pts. /month). | | 60.66 | 14.48 | 100 |
| **Cause of unemployment.** | | | | |
| End of contract. | * | | | 95.5 |
| Others. | * | | | 4.5 |
| **Exit of the system** | | | | |
| Job. ($t_1$) | * | | | 30.6 |
| Benefits exhausted ($C_{t1}$) | * | | | 69.4 |
| **Job Category.** | | | | |
| 1 | * | | | 7.7 |
| 2 | * | | | 9.1 |
| 3 | * | | | 31.4 |
| 4 | * | | | 11.6 |
| 5 | * | | | 40.2 |

**Legend for category**. 1.High levels and associate professional technicians, foremen and supervisors; 2.Technical assistants and skilled clerical workers; 3.Unskilled clerical workers and unskilled production workers.4.Semi-skilled clerical workers; 5. Skilled production workers and semi-skilled production workers.

**Table 5.** Descriptive statistics for variables in the insurance unemployment spells and/or insurance and assistance unemployment spells. (U.I. and U.A.)

| Variables. | Dummy | Mean. | Std. | Sample (%). |
|---|---|---|---|---|
| **Gender.** | | | | |
| Male. | * | | | 66.4 |
| Female. | * | | | 33.6 |
| **Age.** | | | | |
| 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 |
| **Region.** | | | | |
| Agricultural region. | * | | | 34.5 |
| Services region. | * | | | 28.0 |
| Industrial region. | * | | | 37.5 |
| **Family burdens.** | | | | |
| With. | * | | | 40.4 |
| Without. | * | | | 59.6 |
| **Type of observations.** | | | | |
| Completed duration. ($t_1$) | * | | | 30.6 |
| Uncompleted duration. ($C_{t1}$) | * | | | 43.3 |
| Completed duration. ($t_2$) | * | | | 9.5 |
| Uncompl. Duration ($C_{t2}$) | * | | | 16.5 |
| **Entitlement period.** | | | | |
| 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 |
| **Duration** (months). | | | | |
| 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)$^2$. | | 442.24 | 991.58 | 100 |
| **Current true assistance duration.** | | 120.06 | 227.76 | 100 |
| **Entitlement assistance duration.** | | 150.23 | 257.75 | 100 |
| **Wage** (thous.pts./month). | | 67.04 | 22.16 | 100 |
| **Benefits** UI+UA (thous.pts. /month) | | 54.99 | 17.13 | 100 |
| **Assistance benef.** (Thous. pts./month). | | 36.478 | 5.425 | 100 |
| **Cause of Unemployment.** | | | | |
| End of contract. | * | | | 95.5 |
| Others. | * | | | 4.5 |
| **Exit of the system** | | | | |
| Get a Job when receive U.I. ($t_1$) | * | | | 30.6 |
| Exhaust Unempl. Insurance. ($C_{t1}$) | * | | | 43.3 |
| Get a job when receive UA($t_2$) | * | | | 9.5 |
| Exhaust UI and UA ($C_{t2}$) | * | | | 16.5 |
| **Job Category.** | | | | |
| 1 | * | | | 7.7 |
| 2 | * | | | 9.0 |
| 3 | * | | | 32.1 |
| 4 | * | | | 11.5 |
| 5 | * | | | 39.8 |

