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ABSTRACT

The Effect of Job Displacement on the Transitions to Employment and Early Retirement for Older Workers in Four European Countries*

Despite the increased frequency of job loss for older workers in Europe, little is known on its effect on the work-retirement decision. Employing individual data from the European Community Household Panel for Germany, Italy, Spain, and the U.K., a multivariate competing-risks hazard model is estimated in which the effect of job displacement is identified separately for transitions into re-employment and retirement. The findings suggest that in countries with institutional provisions for older unemployed which offer a pathway to early retirement such as, Germany and Spain, older displaced workers exhibit lower re-employment and higher retirement rates compared to the non-displaced. These results are robust to dynamic selection due to unobserved heterogeneity and to the endogeneity of displacement.

JEL Classification: J14, J26, J63, J64

Keywords: job displacement, job loss, unemployment duration, retirement, competing risks

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1. Introduction

This paper investigates the effect of job displacement on the transitions into re-employment, or retirement, in a competing-risks hazard framework for a number of European countries. In recent years, there is evidence of an increase in the frequency of job loss among older workers both in the U.S. (Farber, Haltiwagner, Abraham, 1997; Farber, 2004) and in Europe (OECD, 1998).[2] Despite this development, which has been associated with demand shifts, restructuring of traditional industries, import competition and out-sourcing of jobs, surprisingly very little is known on how job displacement might affect the labor market transitions of older workers and, in particular, the work-retirement decision. Understanding the link between job displacement and retirement has direct implications for policies promoting longer working lives. These policies are considered as a response to the decline in the labor force participation of older workers and the demographic changes that occur in European countries, which put pressure on the sustainability of the social security systems.

In theory, the direction of the effect of job loss towards re-employment, or retirement, is ambiguous. Experiencing a job loss may have considerable consequences because of the interruption of a long tenure job, which diminishes acquired firm-specific human capital, employment and earning prospects. Indeed, studies focusing on workers of all ages find that job displacement leads to a reduction of future earnings (Jacobson, LaLonde, Sullivan, 1993; Ruhm, 1991) and an increase of employment instability (Stevens, 1997), in the sense that the displaced have higher exit rates from subsequent employment.[3] Although the unemployment rate among workers 45 to 64 years old is lower than the overall rate in most OECD countries, the incidence of long-term unemployment is significantly higher (OECD, 1998), suggesting a lower mobility of older workers who experience unemployment. Considering retirement as a distinct labor market

[2] In what follows job loss and job displacement will be used interchangeably.
[3] For a survey on the effect of job displacement see Kletzer (1998). Kuhn (2002) contains an analysis of work displacement for prime age workers for a number of European countries.

state allows to distinguish between two competing explanations for the incidence of long-term unemployment among older workers. That is, unemployment persistence might exist due to 1) difficulties to be re-employed based on poor employment prospects, or 2) due to disincentives to be re-employed. The combination of extended unemployment benefit periods with early retirement schemes available for the older workers, in a number of countries, might affect their decisions by making retirement more attractive (Duval, 2003).[4]

However, job displacement might also affect the work-retirement decision on the opposite direction; reducing wealth and income, which might lead to an extension of the working life. Focusing on the transitions between non-employment and employment following a late-career job loss in the U.S., Chan and Stevens (1999, 2001) find that a job loss for men leads to longer labor force participation reflecting the need to rebuild diminished savings for retirement. For women, the reduced earnings due to a job loss reduce the incentives to work. Using Austrian administrative data, Ichino, Schwerdt, Winter-Ebmer, and Zweimüller (2006) find that after a plant closure initially the old have lower re-employment probabilities as compared to prime-age workers, but later they catch-up.

The analysis in this paper has three novel and important features. The *first* is the focus on the distinction between transitions towards re-employment and retirement for older workers in a number of countries (Germany, Italy, Spain, and the U.K.), which differ in their institutions related to older unemployed, based on individual panel data from the European Community Household Panel (ECHP, 1994-2001). In this respect, the paper contributes to a relatively recent literature on the incentive effects of unemployment related benefits for older workers. Heyma and Van Ours (2005) find that the abolition of the requirement to actively search for a job beyond age 57.5 and the entitlement to unemployment benefits until the age of 65, in the Netherlands, has a large negative effect on the job finding rate. Other studies have shown that increases in the entitlement period of

[4] The literature on retirement has focused on the incentive structure of the pension systems in explaining the observed retirement patterns (e.g. Gruber and Wise, 1998; Meghir and Whitehouse, 1997). Rigidities in the labor market, such as the inability to choose flexible working hours, might also lead to early withdrawal from the labor force even if older workers might prefer to retire gradually (Hurd, 1996).

unemployment benefits for older workers leads to declines in transition rates to employment in Germany (Hunt, 1995) and Austria (Lalive and Zweimüller, 2004), and provide a quantitatively important pathway into early retirement (Lalive, 2006). Kyyrä and Wilke (2007), evaluating the increase in the eligibility age from 53 to 55 of the unemployment insurance system in Finland, which allows unemployed workers to collect benefits up to a certain age limit and then retire, find evidence of a large decrease in the inflow to unemployment and a large increase in the transition rate out of unemployment to employment.

The *second* novel feature of the paper is the joint estimation of the effects of job displacement on the transitions to and out of subsequent employment, distinguishing between the short and long-run effects of displacement. That is, although displaced workers might be re-employed relatively fast, what is important for the overall employment rate is also the stability of the post-displacement employment. In addition, dynamic selection is taken into account by allowing unobserved individual characteristics to be correlated across states.

Finally, the paper addresses the endogeneity of displacement by extending the econometric model into a joint estimation of the selection process into displacement and the transitions into employment, or retirement. Based on the "timing of the events" approach of Abbring and Van den Berg (2003), the causal effect of displacement is identified by means of the variation from the multiple non-employment and employment spells, which are observed for each individual.

The rest of the paper is organized as follows. Section 2 contains a brief discussion of the institutional features related to unemployment insurance and retirement rules in each of the countries considered in this study. Section 3 describes the data and provides a non-parametric analysis of labor market transitions. Section 4 presents the econometric model and discusses identification and the way to address the endogeneity of displacement. Section 5 provides the results of the effect of displacement on labor market transitions, and the last section concludes this paper with a summary of the findings.

2. Institutional Features

The focus of this section is on the institutions which are related to older unemployed in the four countries considered in the analysis. These refer to the unemployment insurance and early retirement schemes based on information obtained from the Mutual Information System on Social Protection (MISSOC, 1994) of the European Union.

In Germany, the legal retirement age is 60 after 180 contribution months if unemployed at the commencement of the pension and if unemployed for 52 weeks after completion of the age of 58.5. Alternatively, the requirement is to have worked part time for older workers for 24 calendar months. The age limit for early pension for unemployed increased in the years 1997 to 2001 from 60 to 65 years. However, the pensions can be claimed after the completion of the age of 60 with the acceptance of pension reductions. The replacement rate for unemployment insurance recipients is 67 per cent of net earnings (60 per cent for beneficiaries without children). The duration of benefits is 32 months for workers aged 54 and over. In Spain, there is no direct provision of early retirement for unemployed. However, early retirement is possible at the age of 60 with an 8% reduction for every anticipated retirement year. With respect to benefits for older unemployed, under the Industrial Restructuring law, workers are entitled to a form of benefit financed under the relevant restructuring plan. These benefits are of particular significance for workers aged at least 55 at the time of restructuring, who may draw them until they reach 65 years of age. The replacement rate for unemployment insurance recipients is 70 per cent for the first 180 days, and 60 per cent afterwards. The duration of unemployment benefits received varies between 4 months and 2 years depending on the contribution period over the preceding 6 years. For long-term unemployed, aged 45 or more, there is a special 6-months benefit of 75-125 per cent of minimum wage.

In Italy, there are no special benefits for older unemployed which are associated with the possibility of early retirement. The legal retirement age is 63 for men and 58 for women. Early pension is available at the age of 54 and after 35 years of contributions, or after 36 years of contributions regardless of age. Early retirement is possible for employees of companies in

economic difficulties at the latest 5 years before normal retirement age. The replacement rate for the ordinary unemployment benefits is 30% of the average pay received during the last 3 months, and the duration is 180 days. The replacement rate for the special unemployment benefit for those in the building industry is 80% of previous earnings with duration of 90 days. In the U.K., there are no provisions of early retirement and no benefits related to older unemployed. The standard unemployment insurance rate is a flat rate of about 80 euros per week for aged 25 or over, with duration up to 12 months limited to 182 days in any job-seeking period in October 1996.

