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Benefit Duration, Unemployment Duration and Job Match Quality: A Regression-Discontinuity Approach

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Abstract

The generosity of the Unemployment Insurance system (UI) plays a central role for the job search behavior of unemployed individuals. Standard search theory predicts that an increase in UI benefit generosity, either in terms of benefit duration or entitlement, has a negative impact on the job search activities of the unemployed increasing their unemployment duration. Despite the disincentive effect of UI on unemployment duration, UI benefit generosity may also increase job match quality by allowing individuals to wait for better job offers. In this paper we use a sharp discontinuity in the maximum duration of unemployment benefits in Germany, which increases from 12 months to 18 months at the age of 45, to identify the effect of extended benefit duration on unemployment duration and post-unemployment outcomes. We find a spike in the re-employment hazard for the unemployed workers with 12 months benefit duration, which occurs around benefit exhaustion. This leads to lower unemployment duration compared to their counterparts with 18 months benefit duration. However, we also show that those unemployed who obtain jobs close to and after the time when benefits are exhausted are significantly more likely to exit subsequent employment and receive lower wages compared to their counterparts with extended benefit duration.

Keywords: Unemployment Benefits, Unemployment Duration, Employment Probability, Job Match Quality, Regression Discontinuity
JEL: C41, J64

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1 Introduction

The generosity of the Unemployment Insurance system (UI) plays a central role for the job search behavior of unemployed individuals(Hansen and Imrohoroglu, 1992; Gruber, 1997). A standard result in the literature is that UI creates re-employment disincentives. An increase in UI benefit generosity has a negative impact on the job search activities of the unemployed increasing their unemployment duration. Moreover, the exit rate from unemployment increases closer to benefit expiration since the marginal benefit of search increases and the reservation wage falls (Mortensen, 1977, Van den Berg, 1990). Many empirical studies have investigated the effect of potential benefit duration on the exit rate from unemployment (e.g. Meyer, 1990; Katz and Meyer, 1990; Card and Levine, 2000, for the US, Roed and Zhang, 2003; Lalive, Van Ours, Zweimüller, 2006; Van Ours and Vodopivec, 2006; Card, Chetty and Weber, 2007a and 2007b for Europe). A common finding is that limiting unemployment benefit duration tends to introduce a spike in the exit rate around benefit exhaustion.

The focus of most of the literature on how benefit duration affects the exit rate from unemployment does not consider the potential effect of UI on post-unemployment outcomes or job match quality. The observed spike close to benefit expiration might reduce the quality of job matches as workers might become less selective.[1] The non-stationarity that arises because of limited benefit duration implies that individuals with different lengths of benefit entitlement should have different optimal paths of reservation wage and search effort over time. This difference in the optimal job search behavior could lead to different realized distributions of job quality. Individuals with a given length of unemployment, the same level of benefits, but a longer period of remaining benefit entitlement may wait for job offers which are better either in terms of re-employment wages and/or employment stability.

In this paper we investigate the effect of extended benefit duration on the re-employment probabilities and on post-unemployment outcomes such as employment stability and re-employment wages. In particular, we are focusing on the job search behavior around benefit expiration to understand the extent to which jobs accepted closer to the time benefits elapse might be of worse quality (less stable, lower wage) because workers become less selective. That is, we analyze the effect of extended benefit duration on post-unemployment outcomes not only for the average unemployed but also for different groups of unemployed, which are defined by their unemployment duration. Our identification strategy relies on a sharp discontinuity in the maximum duration of unemployment benefits in Germany, which increases from 12 to 18 months at the age of 45. Comparing unemployed who are just below the age threshold with individuals just above the corresponding age gives us a measure of the effect of extended benefits. We use an inflow sample into unemployment for the years 2001 to 2003, which is based on administrative records with information on labor market states of each individual being observed for 3 years. Given the large samples

[1] Card and Levine (2000) suggest that the spike might be related to the fact that workers become less selective as they approach the benefit expiration. An alternative explanation of the spike is based on the strategic timing of job starting dates. Boone and Van Ours (2009) provide supporting evidence on this based on Slovenian data.

available and the age of the discontinuity we also consider men and women separately.