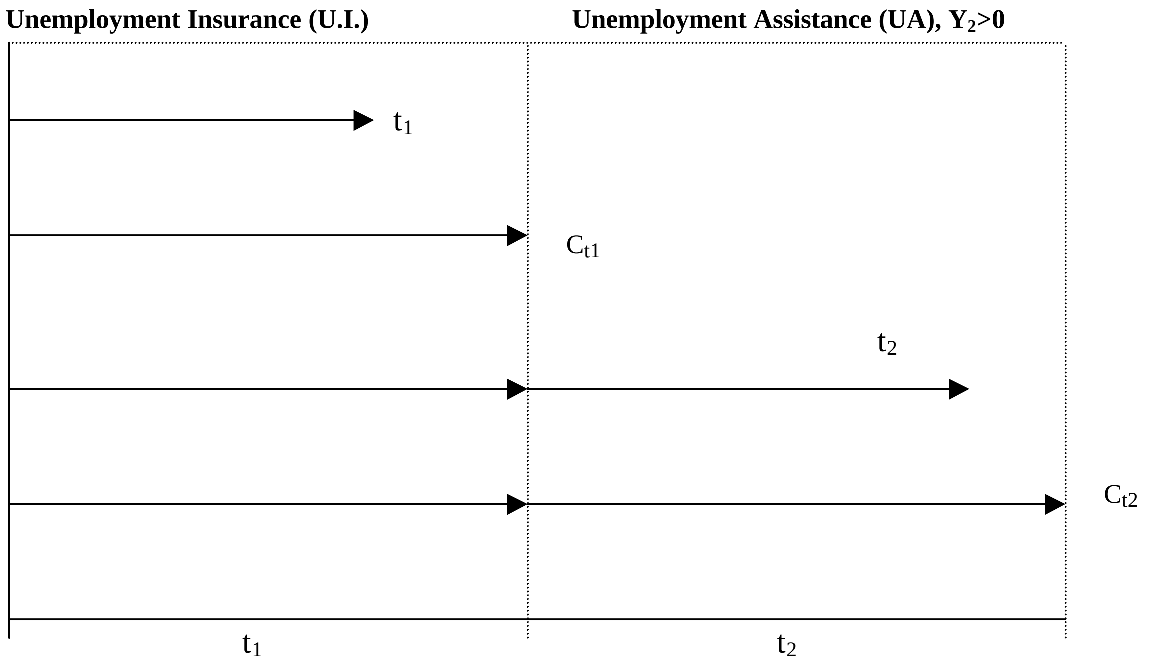
**Legend.** See Job category table 4.