To summarize, in Germany, and Spain, institutions are designed to assist older unemployed and displaced, while in Italy, and the U.K., such provisions are not in general available. It is worth mentioning that this does not preclude special schemes with incentives for early retirement, for instance, in Italy. However, these are case-specific and do not have a general applicability.

3. Data and Descriptive Analysis

The analysis is based on individual data from the European Community Household Panel (ECHP, 1994-2001). The ECHP is a survey based on a standardized questionnaire with annual interviews of a representative panel of households and individuals from the population in each country, covering a wide range of topics including demographics, employment characteristics, education etc. In the first wave, a sample of some 60,500 nationally representative households - approximately 130,000 adults aged 16 years and over - were interviewed in the then 12 Member States. There are three characteristics that make the ECHP relevant for this study. That is, the simultaneous coverage of employment status, the standardized methodology and procedures yielding comparable information across countries and the longitudinal design in which information on the same set of households and persons is gathered.

The ECHP contains, for every individual in each wave, monthly information on the labor market status during the previous year distinguishing between unemployment, inactivity, employment and retirement. An inflow sample of non-employed is constructed from all individuals

45 to 64 years old, at the time of the first interview, who respond in at least two consecutive years of the survey. The inflow sample consists of those who exit employment entering into either unemployment, or inactivity. Transitions from employment directly to retirement are few in this age group and are not included in the inflow sample of unemployed and inactive (those who are not looking for a job but are not retired) denoted as non-employed.

Each non-employment spell can end by either returning into employment, or by retiring. Missing values of the monthly labor market status are imputed following Blau and Riphahn (1999) when the missing months are less, or equal to three.[5] The analysis allows for multiple non-employment spells. Table 1 contains statistics of the sample by country.

[Table 1 about here]

The first row shows the total number of individuals, while the second row those who are non-employed at least once during the sampling period. The inflow sample of individuals used in the analysis consists of those who have at least one flow into non-employment. These numbers vary from 379 individuals, for Italy, to 709 for Germany (row 3), while the number of spells varies from 781, for the U.K., to 1801 for Spain (row 4). After dropping those spells with missing information on displacement, the remaining samples consists of 1064 spells for Germany, 765 for Italy, 1561 for Spain, and 717 for the U.K.

[Table 2 about here]

Table 2 presents the transitions that occur in the sample. Non-employment spells might end either into employment, or to retirement. The spells for which no transitions out of non-employment are observed until the end of the sample period are treated as right censored. About 50 per cent of the non-employment spells in Germany, and 65-68 per cent in Italy, Spain, and the U.K., end by

[5] The missing information is replaced with the value of the month before the missing when the values are the same before and after the missing month. With different values, the imputation depends on the number of missing months. Missing information is replaced with the value of the month after the missing month when the missing month is only one. With two missing months, the first missing value is replaced with the value of the previous month and the second missing value is replaced with the value of the next month. With three missing values, the first missing month is replaced with the value of the previous to month, while the other two missing months are replaced with the value of the month after the missing months.

returning to employment. The share of spells which end to retirement is about 7 per cent for Italy, Spain, and the U.K., while it is much higher – about 20 per cent - for Germany. For those being re-employed, 58 per cent make a transition back to non-employment in Germany, about 75 per cent in Italy and Spain, and 45 per cent in the U.K.[6]

For each of the non-employment spells an indicator of displacement is constructed using the information on the reason for leaving the previous job. The displaced are defined as those who were obliged to stop the previous job by the employer. Table 3 presents summary statistics of individual characteristics by displacement status. Older individuals with medium, or low education, are more likely to be displaced. For the other characteristics, no clear pattern seems to exist across countries.

[Table 3 about here]

The advantage of using survey data compared to administrative data is that the sample is more representative of the whole population of displaced workers. With administrative data displacement is defined using information on plant closures which excludes all involuntary job separations that occur on an individual basis. Moreover, with survey data a control group can be defined out of those who voluntarily left their previous job (for a better job, marriage, child birth, looking after others, illness, etc.). However, using survey data has the disadvantage of relying on self-reported information for the reason of job separation, which might be correlated with individual unobserved characteristics, or be endogenous to labor market institutions. For instance, quits might be reported as layoffs for the worker to be eligible for unemployment insurance, or layoffs to be reported as quits to avoid administrative burden on the side of the employer in countries with strict employment protection legislation. In addition, even in the case of plant closing, the workers who remain until the plant closes are selected non-randomly from the group of workers who were present when the

[6] The paper is focused on Germany, Italy, Spain, and U.K., as for the other countries in the ECHP the inflow sample was relatively small resulting in very few transitions especially towards retirement. As the focus of the paper is on the distinction between transitions to re-employment and retirement this selection was inevitable. However, as discussed in section 2, the four countries studied offer interesting variation in institutional characteristics, representing different welfare regimes.

firm's initial negative demand shocks arrived. This occurs as the firm learns which employees are likely to quit and alters its layoff policies accordingly (Pfann and Hamermesh, 2001).[7]

3.1 Empirical Hazard Estimates

Figure 1 shows the proportion of non-employed who re-enter employment by displacement status. The cumulative failure is based on the empirical (Kaplan-Meier) hazard rates and is equal to one minus the survival rate. In Italy and Spain, non-displaced workers return to employment faster compared to those displaced. The same holds for Germany, although the difference between displaced and non-displaced appears to be smaller, as is the case for the U.K., but to the opposite direction.

[Figure 1 about here]

Figure 2 shows the cumulative failure from non-employment to re-employment for the displaced by age groups. In Germany, and Spain, there is a big difference across age groups in the proportion of displaced workers who return to employment. While for those aged 45-54 more than 60 per cent eventually return to employment, it is only about 40 per cent of those older displaced (aged 55-64) who are re-employed. For Italy and the U.K., such differences by age are smaller. These figures suggest that, for workers in Germany and Spain, displacement past a certain age (around 55 years old) is not "repaired".

[Figure 2 about here]

Figure 3 depicts the proportion of workers who exit subsequent employment. It shows that in countries in which displaced are less likely to return to employment (Italy, Spain) those who do return exit employment at a lower rate.

[Figure 3 about here]

Although differences in re-employment and subsequent employment hazards between displaced and non-displaced are useful, they are not informative on the transitions towards other

[7] The way to address the endogeneity of displacement is discussed in Section 4.2.

states, and in particular, retirement. Moreover, such differences might be confounded by individual observed and unobserved characteristics, or dynamic selection which might arise as workers with higher employability are expected to leave non-employment faster and obtain more stable employment. To address these issues, an adequate econometric model is required.

4. Econometric Methodology

The econometric analysis is based on a multivariate mixed proportional hazard model. In line with most applications analyzing individual's labor market transitions a reduced-form approach is adopted (see Van den Berg (2001) for an overview of duration models).

4.1 The Statistical Model

The analysis considers the effect of job loss on the transitions from non-employment (ne) and from subsequent employment (e), for those who are re-employed. Non-employed workers have the following options: accept a job offer and be re-employed ($ne-e$), or retire ($ne-r$). The transitions from non-employment to employment, or retirement, are modeled in a competing-risks framework. The transitions from subsequent employment (for those who are re-employed) are modeled as a single-risk due to lack of sufficiently large sample, which would allow a distinction to be made between re-entering unemployment and retiring. Observations for individual who remain non-employed until the end of the observation period are treated as right-censored.

Each hazard function is the product of the baseline hazard, which captures the time dependence of the hazard rate, and the systematic part which shifts the baseline hazard. The systematic part includes individual characteristics and economic variables denoted as X_{jik}, where i refers to the individual, $j = ne, e$, and k denotes the spells for each individual. The observed characteristics refer to the year in which each spell has started and are fixed within a spell. However, they are allowed to vary across non-employment and employment and across multiple

spells for each individual. The variables include age dummies, education dummies (defined using the ISCED classification), whether the individual is married, the number of children, non-labor income based on capital and property income acting as a proxy for wealth, and a homeownership dummy.[8] The economic variables include the regional unemployment rate at the time of entering non-employment, or employment, respectively.[9]

The transition for person i in a spell k, from state j to state s, is defined as

$$\theta^s_{jik}(t_k \mid \varepsilon^s_{ji}) = \lambda^s_{ji}(t_k)\exp(y^s_{jik}) \tag{1}$$

where $\lambda^s_{ji}(t_k)$ is the baseline hazard and $\exp(y^s_{jik})$ is the systematic part of the hazard. The baseline hazard has a semi-parametric representation using a piece-wise constant function with specified month intervals defined as

$$\lambda^s_{ji} = \exp\left(\sum_l \lambda^s_{j,l} I_l(t)\right) \tag{2}$$

where the subscript $l = (1,2,3,4)$ denotes the month intervals and $I_l(t)$ are time-varying dummy variables, which are one within the month intervals. These intervals are defined as, $l = 1$ for 1-6 months of duration, $l = 2$ for 7-12 months, $l = 3$ for 13-24 months, and $l = 4$ for more than 24 months.