Our analysis based on a regression discontinuity design (RD) may suffer from two potential selection issues that might invalidate our identification strategy. First, firms and workers might delay the timing of the job separation for the worker to benefit from a longer entitlement period, leading to non-random selection around the eligibility threshold. We test the frequency of the inflow into unemployment and the observable characteristics of the unemployed around the discontinuity and we find no evidence of selection. Second, although the assignment into treatment at the beginning of the unemployment spell is based on this sharp discontinuity, there might be selection in the resulting sample of the re-employed based on observed and unobserved characteristics (Ham and LaLonde, 1996). We investigate the sensitivity of our results to the presence of dynamic selection by estimating a bivariate discrete-time hazard model with correlated unobserved heterogeneity and we find that our findings are robust to this form of selection. Hence, our results are not driven by selection into treatment or dynamic selection and can be interpreted as causal effects.

We find evidence of an effect of extended benefit duration on unemployment duration but also on the duration and wages of accepted jobs. In particular, we find a spike in the unemployment hazard for the unemployed workers with 12 months benefit duration, which occurs close to benefit exhaustion. The unemployed who are above the age of 45 and receive additional six months of benefits exhibit a significantly lower exit rate at the benefit expiration time of the younger group at month 12. The finding of a spike at benefit exhaustion is consistent with the existing empirical evidence. In terms of the effect on post-unemployment outcomes, we find that unemployed workers with 18 months of benefits find jobs that last longer compared to the those workers who receive benefits for 12 months. In particular, we observe that the unemployed with shorter benefit duration who find jobs close to the time benefits are exhausted and when they do not receive benefits anymore are significantly more likely to exit subsequent employment compared to their counterparts with extended benefit duration. This suggests that close to the benefit expiration and after that period the unemployed with 12 months benefit duration accept jobs they would otherwise reject, while those who receive additional 6 months of insurance tend to accept jobs that are of better quality and last longer. Finally, looking at re-employment wages we find that those who accept a job around the time their benefits expire or when do not receive benefits anymore have significantly lower wages compared to their counterparts who accept a job while they could still search and being insured.

Our findings extend previous studies, which have looked at the effect of benefit duration on post-unemployment outcomes but have focused on the average effect. For example, Card, Chetty, and Weber (2007a) for Austria and Van Ours and Vodopivec (2008) for Slovenia evaluate an extension of potential duration of UI benefits and find that it lowers job-finding rates but has no effect on subsequent job match quality. The findings in this paper suggest that due to the non-stationarity of job search there exist effects of extended benefit duration on job match quality, which are heterogeneous.

The paper is organized as follows: Section 2 outlines the theoretical framework and the existing empirical evidence. Section 3 describes the institutional background. Section 4 discusses the identification strategy, describes the data, and provides a descriptive analysis.

The results of the empirical analysis are presented in Section 5 and Section 6 concludes.

2 Theoretical Framework and Empirical Evidence

The main objective of government-provided UI is to allow for consumption smoothing in the event of a negative shock that leads to unemployment. A major concern with UI is the disincentive effect due to moral hazard that might affect the worker's willingness to search for jobs. There is, therefore, a trade-off between providing insurance and the incentives to search for work. Standard search theory predicts that an increase in UI benefit generosity, either in terms of benefit duration or entitlement, has a negative impact on the job search activities of the unemployed increasing their unemployment duration. Unemployed workers exert lower search effort as the opportunity cost of search is lower and they choose higher reservation wages. Moreover, closer to the time of benefit exhaustion, the value of unemployment drops since the marginal benefit of search increases and the reservation wage falls, leading to a higher exit rate out of unemployment (Mortensen, 1977).

This non-stationarity implies that individuals with different lengths of benefit entitlement should have different optimal paths of reservation wage and search effort over time (van den Berg 1990). Figure 1 shows a stylized illustration of the effects of an extended benefit duration on the unemployment hazard rate. There are two periods of interest. The first is the time until benefits are exhausted for the first group of unemployed denoted as $T1$. For $t \leq T1$ the job finding rate θ is equal for both groups at the beginning of the spell. Due to the time-limited benefit duration, closer to the time of benefit expiration the exit rate of those with shorter benefit duration is increasing compared to their counterparts with a longer benefit entitlement, and stays constant at a higher level than before exhaustion. The second period is defined by the exhaustion points of the two groups. For $T1 < t < T2$, the hazard rate of the first group is likely to be higher because benefits have been exhausted, while the second group of workers receives benefits until $T2$.[2]