**Table 6.** Estimation results.

| | U. I. Hazard model | | Comp. U. B. hazard model. | | Unempl. hazard model with a sequential exit. | | | |
|---|---|---|---|---|---|---|---|---|
| **Covariates.** | **Parameter** | **Sign.** | **Parameter** | **Sign.** | **Param. U.I.** | **Sign.** | **Param. U.A** | **Sign.** |
| **Intercept.** | -0.6342<br>(0.2814) | *** | 0.780<br>(0.2874) | * | 1.1468<br>(0.2843) | *** | 22.7871<br>(0.8857) | *** |
| **Gender (women).** | -0.9555<br>(0.04400 | *** | -0.9539<br>(0.0377) | *** | -0.8966<br>(0.0457) | *** | -0.8902<br>(0.0988) | *** |
| **Exit age.** | 0.0734<br>(0.1225) | | 0.6774<br>(0.1045) | *** | 0.1408<br>(0.1333) | | -0.3287<br>(0.2805) | |
| **Exit age square.** | -0.0459<br>(0.0153) | *** | -0.1177<br>(0.0131) | *** | -0.0547<br>(0.0168) | *** | 0.0291<br>(0.0350) | |
| **Job Category.** | | | | | | | | |
| 1 | 0.5049<br>(0.0666) | *** | 0.3180<br>(0.0609) | *** | 0.4553<br>(0.0715) | *** | 0.4746<br>(0.2172) | ** |
| 2 | -0.3078<br>(0.0655) | *** | -0.2450<br>(0.0570) | *** | -0.3642<br>(0.0679) | *** | 0.2016<br>(0.1789) | |
| 4 | -0.0899<br>(0.0648) | * | -0.0359<br>(0.0552) | | -0.1109<br>(0.0686) | *** | 0.4014<br>(0.1426) | *** |
| 5 | 0.0679<br>(0.0426) | *** | 0.0698<br>(0.0359) | *** | 0.0584<br>(0.0463) | | 0.1978<br>(0.0959) | *** |
| **Agriculture region.** | 0.0224<br>(0.0466) | | -0.0260<br>(0.0388) | | 0.0129<br>(0.0516) | | -0.0079<br>(0.1060) | |
| **Industrial region.** | 0.0925<br>(0.0446) | *** | 0.0667<br>(0.0377) | *** | 0.0912<br>(0.0489) | *** | 0.1469<br>(0.1002) | * |
| **Family burdens (with).** | -0.0492<br>(0.0400) | | -0.2746<br>(0.0340) | *** | -0.0129<br>(0.0435) | | -0.0770<br>(0.1221) | |
| **Benefits.(th. pts/month).** | 0.0867<br>(0.0020) | *** | 0.0518<br>(0.0014) | *** | 0.0836<br>(0.0022) | *** | -0.3394<br>(0.0121) | *** |
| **Wage (th. Pts./month).** | -0.0551<br>(0.0013) | *** | -0.025<br>(0.0010) | *** | -0.0521<br>(0.0014) | *** | 0.0070<br>(0.0024) | *** |
| **End of contract.** | 0.4941<br>(0.0810) | *** | 0.3053<br>(0.0698) | *** | 0.5538<br>(0.0826) | *** | -0.2366<br>(0.2027) | |
| **Duration until exh.** | 0.0429<br>(0.003) | *** | 0.0530<br>(0.0027) | *** | 0.0396<br>(0.0031) | *** | 0.0847<br>(0.0087) | *** |
| **(Duration until exh.)$^2$** | -0.0048<br>(0.0004) | *** | -0.008<br>(0.0004) | *** | -0.0044<br>(0.0005) | *** | 0.0105<br>(0.0013) | *** |
| **Factor Loading** | 0.9334<br>(0.0828) | *** | 0.5861<br>(0.0959) | *** | 1.8390<br>(0.0689) | *** | -3.5387<br>(0.4310) | *** |
| **$\gamma_1$.** | 0.2158<br>(0.0205) | *** | 0.0317<br>(0.0163) | *** | 0.2783<br>(0.0201) | *** | 2.6425<br>(0.0831) | *** |
| **Support points⁕.** | | | | | | | | |
| 1st Support Points. | 0[0.73]) | *** | 0[0.62] | *** | 0[0.14] | | | *** |
| 2nd Support Points. | 0.7[0.14 ] | *** | 0.8[0.7] | *** | 0.5[0.49] | | | *** |
| 3rd Support Points. | 1[0.15 ] | *** | 1[0.31 ] | *** | 1[0.1] | | | *** |
| **Log likelihood.** | -7513.6413 | | -9305.8661 | | -9995.3056 | | | |
| **Sample (Censored %).** | 12140(69.4) | | 12140(59.9) | | 12140(43.3) | | 3166(16.5) | |

**Legend.** ***(0.01 significant); **(0.05 significant);*(0.1 Significant). Job categories see table 3. ⁕ Probability for each support point in [].

**Figure 1**. Type of observations for recipients who perceive unemployment insurance and assistance.




**Legend**. $t_1$=complete spell for unemployed who receive unemployment insurance (U.I.).
$C_{t1}$=Censored spell for unemployed who exhaust the unemployment insurance.
$t_2$= Complete spell for unemployed who exhaust U..I., receive an unemployment assistance (U.A.) and get a job.
$C_{t2}$= Censored spell for unemployed who exhaust U.I. and U.A.