For the non-employment spells, where $j = ne$, the index y^s_{jik} is given by

$$y^s_{neik} = \beta^s_{0ne} + \beta^s_{1ne} X_{neik} + \delta^s_{1ne} D_k + \sum_{a=1}^{3} \delta^s_{2ne} I(a) D_k + \varepsilon^s_{nei} \tag{3}$$

For the employment spells y_{eik} is defined as

$$y_{eik} = \beta_{0e} + \beta_{1e} X_{eik} + \delta_{1e} D_k + \sum_{a=1}^{3} \delta_{2e} I(a) D_k + \varepsilon_{ei} \tag{4}$$

[8] Questions about job tenure are asked in the ECHP at a yearly basis (at the time of each interview) and not at each month. Since the spells are based on the monthly calendar, the tenure variable includes many missing values reducing the sample considerably. Therefore, it is not included in the regressors. Controlling for unobserved heterogeneity is able to capture the effect of tenure, as individuals with higher employability are more likely to obtain a good job match and experience longer job tenure.

[9] Year dummies are also included which capture wide economic effects and the effect of policy changes (e.g. Germany). Given the data limitation, an investigation of the effect of policy changes is left for future research based on administrative data.

Note that, for the non-employment hazard in (3), there are two destination states which are denoted with the superscript $s = e, r$ and the coefficients are destination specific. For the employment hazard, s denotes just a single state, so it is dropped from (4). The main variable of interest is the dummy variable D_k denoting whether a non-employed worker has been displaced. The specification includes a set of interactions of the displacement dummy with age dummies denoted as $I(a)$. Given sample size constraints, three age groups are considered: 45-55 ($a = 1$), 56-60 ($a = 2$), and 61-64 ($a = 3$). The unobserved heterogeneity is represented by a scalar random variable ε_{ji}^s, which is discussed below.

The contribution to the likelihood of a completed unemployment and employment spell, conditional on the observed and unobserved characteristics, is given by[10]

$$f_j^s(t_j \mid \varepsilon_j^s) = \theta_j^s(t_j \mid \varepsilon_j^s) \exp\left(-\int_0^{t_j} \theta_j^s(t_j \mid \varepsilon_j^s) dv\right) \qquad (5)$$

while the contribution of a censored spell is given by

$$S_j^s(t_j \mid \varepsilon_j^s) = 1 - F_j^s(t_j \mid \varepsilon_j^s) = \exp\left(-\int_0^{t_j} \theta_j^s(t_j \mid \varepsilon_j^s) dv\right) \qquad (6)$$

where F_j^s are distribution functions.

Let c_j^s be destination indicator variables for completed durations. That is, c_{ne}^e (c_{ne}^r) is a dummy variable which takes the value of one if the non-employment spell is completed with a transition into employment (retirement), and the value of zero if the spell is censored. Similarly, c_e for the employment hazard takes the value of one if the employment spell is completed, and zero if it is censored. The likelihood for the non-employment spells can be written as

$$L_{ne} = \iint ([f_{ne}(t_{ne} \mid \varepsilon_{ne}^e)]^{c_{ne}^e} [S_{ne}(t_{ne} \mid \varepsilon_{ne}^e)]^{1-c_{ne}^e})([f_{ne}(t_{ne} \mid \varepsilon_{ne}^r)]^{c_{ne}^r} [S_{ne}(t_{ne} \mid \varepsilon_{ne}^r)]^{1-c_{ne}^r}) dG(\varepsilon_{ne}^e, \varepsilon_{ne}^r) \quad (7)$$

while the likelihood for the employment spell is given by

[10] For notational simplicity, in what follows, the i and k subscripts are dropped and the conditioned on the X_{jik} variables becomes implicit, unless otherwise stated.

$$L_e = \int [\, f_e(t_e \mid \varepsilon_e)]^{c_e} [S_e(t_e \mid \varepsilon_e)]^{1-c_e} \, dG(\varepsilon_e) \tag{8}$$

Therefore, the total contribution to the likelihood for each individual can be written as

$$L_i = \iiint L_{ne} \; L_e \; dG(\varepsilon^e_{ne}, \varepsilon^r_{ne}, \varepsilon_e) \tag{9}$$

4.2 Unobserved Heterogeneity and Endogeneity of Displacement

Following Heckman and Singer (1984), the unobserved heterogeneity distribution is defined as a discrete distribution with the support points denoted by $(\varepsilon^e_{ne,p}, \varepsilon^r_{ne,p}, \varepsilon_{e,p})$ and the corresponding probability mass given by $\Pr(\varepsilon^e_{ne} = \varepsilon^e_{ne,p}, \varepsilon^r_{ne} = \varepsilon^r_{ne,p}, \varepsilon_e = \varepsilon_{e,p}) = \pi_p$, where P denotes the number of support points. Each unobserved factor is assumed to be time invariant, and individual specific for each destination state. That is, it is assumed to be the same across multiple spells of non-employment, or employment. However, the unobserved factors are allowed to be different and correlated across non-employment and employment spells. The sample likelihood can be written as follows

$$L = \prod_{i=1}^{n} \sum_{p=1}^{P} \pi_p L_i \tag{10}$$

where the individual likelihood L_i is defined in (9).

In order to account for the endogeneity of displacement, the model is extended to a joint estimation of the selection process in displacement and the transitions out of non-employment and employment. The selection process, which is specified as a logit model, is defined as

$$P = \Pr(D_k = 1 \mid X_{ik}, \varepsilon_d) = \Lambda(y_{dik}) \tag{11}$$

where $y_{dik} = \beta_{0d} + \beta_{1d} X_{dik} + \varepsilon_{di}$, and d denotes the displacement selection equation. This procedure for dealing with endogenous regressors in a duration framework is analogous to the study by Bover, Arellano and Bentolila (2002), who consider a univariate model of unemployment duration, and to the treatment of initial conditions by Ham and LaLonde (1996) in their evaluation

of training on a multivariate model of unemployment and employment spells. The contribution of each individual to the likelihood function can be written based on (9) as

$$L_i = \int L_{ne} L_e P^d (1-P)^{1-d} \, dG(\varepsilon_{ne}^e, \varepsilon_{ne}^r, \varepsilon_e, \varepsilon_d) \qquad (12)$$

The joint distribution $G(\varepsilon_{ne}^e, \varepsilon_{ne}^r, \varepsilon_e, \varepsilon_d)$ contains an additional component ε_d which captures the effect of unobserved factors that affect the probability to be displaced and can be correlated with the transition equations. In this case, the mass points of the discrete distribution are denoted as $(\varepsilon_{ne,p}^e, \varepsilon_{ne,p}^r, \varepsilon_{e,p}, \varepsilon_{d,p})$ with a corresponding probability π_p, and the likelihood function is similar to (10).

4.3 Identification

The purpose of the econometric model is to identify the causal effect of displacement on the transitions out of non-employment and subsequent employment. The model includes a competing-risks part which distinguishes between transitions from non-employment to employment, or retirement. Identification of a competing- risks proportional hazard model has been shown by Heckman and Honore (1989). In the multivariate duration model, which includes the transitions out of subsequent employment, dynamic selection is controlled for by allowing the unobserved characteristics to be correlated across the non-employment and employment spells. A detailed discussion of such dynamic selection can be found in the study by Ham and LaLonde (1996).

The identification of the displacement effect (treatment) relies on the identification of treatment effects on duration models by Abbring and Van den Berg (2003). Using the variation and randomness in the treatment assignment and controlling for selection into treatment based on unobservables, they show that the causal treatment effect is identified without the need of exclusion restrictions. The assignment into treatment embeds a competing-risks model that does not involve the treatment. Empirical applications which exploit the “timing of events” approach can be found in

Bonnal, Fougère, and Serandon (1997), Abbring, Van den Berg, and Van Ours (2005), and Van den Berg, Van der Klaauw, and Van Ours (2004).