Insert Figure 1 about here

Besides the trade-off between insurance and the incentives to leave unemployment for a job, the relationship between the length of benefit entitlement and the optimal path of job search behavior might lead to a positive relationship between insurance and the quality of jobs obtained. The reason is that closer to benefit expiration and after benefits have expired workers might become less selective and obtain jobs of lower quality. Therefore, the difference in the optimal job search behavior of individuals with different lengths of benefit entitlement over time could lead to different realized distributions of job quality. Individuals with a given length of unemployment, the same level of benefits, but a longer period of remaining benefit entitlement may wait for job offers which are better in terms of re-employment wages and employment stability. The job match quality aspect of UI has been considered in a number of theoretical papers. Acemoglu and Shimer (1999) show

[2] In our empirical analysis $T1 = 12$, while $T2 = 18$.

that the increased utility of unemployment when receiving UI induces workers to search for higher wages and firms respond by creating high-wage, high-quality jobs. Marimon and Zilibotti (1999) show that UI can increase job match quality by helping workers to get jobs which are compatible with their skills and therefore less likely to dissolve.

Numerous studies have investigated the effect of benefit duration and its effect on the exit rate from unemployment both in the U.S. and in Europe. Exploiting differences in potential benefit duration across U.S. states, Meyer (1990) and Katz and Meyer (1990) find a sharp increase in the exit rate from unemployment before benefits are exhausted, while such increases are not found for the non-recipients. Card and Levine (2000) exploit an exogenous variation in benefit duration in New Jersey and also find a spike in the unemployment hazard rate around benefit expiration. In a more recent study Addison and Portugal (2008) also find for the U.S. an increase in the exit rate from unemployment before benefits are exhausted. Ham and Rea (1987) obtain similar findings for Canada.

For Europe, an early study is Hunt (1995) for Germany who makes use of institutional changes in the benefit entitlement schemes in the 1980s. The changes mainly consisted in an extension of the maximum duration of unemployment benefit receipt for unemployed older than 42 years, whereby different age groups are affected differently. She applies difference-in-differences estimators using the German Socioeconomic Panel (SOEP) and finds a negative impact of increased benefit entitlement on the hazard rate from unemployment to employment as well as out of labor force. The evidence of follow-up studies on the effects of institutional changes in Germany in the 1980s is rather mixed.[3] In a recent study Fitzenberger and Wilke (2010)make use of an administrative data set in order to analyze the effects of the reforms in the 1980s on the distribution of duration in nonemployment. Their findings suggest that firms and older workers make use of the extended benefit entitlement periods as part of early retirement schemes, but they do not find any impact on the time spent in unemployment before finding a new job.

Carling, Edin, Harkman, and Holmlund (1996) find for Sweden an increase in the exit rate from unemployment around benefit exhaustion. Due to the availability of labor market programs at the end-of-benefit-period, they find a much larger increase in the exit rate to those programs. Winter-Ebmer (1998) and Lalive and Zweimüller (2004) investigate the effect of an extended benefit period in Austria and find significant disincentive effects. Winter-Ebmer (1998) finds an effect which exists only for males and is larger for long unemployed spells. Roed and Zhang (2003) for Norway find instead that the spike around the time of benefit expiration is larger for females than for males. Van Ours and Vodopivec (2006) studying benefit reduction in Slovenia find both strong effects on the exit rate out of unemployment and substantial spikes around benefit exhaustion. More recent evidence based on an RD design is offered by Lalive (2008) using discontinuities in the potential benefit duration at age 50 and across regions in Austria. He finds that extended benefit duration increases unemployment duration and the effect is larger for women compared to men.

[3] An example of a study based on the SOEP and finding no significant effect of the reforms on the duration of unemployment is Schneider and Hujer (1997) whereas Steiner (2001) finds a negative correlation of receiving unemployment benefits and the probability of leaving unemployment. For a detailed discussion of the literature on Germany see e.g. Fitzenberger and Wilke (2010).

The empirical evidence for the effect of UI on post-unemployment outcomes is more scarce and mixed. Ehrenberg and Oaxaca (1976) were the first to consider the effect of UI on post-unemployment outcomes finding a positive effect of benefits on post-unemployment wages. Addison and Blackburn (2000) review the literature and provide results which suggest a weak effect of UI on re-employment wages. More recently, Centeno and Novo (2009) exploit a reform of the Portuguese UI system that increased the entitlement period for some age-groups, while leaving it unchanged for other age-groups. They also find that the extension had a small but positive effect on re-employment wages, which is stronger at the bottom of the pre-unemployment wage distribution and is concentrated at short unemployment durations.