**Figure 2**. Types of durations in the Spanish Unemployment Compensation System.

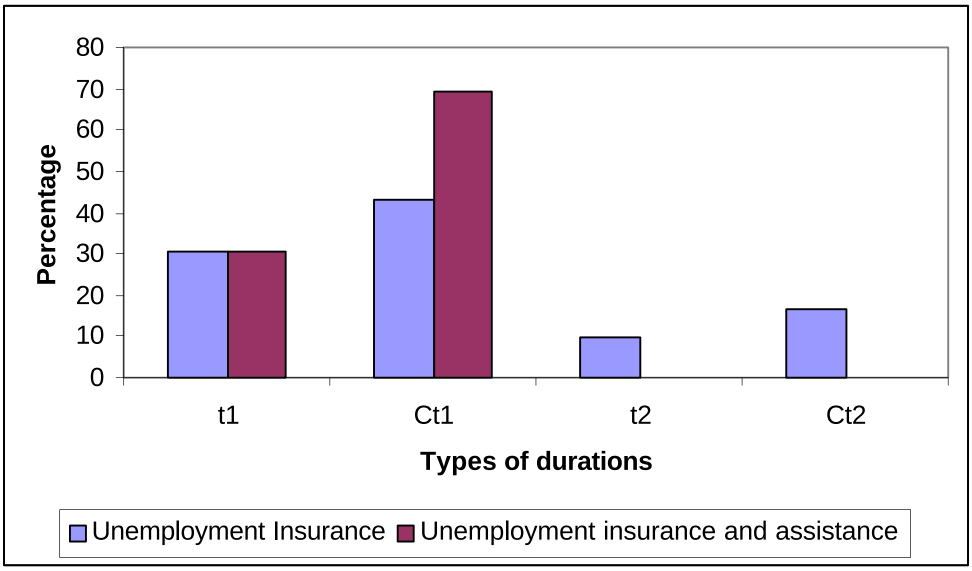


**Figure 3**. Number of individuals exposed to risks with and without unemployment assistance data. (U.I. and .U.A. includes information of unemployment assistance; U.I. does not include unemployment assistance information).

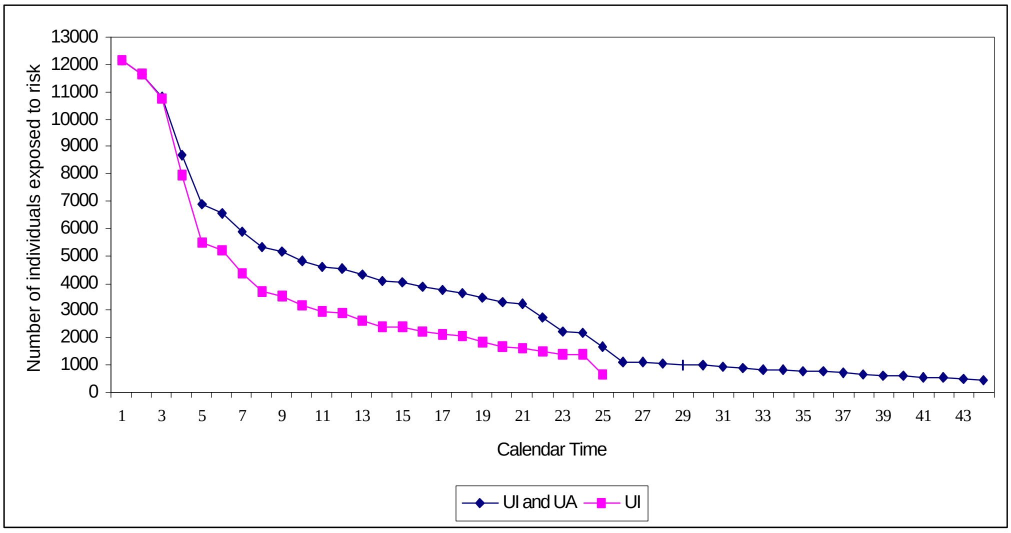



**Figure 4.** Survival profiles of workers who receive unemployment insurance (U.I.) and unemployment insurance or both types of benefits (U.I. and U.A.).