For the purpose of this paper, the assignment into treatment is reduced to the probability model in (11), in which the probability to be displaced is defined as

$$\Pr(D_k = 1) = \frac{\theta_d}{\theta_d + \theta_q} \tag{13}$$

where θ_d and θ_q denote the probability to exit the previous employment due to displacement, or quit, respectively. Identification of this model relies on observing multiple non-employment and employment spells for each individual, which provide variation on the displacement indicator. As with the linear panel data, observing multiple outcomes for given unobserved heterogeneity values can be exploited to deal with unobserved heterogeneity under conditions that are mild relative to the single-spell case (Abbring and Van den Berg, 2003). By allowing unobserved heterogeneity in the selection equation to be correlated with the transition equations, the selection effect is identified separately from the causal effect of the treatment. As an example of such selection, one can think of individuals who are more likely to be displaced and also less likely to be re-employed because of unobserved differences in their labor market attachment.

Identification is also based on two assumptions related to anticipation and announcement effects. The non-anticipation assumption requires that individuals do not adjust their behavior inducing displacement by knowing the future retirement date. The announcement effect is related to the situation in which agents, knowing about a future job loss in advance, might retire immediately, or might postpone any action and retire after being laid off. The dependence of pension benefits on employment and earnings in the years before retirement, or the requirement for a number of years of contributions for pension eligibility, reduces the incentives to retire earlier in case of the announcement effect. Moreover, modeling the probability to be displaced conditional on observed and unobserved characteristics and allowing this probability to be correlated with the transitions to

re-employment, or retirement, captures the selection that might occur in the case of inducing, or postponing, displacement due to announcement and anticipation effects.

5. Empirical Results

The econometric model is estimated under three different set of assumptions. The first assumes that there is no unobserved heterogeneity such that transitions across states are independent and displacement is also exogenous. The second allows for correlated unobserved heterogeneity treating displacement as exogenous, while the third relaxes both assumptions of independent transitions and the exogeneity of displacement. Each of these models is estimated also by including interactions of the displacement dummy with age groups, in order to capture age dependent effects of displacement on the transitions across labor market states.

5.1 The Effect of Displacement

Table 4 presents the coefficient estimates for the displacement dummy and for duration dependence from the model without controlling for individual unobserved heterogeneity, assuming displacement is exogenous. Estimates from the first panel, for transitions from non-employment to employment, show that displaced workers in Germany, Italy and Spain, are significantly less likely to be re-employed compared to the non-displaced. The effect of being displaced is positive, but not significant for the U.K. The second panel of Table 4, for the transitions from non-employment to retirement, shows that displaced workers in Italy and the U.K. are less likely to retire compared to the non-displaced. The effect is significant at the 5 per cent level for Italy. On the other hand, in Spain, individuals who have been displaced are significantly more likely to retire. The third panel of Table 4 shows the coefficient estimates for the transition out of subsequent employment. In all countries, the coefficients of displacement exhibit a negative sign, but they are not significantly different from zero.

[Table 4 about here]

Duration dependence is negative and significant in all countries for the transitions to re-employment and positive for the transitions to retirement.[11] That is, the longer individuals stay in non-employment, the less likely to be re-employed and the more likely to retire. However, in the presence of unobserved individual characteristics such as, motivation, or unobserved human capital variables, the coefficient estimates of the effect of displacement and duration dependence are expected to be downward biased. The reason is that dynamic selection occurs as those with high values of the unobserved variables have on average higher exit rates. Hence, the remaining sample of individuals, who are still non-employed at high durations, tend to have lower values of the unobserved variables. This leads to spurious duration dependence and to a lower observed difference in the hazards between displaced and non-displaced than the true average difference. The latter happens as the sample of non-displaced survivors, who have a higher hazard, has on average lower values of the unobserved variables than the sample of displaced survivors.

The results in Table 5, taking into account unobserved heterogeneity, show a similar pattern for the effect of displacement as with the model in which the transitions are assumed to be independent. The effect is larger indicating a downward bias if unobserved heterogeneity is ignored, and a comparison of the likelihood values reveals an improvement in the fit of the model.

[Table 5 about here]

In the empirical application with two points of support for each of $\varepsilon_{ne}^{e}, \varepsilon_{ne}^{r},$ and ε_{e}, and an unrestricted correlation, the empirical results implied perfect correlation. So, the model was estimated under perfect correlation between the error terms. For identification, the first mass point is normalized to zero, since there is a constant term in the vector of covariates, such that the second mass point can be interpreted as the deviation from the first. Therefore, six parameters are identified and one probability. This means, conditional on the observed characteristics and the time spent in the current spell, there are two types of individuals that differ in their non-employment hazard

[11] Since a constant is included in the model, the first interval is normalized to zero, so the reference category in the duration dependence coefficients is duration between 1 to 6 months.

(high/low) towards re-employment and retirement, and their employment hazard (high/low). The heterogeneity mass points indicate the presence of one group in Italy and Spain with a lower hazard towards re-employment and out of subsequent employment, and a higher hazard towards retirement. For Germany and the U.K., the heterogeneity distribution seems to affect mostly the transitions out of subsequent employment. Finally, the pattern of duration dependence is also similar between the two models, although the effect is smaller in the model with unobserved heterogeneity, which is expected due to the dynamic selection discussed above.

5.2 The Effect of Displacement by Age

To investigate the extent to which the displacement effect differs by age, the displaced dummy is interacted with age groups as is described in (3) and (4) of Section 4.1. Specification 2, in Table 6, refers to the case in which the displaced dummy is interacted with the age group 45-54, so the main effect refers to the displaced 55 years old and above. In specification 3, the displaced dummy is interacted with the age groups 45-54 and 55-60.[12] The cut-off points of the age groups at 55 and 60 are chosen such that they match as close as possible with the institutional features, as described in section 2, and at the same time allow for sufficient variation for the estimation of the model. With the existing data it is not possible to perform the estimation with interactions of the displacement dummy with each age, so broader age groups need to be defined.

[Table 6 about here]

In Germany and Spain, older displaced are less likely to be re-employed and more likely to retire compared to the non-displaced. In particular, from specification 2 in Table 6, the coefficient for the displaced workers, which refers to those above age 54, is negative and significant for the transition from non-employment to employment in both countries.[13] For Spain, the effect of displacement on the transitions to retirement is consistent across all age groups. From specification

[12] For identification, the third age group (61+) and its interaction with the displacement dummy are the reference category.

[13] The interaction of the displacement dummy with the dummy for the age group 40-54 is positive, which suggests that younger displaced are more likely to be re-employed than older ones.

3, the displaced at age 60, or above, are more likely to retire compared to the non-displaced. Note that, for Germany, there is a significant negative effect on the exit to retirement for displaced aged 40-54 and 55-60 relative to the displaced above 60. This seems consistent with the possibility of early retirement at age 60 for the insured unemployed, which creates disincentives to be re-employed until become eligible for early retirement. Finally, the exit rate from subsequent employment, for those who are re-employed, is positive and significant for workers between 55-60 in Germany, and for workers above 60 in Spain.

Older displaced - above 55 years old – in Italy are less likely to exit non-employment both towards re-employment and retirement. That is, contrary to Germany and Spain, an increased exit rate of older workers towards retirement is not found for Italy. Finally, for the U.K., being displaced does not seem to have a significant effect on the exit rate from non-employment and subsequent employment.

5.3 Endogeneity

The discussion so far is based on the assumption that displacement is exogenous and uncorrelated to unobserved heterogeneity. However, workers might decide to quit instead of being laid-off due to an announcement effect, or there might be unobserved characteristics that make them more likely to be laid-off than others. To the extent that these characteristics affect also their transitions across labor market states might lead to biased estimates.

Table 7 shows the estimates of the displacement effect for the transitions from non-employment to employment, or retirement, and the transitions out of subsequent employment for the three specifications. For Germany and Spain, even after accounting for the endogeneity of displacement, older displaced are less likely to be re-employed and more likely to exit to retirement. The effect towards retirement is significant and positive for Germany in specification 3, which refers to the displaced above 60 years old. For Spain, a positive effect is found in all specifications as in Tables 5 and 6, although the effect is not as precisely estimated as in the model without taking

into account the endogeneity of displacement. For Italy and the U.K., displaced workers do not differ in their likelihood to be re-employed compared to the non-displaced in specification 1. While for the U.K. these results are similar to the ones in Table 5, taking into account the endogeneity of displacement changes the negative and significant effect for Italy to a positive, but insignificant. As for the transitions to retirement, displaced workers in these two countries are less likely to exit to retirement.