Because wages are not the only state variable sufficient to summarize individual well-being, another strand of the literature measures the effect of UI generosity on post-unemployment outcomes with the incidence of unemployment, or the time elapsed between re-employment and acceptance of a subsequent job, using job matching arguments based on Jovanovic (1979). In a series of papers, Belzil (1992, 1995, 2001) analyzes unemployment experience and employment duration in the context of the Canadian UI reform finding that the incidence of voluntary unemployment is positively correlated with the duration of the preceding spell of unemployment and benefit exhaustion, and a weak positive relationship between re-employment duration and unemployment benefit generosity. Centeno (2004) studies the effect of the generosity of U.S. benefit levels and finds that larger UI benefits lead to longer subsequent employment spells. Card, Chetty, and Weber (2007b) apply a regression discontinuity design and find for Austria that an increase in benefit entitlement length reduces job-finding rates but does not have any effect on subsequent job match quality, measured in wage growth and job duration. Van Ours and Vodopivec (2008) investigate the effect of reducing the potential duration of unemployment benefits in Slovenia and find that it strongly increased job finding rates but had no effect on the quality of post-unemployment jobs. Fitzenberger and Wilke (2010) also do not find evidence for an improved job match quality in terms of job stability or wages for the older worker after the reform in Germany in the 80s. Tatsiramos (2009) using individual data from the European Community Household Panel for eight countries, finds that although receiving benefits has an adverse effect by increasing unemployment duration, there is also a positive effect associated with the increased duration of subsequent employment. His findings suggest that jobs which are accepted while being insured last longer. This beneficial effect of unemployment insurance on employment stability is pronounced in countries with relatively generous benefit systems.

3 Institutional Background

Germany has undergone some major labor market reforms in the last couple of years including the *Hartz reforms* which consisted of, among other things, a change of the unemployment benefit and social assistance schemes.[4] In our empirical analysis we are

[4] A detailed description of the unemployment insurance system in Germany and its changes over time is given in Konle-Seidl, Eichhorst, and Grienberger-Zingerle (2009).

focussing on an inflow sample of unemployed workers between 2001 and 2003, a period prior to the *Hartz reforms*.

Prior to the reforms, Germany had a system of income protection which was based on three pillars: 1) unemployment benefits, 2) unemployment assistance and 3) social assistance. Unemployment benefits (UB, *Arbeitslosengeld*) provide earnings-related income replacement and are based on an employment record in a reference period (see §127, Social Code III, *Sozialgesetzbuch III*). The replacement rate of UB depends on family status, while the duration depends on age and previous employment duration. Unemployed persons with at least one child are entitled to 67% of previous net remuneration and 60% otherwise; individual means or needs are not taken into account. The exact amount is calculated based on the average gross daily income within the assessment frame of twelve months from which social security contributions, income tax and the solidarity surcharge were subtracted to get the average net daily income which is the basis for the UB claim.

Insert Table 1 about here

To generate a claim for UB workers had to be employed for at least 12 months in the last three years (*Rahmenfrist*) before entering unemployment; workers who have been employed less than 12 months within the last three years were not entitled for UB, but could receive means-tested social assistance. The maximum duration of unemployment benefits varied between 6 and 32 months (see Table 1). Depending on age and months worked in the last seven years, there exist several discontinuities in the maximum duration of unemployment benefits. For the purpose of our analysis we are focusing on the discontinuity at the age of 45 for which the maximum benefit duration increases by 6 months - from 12 to 18 months, given the workers have been employed for at least 36 months in the last seven years. Other discontinuities also appear at age 47 and 52 which lead to an increase of the maximum benefit duration by four months, conditional on previous employment duration of 44 and 52 months, respectively. We concentrate on the discontinuity at the age of 45 because the additional jumps from 18 to 22 and 22 to 26 occur at a very late stage in the unemployment spell and it seems reasonable to expect that the transition rate from unemployment to employment is quite low at this stage independent of receiving unemployment benefits or unemployment assistance. Finally, there is another discontinuity at age 57 of six months increase of benefit duration from 26 to 32 months. We do not consider this discontinuity either because it is very much related to early retirement. See Tatsiramos (2010) for an analysis of unemployment an early retirement for older workers. The benefits are funded through employer and employee contributions and administered by the Public Employment Services (PES).[5]