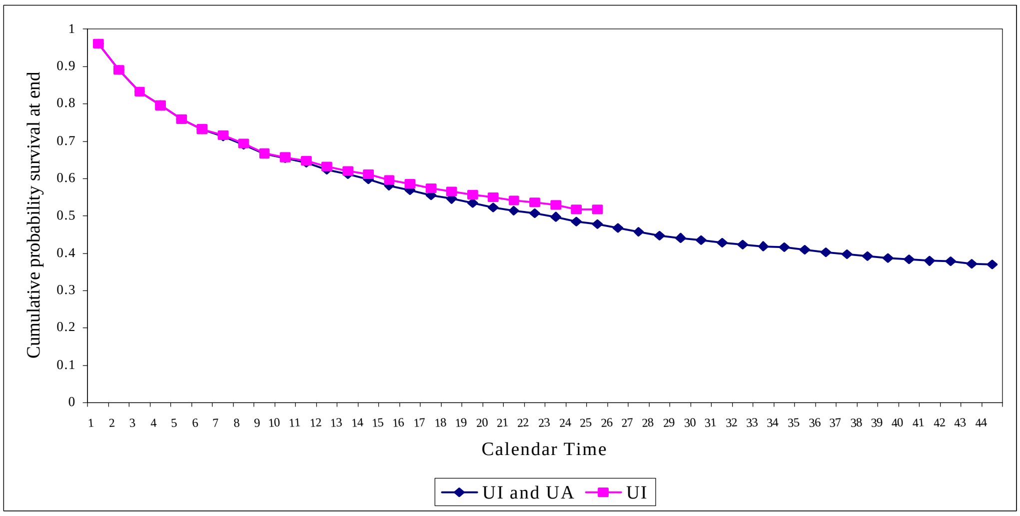


**Figure 5**. Histogram of the duration (in days) until the exhaustion of the benefits. Unemployment insurance information (not included censored data).

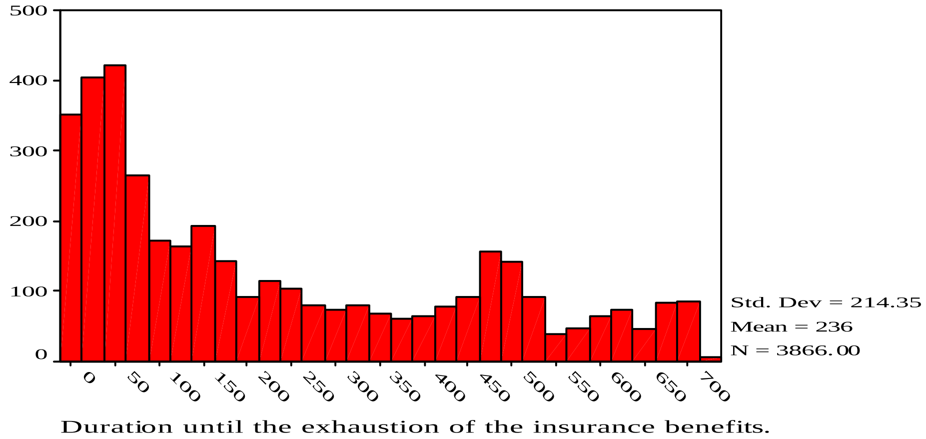



**Figure 6.** Histogram of the duration (in days) until the exhaustion of the benefits. Data of unemployment insurance and both types of benefits. (not included censored data).

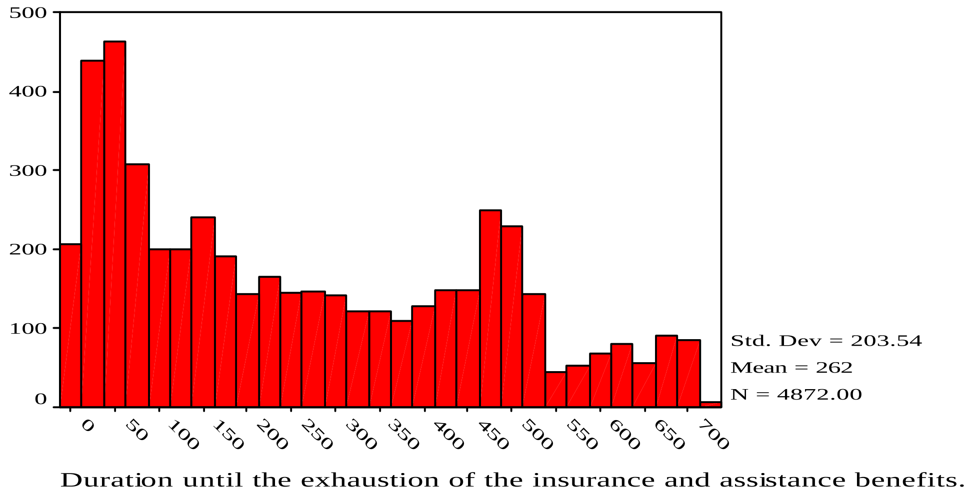


**Figure 7.** Histogram of the duration (in days) until the exhaustion of the assistance benefits. Unemployment assistance data (not included censored data).