[Table 7 about here]

Overall, these results show that there are clearly two different patterns on the effect of displacement. In Germany and Spain, displaced workers exhibit lower re-employment and higher retirement rates compared to the non-displaced. To the contrary, in Italy and the U.K., the re-employment rates do not differ between the two groups of workers, but the displaced exhibit lower transitions rates towards retirement. These patterns suggest a role of the different institutions that prevail across countries, with the availability of unemployment related benefits (in Germany and Spain) offering a pathway to early withdrawal from the labor market, which coincides with longer unemployment spells.

The results in Table 7 show also differences in the effect of displacement on the transitions out of subsequent employment compared to the model in which displacement is assumed to be exogenous. In particular, in Italy and Spain, those displaced who are re-employed are significantly more likely to exit this post-displacement employment compared to the non-displaced. For Germany the opposite is observed, while for the U.K. the effect is not significantly different from zero. The distribution of unobserved heterogeneity shows for Italy and Spain, in particular, the presence of a group with a lower propensity to experience displacement and higher transitions into and out of employment.

Finally, Table 8 shows the transition specific coefficient estimates for the individual characteristics including the ones for the equation of the probability to be displaced. As expected, being young and educated increases the likelihood to be re-employed, while older workers are more

likely to retire. Experiencing health problems appears to lower the chances of re-employment, while the number of children lowers the transitions to retirement. Younger workers in Spain are more likely to exhibit unstable employment patterns, which might be explained by the presence of fixed term contracts.

[Table 8 about here]

Conclusion

The labor market situation of older workers has become extremely important in the recent years. Population ageing is expected to increase the share of older workers in the labor force, while displacement due to technological progress and restructuring of traditional industries affects disproportionately older workers. Despite these developments, very little is known on how job displacement might affect the work-retirement decision. This paper investigates the effect of job displacement, for workers aged 45-64 years old, on labor market transitions in Germany, Italy, Spain, and the U.K., based on individual data from the European Community Household Panel (ECHP, 1994-2001). To understand the factors and the incentives that determine the behavior of older workers, a multivariate competing-risks hazard model is estimated which considers the transitions out of non-employment to re-employment and to retirement. Explicitly modeling the transitions to retirement allows to distinguish among two competing explanations for the low re-employment rates of older displaced workers. That is, difficulties to be re-employed vs. the lack of incentives to be re-employed if unemployment can be used as a pathway to early retirement. The model also distinguishes between the short and long term effects of job loss by analyzing the transitions from the post-displacement employment state taking into account correlated unobserved heterogeneity and the endogeneity of displacement.

The results suggest that, in Germany and Spain, older displaced are less likely to be re-employed and more likely to retire relative to the non-displaced. In contrast, in Italy and the U.K. older displaced are less likely to retire. Institutional differences across countries might explain these findings. In particular, the relatively generous unemployment insurance for involuntary unemployed

in Germany and Spain, with the possibility to retire as early as 60 years old, might create incentives not to return to employment for those below age 60, and for an early withdrawal from the labor market for those above 60. In contrast, the lack of substantial unemployment insurance and of early retirement provisions for the displaced in countries such as, Italy and the U.K., seem not to create incentives for an early exit from the labor force. Instead, displaced workers return to employment faster than the non-displaced, although this effect is not statistically significant.

These findings have important policy implications for the necessary reforms as a response to the demographic changes that occur in European countries and the pressure they place on the social security systems. In particular, policies aiming at increasing the employment rates of older workers should take into account the role of job displacement and its interaction with institutions that might affect individual incentives. For instance, policies that enhance re-employment probabilities might be ineffective in a system with generous unemployment insurance, which might be used as a pathway to retirement.

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Figure 1. Fraction re-employed by displacement status (all ages).

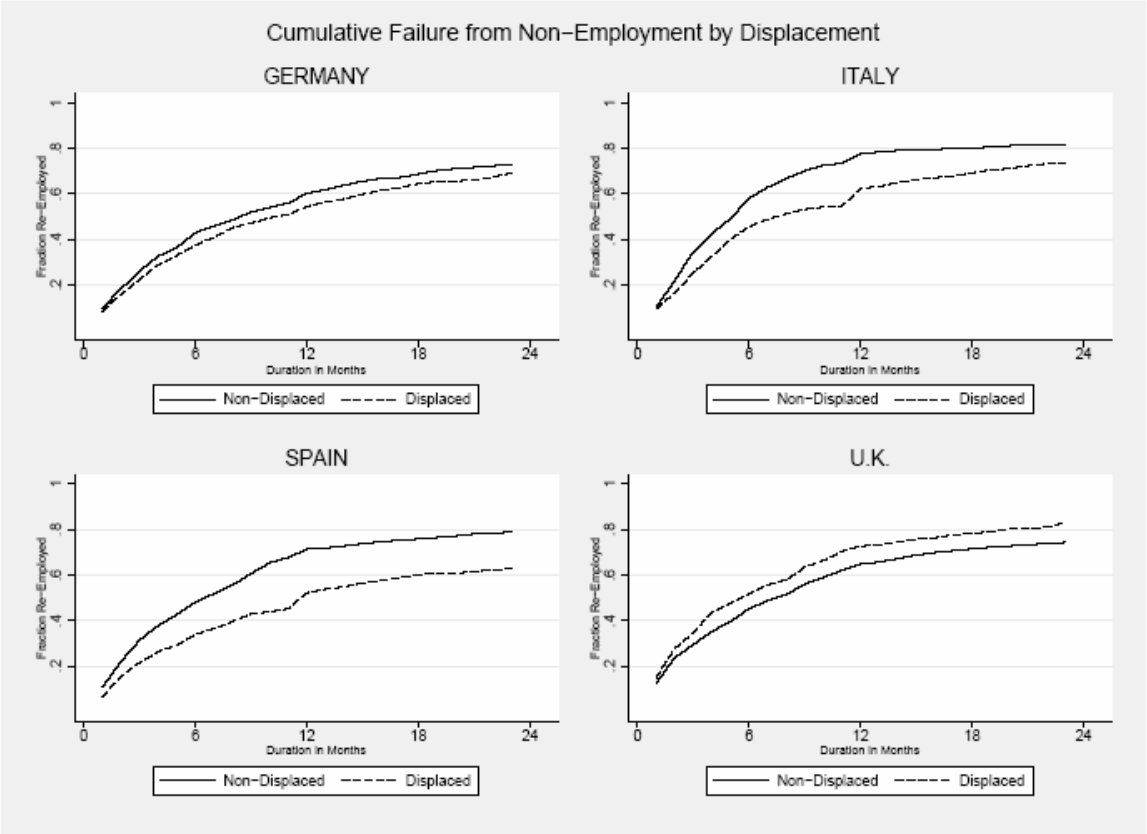

Figure 2. Fraction re-employed for the displaced by age groups.