After the entitlement period of UB had expired unemployed individuals were eligible for principally unlimited and means-tested unemployment assistance (UA, *Arbeitslosenhilfe*). These benefits were still earnings-related (57%/53% replacement rate with/without children). In contrast to UB, the UA was granted for an unlimited period (as long as individuals were available for the labor market) and funded through the Federal budget,

[5]The discontinuities were changed within the *Hartz reforms*, but since these changes became effective only on February 1, 2006 they are not relevant for our analysis.

i.e., by general taxation. Finally, the social assistance (SA, *Sozialhilfe*), provided basic income protection on a means-tested and flat-rate basis for all German inhabitants. This assistance was independent of employment experience but conditional on not having other resources from earned income, other social benefits or family transfers. This makes clear that the benefits for unemployed individuals do not drop down to zero once the maximum duration for unemployment benefits is reached.

A worker who enters unemployment and is eligible for unemployment benefits keeps the entitlement for up to four years. The entitlement expires either after this time period or if a new entitlement emerges. To generate a new entitlement it is necessary to be employed for at least 12 months. In case that the worker still had months left from an old UB entitlement, the new entitlement is added to the old one up to the maximum possible entitlement according to age. Consider the following example. Assume a 44.5 years old individual who enters unemployment and who can claim - based on previous employment record - the maximum benefit duration of 12 months. Let us distinguish two cases. In the first case, the individual exits unemployment for a job after eight months and stays employed for less than 12 months before becoming unemployed again. In this second unemployment spell the remaining entitlement period will be four months and not 18 months. This will be the case, even if the individual has crossed the age threshold of 45, because the entitlement is not renewed, as the employment duration between the two unemployment spells was less than 12 months. In the second case, the individual exits unemployment for a job after eight months but stays employed for at least 12 months before becoming unemployed again. In this case, the individual who will be older than 45 will be entitled to the longer benefit duration of 18 months.

4 Identification and Data

4.1 Regression Discontinuity Approach

The goal of our empirical analysis is to examine the effects of extended benefit duration on unemployment duration and post unemployment outcomes. We have outlined in the previous Section that German legislation for unemployment benefits contains sharp discontinuities with respect to age which we will exploit as a source for identification. With a regression discontinuity approach we will be able to measure the effects of the treatment at some threshold. Following Hahn, Todd, and Van der Klaauw (2001) let $D_i \in \{0, 1\}$ be a binary treatment variable indicating whether individuals are below ($D_i = 0$) or above ($D_i = 1$) the threshold. Y_i^0, Y_i^1 are the individual potential outcomes and $Y_i^1 - Y_i^0$ is the individual treatment effect. In the sharp regression discontinuity design, the assignment D_i is a deterministic function of one of the covariates Z_i such that:

$$D_i = \mathbf{1}\{Z_i \geq c\} \tag{1}$$

The forcing variable Z_i in our case is age and the threshold c we are interested in corresponds to 45 years. This implies that all individuals change participation status exactly at c. Institutionally this is the case, since the age at entry into unemployment is determining

the maximum benefit duration. But still people might wait out with their unemployment registration until reaching the age threshold. However, this is unlikely since unemployment needs to be announced already in advance (in order to avoid sanctions) such that a postponement carries a high risk. We will test whether there is evidence for such strategic behavior. The average causal effect δ of the treatment at the discontinuity point is then given by:

$$\begin{aligned} \delta &= E[Y_i^1 - Y_i^0 \mid Z_i = c] \\ &= \lim_{z \downarrow c} E[Y_i^1 \mid Z_i = z] - \lim_{z \uparrow c} E[Y_i^0 \mid Z_i = z] \\ &= E[Y_i(D=1) - Y_i(D=0) | Z_i = c] \end{aligned} \tag{2}$$

The treatment effect is identified if the conditional mean of Y^0 is continuous at c (i.e., $E[Y^d|Z = z]$ is continuous in z at c for $d = \{0, 1\}$). Under this assumption, the treatment effect δ is obtained by estimating the discontinuity in the empirical regression function. We are interested in three outcome variables: the unemployment duration, the stability or duration of the subsequent employment spell and reemployment wages.