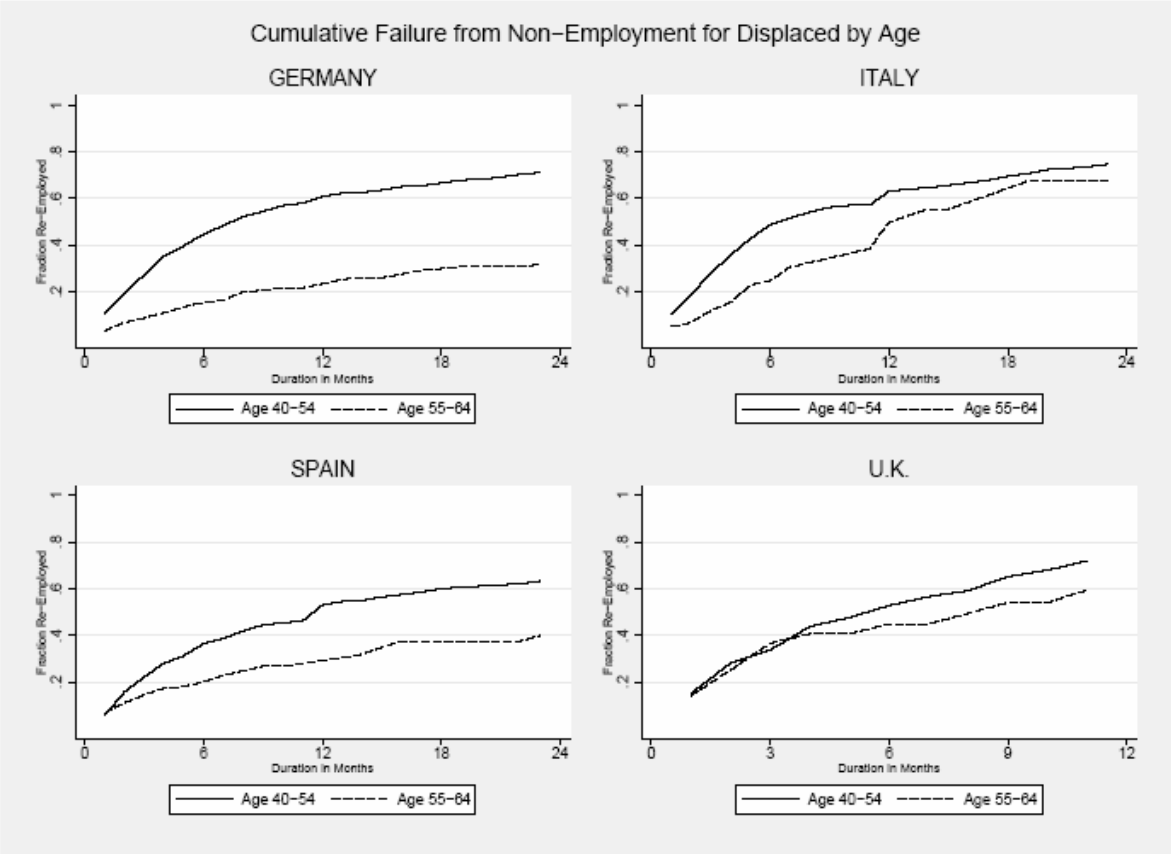

Figure 3. Fraction re-entering into non-employment by displacement status.

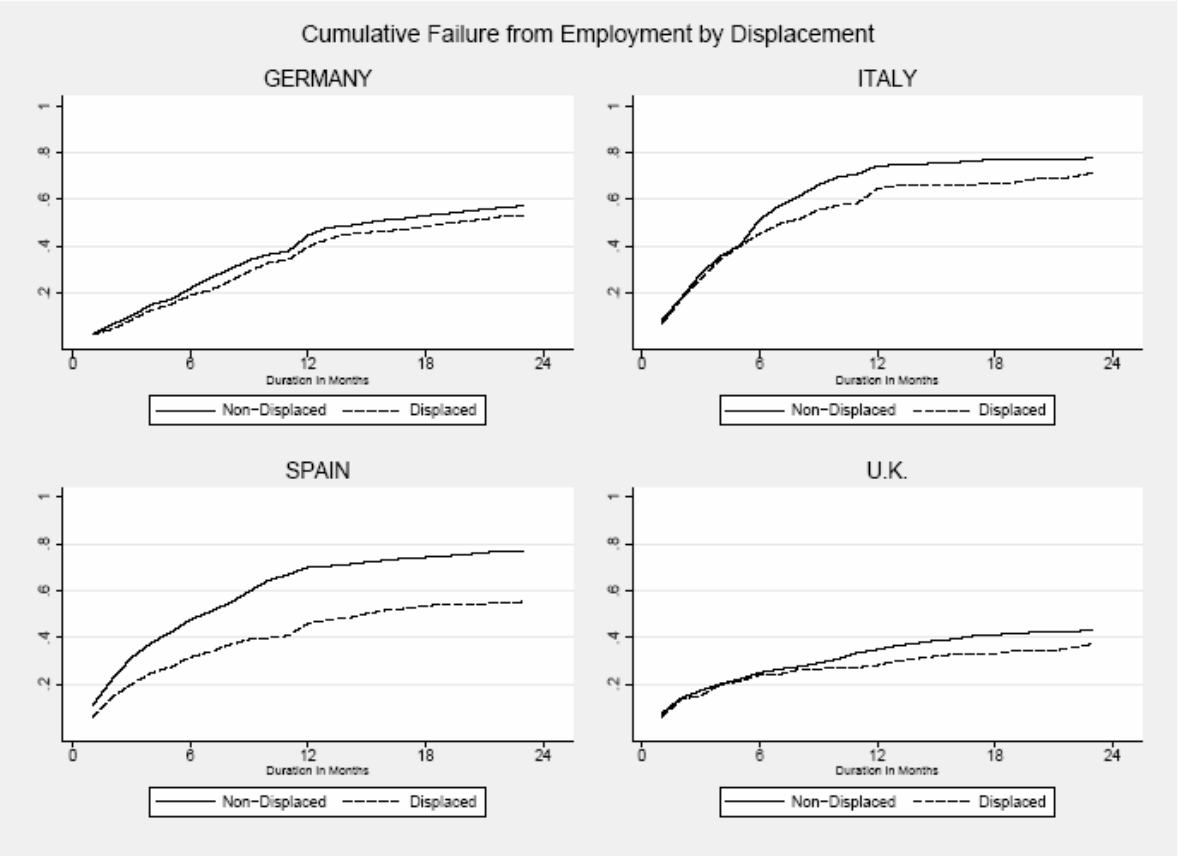

Table 1. Sample statistics.

	Germany	Italy	Spain	UK
Number of Individuals	15710	21892	22341	12646
Number of Individuals who are Non-Employed at Least Once	6172	10439	12522	4934
Number of Individuals with at Least One Flow into Non-Employment from Employment (aged 45-64)	709	379	642	450
Number of Spells	1315	1154	1801	781
Number of Spells Without Missing Information on Observed Characteristics	1309	1070	1789	762
Number of Spells Without Missing Information on Displacement	1064	765	1561	717

Source: ECHP (1994-2001), own calculations.

Table 2. Transitions into and out of non-employment in the sample.

	Non-Employment			Subsequent Employment	
	NE to E	NE to R	Cens	E to NE	Cens
Germany					
N	548	219	297	318	230
%	(51.50)	(20.58)	(27.91)	(58.03)	(41.97)
Italy					
N	523	58	184	390	133
%	(68.37)	(7.58)	(24.05)	(74.57)	(25.43)
Spain					
N	1034	106	421	780	254
%	(66.24)	(6.79)	(26.97)	(75.44)	(24.56)
UK					
N	468	52	197	214	254
%	(65.27)	(7.25)	(27.48)	(45.73)	(54.27)

Source: ECHP (1994-2001), own calculations. NE denotes non-employment, E-Employment, R-Retirement, and Cens refers to right-censored spells.

Table 3. Means of individual characteristics for displaced and non-displaced workers.

	Germany		Italy		Spain		UK	
	Displ.	Non-Displ.	Displ.	Non-Displ.	Displ.	Non-Displ.	Displ.	Non-Displ.
High Education	0.208	0.240	0.004	0.015	0.126	0.049	0.285	0.288
Medium Education	0.534	0.553	0.162	0.123	0.126	0.045	0.115	0.080
Low Education	0.258	0.207	0.834	0.862	0.748	0.906	0.600	0.632
Age	52.66	52.55	51.34	51.85	53.25	52.10	51.57	52.10
Married	0.837	0.824	0.855	0.898	0.832	0.839	0.731	0.770
Number of Kids	0.306	0.229	0.472	0.422	0.436	0.536	0.377	0.354
Bad Health	0.250	0.220	0.093	0.096	0.085	0.146	0.154	0.152
Home Owner	0.461	0.460	0.663	0.747	0.883	0.882	0.792	0.782
Number of Spells	523	541	235	530	293	1268	130	587

Source: ECHP (1994-2001), own calculations.

Table 4. Hazard estimates for the effect of displacement without unobserved heterogeneity.

	Germany		Italy		Spain		UK	
	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.
Specification 1								
From Non-Employment to Employment								
Displaced	-0.192	0.088	-0.364	0.100	-0.664	0.093	0.126	0.118
From Non-Employment to Retirement								
Displaced	-0.067	0.147	-0.627	0.310	0.716	0.229	-0.573	0.483
Out of Employment								
Displaced	-0.100	0.087	-0.088	0.083	-0.126	0.083	-0.060	0.140
Duration Dependence								
$\lambda^{e}_{ne6--12}$	-0.719	0.114	-0.405	0.110	-0.120	0.072	-0.417	0.115
$\lambda^{e}_{ne13--24}$	-1.166	0.133	-1.323	0.170	-1.339	0.121	-1.280	0.165
λ^{e}_{ne25--}	-1.889	0.188	-2.384	0.258	-1.814	0.150	-2.181	0.220
$\lambda^{r}_{ne6--12}$	0.941	0.229	0.719	0.327	1.030	0.281	0.729	0.310
$\lambda^{r}_{ne13--24}$	0.998	0.225	-0.007	0.479	0.892	0.296	-0.248	0.425
λ^{r}_{ne25--}	1.619	0.220	0.916	0.384	1.198	0.322	-2.049	0.750
λ_{e6--12}	0.730	0.095	0.447	0.084	-0.219	0.067	-0.420	0.134
$\lambda_{e13--24}$	0.267	0.122	-0.585	0.191	-0.830	0.106	-0.560	0.148
λ_{e25--}	0.042	0.143	-0.597	0.248	-0.629	0.131	-0.340	0.144
log L	-10,627.71		-12,361.44		-24,374.05		-6,594.84	

Notes: The model distinguishes between transition from non-employment to employment, or retirement, and transitions out of subsequent employment for those re-employed. Estimations are performed separately by country. Apart from the dummy for being displaced, other controls include dummies for age, education, marital status, number of children, health status, home ownership, non-labor income, gender, regional unemployment rate and year dummies. Duration dependence is captured by group duration dummies with duration from 1 to 6 months being the reference group.

Table 5. Hazard estimates for the effect of displacement with unobserved heterogeneity.

	Germany		Italy		Spain		UK	
	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.
Specification 1								
From Non-Employment to Employment								
Displaced	-0.193	0.089	-0.372	0.108	-0.640	0.097	0.135	0.119
From Non-Employment to Retirement								
Displaced	-0.068	0.147	-0.567	0.328	0.668	0.237	-0.574	0.484
Out of Employment								
Displaced	-0.149	0.099	-0.148	0.100	-0.087	0.104	-0.022	0.153
Duration Dependence								
$\lambda^{e}_{ne6\text{--}12}$	-0.715	0.114	-0.273	0.117	-0.061	0.075	-0.355	0.095
$\lambda^{e}_{ne13\text{--}24}$	-1.160	0.133	-1.098	0.185	-1.223	0.126	-0.409	0.116
$\lambda^{e}_{ne25\text{--}}$	-1.874	0.189	-2.050	0.284	-1.658	0.158	-1.264	0.166
$\lambda^{r}_{ne6\text{--}12}$	0.942	0.230	0.565	0.331	1.018	0.281	0.734	0.311
$\lambda^{r}_{ne13\text{--}24}$	1.002	0.225	-0.229	0.485	0.872	0.297	-0.240	0.427
$\lambda^{r}_{ne25\text{--}}$	1.624	0.221	0.624	0.401	1.158	0.328	-2.034	0.749
$\lambda_{e6\text{--}12}$	1.068	0.100	0.795	0.099	0.319	0.084	0.127	0.149
$\lambda_{e13\text{--}24}$	1.841	0.183	0.013	0.219	-0.115	0.128	0.447	0.180
$\lambda_{e25\text{--}}$	2.141	0.230	0.275	0.273	0.154	0.153	1.017	0.202
Unobserved Heterogeneity								
ε^{e}_{ne1}	-3.633	0.384	-3.442	0.343	-3.335	0.228	-2.155	0.223
ε^{e}_{ne2}	0.228	0.200	0.982	0.167	0.641	0.116	0.262	0.203
ε^{r}_{ne1}	-4.541	0.501	-3.087	0.841	-5.856	0.696	-4.766	0.969
ε^{r}_{ne2}	0.086	0.307	-1.406	0.586	-0.921	0.553	0.173	0.888
ε_{e1}	-3.739	0.354	-3.622	0.320	-2.754	0.207	-2.266	0.372
ε_{e2}	2.392	0.181	1.194	0.126	1.310	0.078	2.083	0.167
p1	0.313		0.529		0.709		0.421	
log L	-10,473.84		-12,244.39		-24,029.94		-6,515.60	

Notes: The model distinguishes between transition from non-employment to employment, or retirement, and transitions out of subsequent employment for those re-employed. Estimations are performed separately by country. The distribution of unobserved heterogeneity is assumed to be discrete with each transition specific factor having two points of support. In the estimation with unrestricted correlation the results suggested perfect correlation, so one probability is estimated. Apart from the dummy for being displaced, other controls include dummies for age, education, marital status, number of children, health status, home ownership, non-labor income, gender, regional unemployment rate and year dummies. Duration dependence is captured by group duration dummies with duration from 1 to 6 months being the reference group.

Table 6. Hazard estimates for the effect of displacement by age with unobserved heterogeneity.

	Germany		Italy		Spain		UK	
	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.
Specification 2								
From Non-Employment to Employment								
Displaced	-0.587	0.205	-0.434	0.216	-0.889	0.197	-0.215	0.329
Displaced*(Age 45-54)	0.478	0.226	0.142	0.244	0.333	0.222	0.399	0.354
From Non-Employment to Retirement								
Displaced	-0.005	0.175	-1.161	0.497	0.573	0.253	-0.270	0.663
Displaced*(Age 45-54)	-0.204	0.307	0.947	0.637	0.841	0.675	-0.622	1.024
Out of Employment								
Displaced	0.543	0.236	0.571	0.194	-0.227	0.195	0.253	0.383
Displaced*(Age 45-54)	-0.857	0.252	-0.762	0.225	0.202	0.230	-0.441	0.425
Log Likelihood	-10,469.82		-12,238.80		-24,025.89		-6,514.09	
Specification 3								
From Non-Employment to Employment								
Displaced	-1.610	1.051	-0.089	0.519	-0.582	0.357	-0.789	0.765
Displaced*(Age 45-54)	1.502	1.055	-0.195	0.531	0.025	0.372	0.984	0.776
Displaced*(Age 55-60)	1.086	1.072	-0.571	0.563	-0.408	0.426	0.751	0.848
From Non-Employment to Retirement								
Displaced	1.241	0.547	-0.083	0.820	0.927	0.339	-0.444	1.190
Displaced*(Age 45-54)	-1.447	0.601	-0.127	0.916	0.475	0.716	-0.455	1.421
Displaced*(Age 55-60)	-1.354	0.567	-1.546	1.036	-0.708	0.450	0.259	1.409
Out of Employment								
Displaced	-0.196	0.814	-0.811	0.489	0.936	0.289	-0.091	0.813
Displaced*(Age 45-54)	-0.111	0.825	0.593	0.500	-0.956	0.315	0.029	0.825
Displaced*(Age 55-60)	0.808	0.846	1.133	0.514	-1.398	0.380	0.392	0.933
log L	-10,463.80		-12,233.93		-24,017.40		-6,513.93	

Notes: The model distinguishes between transition from non-employment to employment, or retirement, and transitions out of subsequent employment for those re-employed. Specification 2 includes an interaction of the displacement dummy with the age group dummy 45-54, and specification 3 with age group dummies 45-54 and 55-60. The distribution of unobserved heterogeneity is assumed to be discrete with each transition specific factor having two points of support. Estimations are performed separately by country including year dummies. In the estimation with unrestricted correlation, the results suggested perfect correlation, so one probability is estimated. Apart from the dummy for being displaced, other controls include dummies for age, education, marital status, number of children, health status, home ownership, non-labor income, gender, and regional unemployment rate. Duration dependence is captured by group duration dummies with duration from 1 to 6 months being the reference group. Both duration dependence coefficients and the distribution of unobserved heterogeneity are not reported as they are similar with Table 5.

Table 7. Hazard estimates for the effect of displacement with unobserved heterogeneity controlling for the endogeneity of displacement.