Many of our observations are right-censored, i.e. we do not observe the end of the unemployment spell before the end of our observation window. In order to take this into account, we estimate a hazard rate model for the transition rate from unemployment to employment. Unemployment in our case includes "out of labor force" because we are interested in the effect on the time until the next job and not on the time being officially registered as unemployed. The corresponding hazard rate λ_{ue} at time t can be written as:

$$\lambda_{ue}(t) = \lambda_{u0}(t) \exp(\alpha_{u1} X_i + \mu_u D_i + \beta_{u0} D_i (Age_i - Age_0) + \beta_{u1}(1 - D_i)(Age_i - Age_0)). \tag{3}$$

where $\lambda_{u0}(t)$ describes the time varying baseline hazard rate and μ_u captures the causal effect of the increase in the maximum benefit duration on the hazard rate from unemployment to employment. The parameters β_{u0} and β_{u1} capture the effects of the assignment variable age below and above the threshold on the probability of leaving unemployment for a job. This ensures that μ_u does not capture a general age effect but the causal impact of the discontinuity in the benefit duration, see Lalive (2008) for a similar approach in the context of linear regression models. In addition to that we control for observable characteristics X_i.

Besides the transition process from unemployment to employment a main focus of our study is on the effect of extended benefit duration on the stability of new jobs. Therefore, we additionally estimate the hazard rate model for transition from employment to unemployment, which is given by:

$$\lambda_{eu}(t) = \lambda_{e0}(t) \exp(\alpha_{e1} X_{ei} + \mu_e D_i + \beta_{e0} D_i (Age_i - Age_0) + \beta_{e1}(1 - D_i)(Age_i - Age_0)). \tag{4}$$

The causal effect of extended benefit duration on subsequent job stability is given by μ_e, $\lambda_{e0}(t)$ describes the time varying baseline hazard rate and α_{e1} captures the impact of observable characteristics X_{ei} on the transition process from employment to unemployment. X_{ei} includes the previous unemployment duration.

Although the assignment into treatment at the beginning of the unemployment is based on a sharp discontinuity and is therewith assumed to be exogenous, there might be dynamic selection in the resulting sample of the re-employed based on observed and unobserved characteristics. For a similar argument in the context of experimental data on training see Ham and LaLonde (1996). In order to test whether dynamic selection based on unobservable characteristics drives our results we will additionally estimate bivariate hazard rate models with potentially correlated unobservables influencing both the duration of unemployment and the duration of subsequent employment.[6]

For the estimation of the effect of extended benefits on wages we estimate the following linear regression:

$$log(w_i) = \alpha_w X_{ei} + \mu_w D_i + \beta_{w0} D_i(Age_i - Age_0) + \beta_{w1}(1 - D_i)(Age_i - Age_0) \qquad (5)$$

The effect of extended benefit duration on reemployment wages is given by μ_w, while α_w captures the impact of observable characteristics including the previous unemployment duration on the logarithm of wages.

As we have outlined in Section 2 and Figure 1, we expect a higher exit rate out of unemployment closer to the time of benefit exhaustion. Corresponding to that, we expect the treatment effect to vary over time spent in unemployment. For that reason we estimate for the hazard rate from unemployment to employment a specification in which we interact the baseline hazard rate with the treatment dummy. Since we expect that workers might become less selective the closer they are to benefit expiration and after their benefit entitlement has expired, we additionally interact the impact of being eligible for 18 months of benefits with the time interval in which individuals left the unemployment spell for a job. These interaction effects will provide insights in the heterogeneity of the treatment effects with respect to two dimensions of job match quality, which are employment stability and realized wages.

4.2 Data and Sample

Our data are drawn from the *IZA Evaluation Data Set* which is an ongoing data collection process in order to provide a new data source for labor market research. The *IZA Evaluation Data Set* is based on two main pillars: the first one is a random inflow sample into unemployment in Germany for the years 2001-2007 containing over 855,000 individuals corresponding to 4.7% of the total population of unemployment entrants. The second pillar is a survey of roughly 18,000 individuals who were interviewed around two months after they entered unemployment between June 2007 and May 2008 (see Caliendo et al., 2009, for details). For our purpose we focus only on the administrative part and use an inflow sample into unemployment from the years 2001 to 2003. The data is based on the 'Integrated Labour Market Biographies' (ILMB, *Integrierte Erwerbs-Biographien*) of