	Germany		Italy		Spain		UK	
	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.
From Non-Employment to Employment								
Specification 1								
Displaced	-0.175	0.105	0.180	0.156	-0.365	0.107	0.124	0.118
Specification 2								
Displaced	-0.584	0.213	0.012	0.246	-0.619	0.200	-0.208	0.331
Displaced*(Age 45-54)	0.489	0.225	0.209	0.235	0.332	0.219	0.403	0.356
Specification 3								
Displaced	-1.610	1.052	0.686	0.545	-0.292	0.359	-0.769	0.762
Displaced*(Age 45-54)	1.516	1.055	-0.338	0.545	0.002	0.369	0.968	0.774
Displaced*(Age 55-60)	1.090	1.072	-0.653	0.577	-0.451	0.422	0.728	0.845
From Non-Employment to Retirement								
Specification 1								
Displaced	-0.105	0.180	-0.578	0.532	0.340	0.259	-0.576	0.484
Specification 2								
Displaced	-0.041	0.201	-1.190	0.621	0.210	0.272	-0.264	0.664
Displaced*(Age 45-54)	-0.198	0.306	1.018	0.616	0.951	0.675	-0.636	1.024
Specification 3								
Displaced	1.209	0.553	-0.335	0.824	0.572	0.359	-0.417	1.184
Displaced*(Age 45-54)	-1.446	0.601	0.012	0.880	0.598	0.716	-0.473	1.418
Displaced*(Age 55-60)	-1.359	0.567	-1.521	1.014	-0.647	0.448	0.200	1.402
Out of Employment								
Specification 1								
Displaced	-0.707	0.126	0.356	0.100	0.381	0.098	-0.159	0.164
Specification 2								
Displaced	-0.366	0.294	0.555	0.207	0.281	0.172	0.205	0.398
Displaced*(Age 45-54)	-0.391	0.309	-0.347	0.196	0.140	0.197	-0.265	0.433
Specification 3								
Displaced	-0.722	0.823	0.034	0.424	0.427	0.162	-0.144	0.815
Displaced*(Age 45-54)	-0.039	0.822	0.223	0.424	0.462	0.161	0.289	0.826
Displaced*(Age 55-60)	0.401	0.856	0.681	0.450	-0.203	0.135	0.444	0.932

Notes: See notes in Table 6. The model is extended by estimating the probability to be displaced. The unobserved factor is allowed to be correlated with the transition equations.

Table 8. Hazard estimates of individual characteristics with unobserved heterogeneity controlling for the endogeneity of displacement.

	Germany		Italy		Spain		UK	
	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.
From Non-Employment to Employment								
Age 45-54	0.485	0.311	0.517	0.258	0.676	0.147	0.455	0.265
Age 55-60	-0.496	0.323	0.423	0.265	0.309	0.158	0.049	0.283
High Education	0.367	0.145	-0.781	0.545	0.209	0.138	0.281	0.109
Secondary Education	0.125	0.126	-0.249	0.149	0.173	0.146	-0.079	0.178
Married	0.041	0.123	-0.053	0.157	-0.040	0.096	-0.134	0.114
Number of Children	0.019	0.066	0.124	0.066	0.007	0.040	-0.062	0.061
Having Bad Health	-0.443	0.114	-0.170	0.165	-0.324	0.103	-0.840	0.157
Non Labor Income	-0.019	0.017	0.021	0.014	-0.008	0.006	0.026	0.016
Home Owner	0.138	0.093	-0.141	0.106	-0.029	0.101	0.031	0.132
Regional Unem. Rate	0.037	0.011	-0.0002	0.006	0.001	0.006	-0.036	0.018
Male	0.209	0.093	0.068	0.106	0.444	0.073	0.370	0.101
From Non-Employment to Retirement								
Age 45-54	-2.010	0.302	-1.123	0.438	-3.432	0.360	-1.352	0.497
Age 55-60	-0.539	0.287	-0.339	0.438	-1.045	0.224	-0.444	0.498
High Education	0.144	0.217	-0.425	1.092	-0.501	0.540	-0.371	0.433
Secondary Education	0.025	0.180	-0.470	0.461	0.547	0.388	0.701	0.437
Married	-0.050	0.192	-0.745	0.353	0.330	0.313	0.796	0.455
Number of Children	-0.525	0.211	-0.060	0.247	-0.310	0.219	-0.680	0.367
Having Bad Health	0.484	0.150	0.245	0.504	-0.251	0.275	-0.180	0.379
Non Labor Income	-0.003	0.027	-0.042	0.041	0.017	0.020	0.051	0.049
Home Owner	-0.030	0.152	1.415	0.490	0.288	0.389	0.029	0.430
Regional Unem. Rate	0.010	0.021	-0.083	0.018	0.023	0.019	0.010	0.048
Male	0.352	0.154	0.992	0.326	0.996	0.282	-0.183	0.323
Out of Employment								
Age 45-54	-0.211	0.287	-0.187	0.311	0.310	0.148	-0.482	0.310
Age 55-60	0.242	0.304	-0.268	0.316	0.268	0.145	-0.327	0.324
High Education	0.309	0.186	-0.192	0.227	-0.169	0.137	0.571	0.141
Secondary Education	-0.032	0.145	-0.004	0.096	-0.186	0.171	0.291	0.236
Married	-0.412	0.158	0.051	0.104	0.114	0.092	-0.258	0.136
Number of Children	-0.094	0.078	-0.075	0.038	0.035	0.041	0.036	0.078
Having Bad Health	0.269	0.125	-0.106	0.115	0.139	0.100	-0.135	0.200
Non Labor Income	-0.030	0.022	0.013	0.009	0.020	0.006	0.050	0.023
Home Owner	0.194	0.128	-0.197	0.070	-0.123	0.100	-0.458	0.161
Regional Unem. Rate	-0.053	0.016	0.018	0.004	0.013	0.007	-0.128	0.023
Male	0.700	0.119	-0.271	0.068	-0.200	0.077	-0.265	0.130

(continues)

Table 8. Hazard estimates of individual characteristics with unobserved heterogeneity controlling for the endogeneity of displacement. (cont.)

	Germany		Italy		Spain		UK	
	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.
Selection Equation								
Age 45-54	0.967	0.423	0.460	0.573	-0.491	0.267	1.084	0.569
Age 55-60	1.016	0.428	-0.035	0.598	-0.536	0.289	0.502	0.607
High Education	-0.646	0.229	-2.028	1.260	1.667	0.370	-0.240	0.240
Secondary Education	-0.543	0.191	0.772	0.475	1.257	0.303	0.296	0.343
Married	-0.027	0.194	-0.480	0.394	0.025	0.217	-0.219	0.240
Number of Children	0.188	0.118	-0.210	0.166	-0.073	0.122	-0.097	0.133
Having Bad Health	0.231	0.165	0.049	0.429	-0.681	0.256	0.029	0.283
Non Labor Income	0.023	0.028	-0.071	0.036	-0.030	0.015	0.022	0.033
Home Owner	0.079	0.149	-0.154	0.287	-0.022	0.265	-0.027	0.281
Regional Unem. Rate	0.024	0.018	-0.026	0.017	-0.071	0.016	-0.075	0.039
Male	0.837	0.153	1.516	0.345	0.850	0.184	1.201	0.211
Duration Dependence								
$\lambda^{e}_{ne6\text{--}12}$	-0.719	0.114	-0.310	0.118	-0.059	0.075	-0.417	0.116
$\lambda^{e}_{ne13\text{--}24}$	-1.166	0.133	-1.165	0.184	-1.218	0.126	-1.279	0.165
$\lambda^{e}_{ne25\text{--}}$	-1.889	0.188	-2.169	0.275	-1.656	0.158	-2.177	0.221
$\lambda^{r}_{ne6\text{--}12}$	0.941	0.229	0.731	0.343	1.012	0.281	0.731	0.311
$\lambda^{r}_{ne13\text{--}24}$	1.000	0.225	0.010	0.502	0.866	0.297	-0.245	0.426
$\lambda^{r}_{ne25\text{--}}$	1.623	0.221	0.936	0.425	1.200	0.335	-2.046	0.750
$\lambda_{e6\text{--}12}$	1.182	0.110	0.513	0.091	0.178	0.079	-0.048	0.142
$\lambda_{e13\text{--}24}$	1.460	0.183	-0.483	0.200	-0.238	0.122	0.443	0.184
$\lambda_{e25\text{--}}$	1.537	0.206	-0.422	0.264	0.057	0.147	1.137	0.214
Unobserved Heterogeneity								
ε^{e}_{ne1}	-3.434	0.378	-3.166	0.331	-3.408	0.232	-2.668	0.397
ε^{e}_{ne2}	-0.057	0.193	0.856	0.208	0.693	0.113	0.107	0.304
ε^{r}_{ne1}	-4.550	0.488	-3.967	0.885	-5.676	0.701	-4.767	1.100
ε^{r}_{ne2}	0.118	0.318	0.093	0.802	-1.484	0.776	0.157	1.098
ε_{e1}	-3.047	0.335	-2.433	0.271	-2.832	0.230	-2.239	0.413
ε_{e2}	1.944	0.148	0.528	0.157	1.186	0.080	2.079	0.178
ε_{d1}	-2.574	0.569	0.228	0.728	0.278	0.502	-2.243	0.745
ε_{d2}	1.382	0.285	-4.669	0.633	-3.455	0.511	0.017	0.406
p1	0.372		0.625		0.741		0.305	
log L	-11,851.70		-13,422.08		-25,837.94		-7,158.21	

Notes: The coefficient estimates refer to the model with unobserved heterogeneity taking into account the endogeneity of displacement of Table 7.