[6]The joint distribution of the unobserved characteristics is modeled via a one factor loading approach, i.e. the unobserved terms are loading on one common factor which allows for flexible correlation between the two terms. For a discussion of factor loading specifications in the context of multivariate proportional hazard rate models see van den Berg (2001).

the Public Employment Services, containing relevant register data from four sources: employment history, unemployment support recipience, participation in active labor market programs, and job seeker history. This gives us access to detailed daily information on employment subject to social security contribution, including occupational and sectoral information, and the receipt and level of transfer payments during periods of unemployment, job search, and participation in different programs of active labor market policy. Since we observe the duration in different states like unemployment or employment on a daily basis, this would principally allow us estimation of continuous time duration models. However, as in Germany most of the employment spells start at the begin of a month (and unemployment spells last until the end of a month), we construct discrete time spell data where one month corresponds to one time unit. Based on that we estimate discrete time duration models later on.

Furthermore, a large variety of socio-demographic and qualificational variables is available. We can use variables such as age, marital status, number of children and nationality (German or foreigner). A second class of variables (qualification variables) refers to the human capital of the individual. The attributes available are school degree and job qualification. Furthermore, we can also draw on an extensive labor market history and career variables. The available data in this regard is quite extensive (inter alia: nearly complete seven-year labor market history; including daily earnings from employment; amount of daily unemployment benefits; previous profession, etc.). The employment outcomes of these individuals are observed for 3 years after entering unemployment.

Insert Table 2 about here

Eligibility for unemployment benefits is based on age and previous employment experience. We restrict our sample to men and women from West Germany who have been employed for at least 36 months in the last seven years when entering unemployment to ensure that extended benefit duration only depends on age. We further restrict our sample for men to be aged between 44 and 46 years which leaves us with 3,432 male unemployed (see Table 2). For women we choose a slightly larger age range from 43.5 to 46.5 years which results in 3,784 female unemployed. This wider age range for women ensures that we have enough observations for both males and females in order to allow for heterogeneous effects. We also consider a second sample which consists of individuals who have been working for 12 months in regular employment in the year prior to entering unemployment. This ensures that all individuals in this sample are eligible for 12 and 18 months of benefit entitlement, respectively. This is related to the discussion in Section 3 on the conditions for generating a new entitlement to unemployment benefits. Doing so we loose around 30% of the observations leaving roughly 2,200 males and 2,700 females in the sample. We refer to this as Sample B and to the former as Sample A.

Insert Table 3 about here

We only consider two labor market states in our analysis: unemployment and employment. The unemployment state includes registered unemployment with or without

receiving benefits, participation in active labor market programs, job-seeking (if not in regular employment at the same time) and also being out-of-the labor force. Since we do not have any information about self-employment in the administrative data, the latter might also include people who became self-employed. The employment state includes only individuals who exit unemployment and who are in regular employment, i.e. those who do not fall in one of the mentioned unemployment categories. Participants in public work programs or individuals receiving wage subsidies are not treated as regular employed. Based on these definitions, Table 3 contains the number of transitions between the two states. For both samples and across gender we observe approximately 25%-30% of the observations as right-censored in unemployment. That is these individuals do not leave unemployment within our observation period of 36 months. Conditional on having made a transition from unemployment to employment we also see that around 40% of the men and 50% of the women remain in this state until the end of our observation window.

4.3 Descriptives

One important identification assumption is that the assignment to treatment around the threshold is random. However, firms and workers may alter the timing of layoffs leading to non-random selection around the threshold. If there is selection around the threshold we would expect (i) differences in the inflow probability and (ii) differences in observable characteristics for individuals below and above the age 45.

Figure 2 presents the empirical density for different age groups in our samples. The density is quite stable across the age range for men and women in both samples A and B, indicating no systematic selection into the treatment. However, since we observe a slight difference between the share of men in our sample directly below and above the age 45, we will conduct additional estimations excluding these groups in order to test the sensitivity of our results.

Insert Figure 2 about here

In addition, we examine the characteristics of job losers below and above the threshold. Tables A.1 and A.2 contain some selected descriptives. We find that individuals are very similar with respect to nearly all of the variables. For men, we do observe only one significant difference in the share of individuals with children below the age of 10 which can be explained by the fact that individuals below the threshold are on average one year younger. For women, we find in addition some significant differences in marital status, two educational variables and the time spent in employment in the years 4-7 before entering unemployment. These differences become largely insignificant once we use only women in the age range from 44 to 46 years. Comparisons at other 'artificial' thresholds which are unrelated to ours (e.g., at age 41) show similar patterns. This indicates that these significant differences may be driven by age and not by selection around the threshold. Additionally, we will include these characteristics in our estimations.

The comparison of both the observable characteristics and the inflow probabilities below and above the threshold do not indicate that workers delay the timing of job separation

for the worker to benefit from a longer entitlement period. The reason for this might be the fact that the probability of benefiting from these additional 6 months of benefit duration is quite low at the beginning of the unemployment spell, because most of the individuals will find a new job within the first 12 months of unemployment. In contrast to this, we find strong evidence for a selection for older workers, indicating that some workers delay the entry into unemployment until they are 57 years old in order to combine unemployment with early retirement (see Table 1 for the benefit schemes for older workers).

Figure 3 shows the observed unemployment duration for different groups by age of entering unemployment. For both men and women the average unemployment duration for those who enter unemployment after the age of 45 is higher compared to their younger counterparts below the threshold. A linear regression of unemployment duration on the treatment dummy and age similar to the specification in Equation 3 shows that receiving six more months of benefits increases unemployment duration by about two months for both men and women. In addition, for both men and women above the threshold we observe a slight increase in unemployment duration as individuals get older.

Since our data set contains many censored observations and the impact of a longer benefit entitlement may vary over time spent in unemployment it is more informative to look at empirical hazard rates. Figure 4 shows a spike in the probability of leaving unemployment for a job around month 12, the last month of benefit receipt for the younger group, which is larger for women. We also observe that the spike is more pronounced for both genders in sample B as for the control group of unemployed the potential benefit duration is exactly 12 months. However, the increase in the exit probability is rather moderate. This might be due to the fact that transfers do not drop to zero once the receipt of UB expires (see Section 3). Especially if the household does not have any other sources of income, the drop is relatively small compared to other countries like the US.

Insert Figures 3, 4 and 5 about here

Figure 5 presents the empirical hazard rates for the transition from employment to unemployment. In contrast to the hazard rates from unemployment to employment we do not find a clear pattern for the differences between individuals below and above the threshold. What is striking is the spike around month 8 to 11 for men in the case of sample A, which occurs independent of the previous duration of benefit entitlement. This spike is reduced once we condition on being continuously employed for 12 months before entering unemployment in sample B. This indicates that the spike in the probability of reentering unemployment is reflecting a seasonal pattern driven by workers who experience a short period of unemployment every year.[7]

5 Results

We estimate the unemployment and employment transitions and the wage regression described in section 4.1 for men and women separately. We present the results of two main

[7]This seasonal pattern can be observed for the complete inflow sample into unemployment and is not specific to our age group.

specifications. In the first specification we include a dummy for being treated. By being treated we mean those who enter unemployment above the age of 45 and receive extended benefit duration of 18 months. The non-treated or the controls are those who enter unemployment below the age of 45 and receive benefits for 12 months. For both transitions and the wages, this specification identifies an average effect of being treated on the exit rates from unemployment and employment, respectively.

As outlined in Section 4.1, in the second specification, for the unemployment hazard we interact the treatment dummy with elapsed unemployment duration. For the employment hazard and the wage regression, we interact the treatment dummy with previous unemployment duration. In both cases we specify unemployment duration flexibly by 3-month intervals. With this specification we can identify the effect of treatment on the exit rate from unemployment at different lengths of unemployment, and the effect on subsequent job match quality.

5.1 Unemployment Hazard

Column (1) of Table 4 shows that eligibility of additional 6 months of unemployment benefits has a negative effect on the hazard from unemployment. This average effect is significant at the 10 per cent level for both males and females.

In column (2) we present the results from the interaction of the treatment dummy with unemployment duration grouped in intervals. For both males and females those eligible to 12 months of benefits exhibit a significantly higher exit rate from unemployment close to the time benefits expire. The difference between treated and controls is therefore negative. This is consistent with the graphical evidence in Figure 4 where we observed a spike in the unemployment hazard at 12 months for the group with 12 months of benefit duration. We find similar patterns for both males and females for sample B as shown in columns (3) and (4). It is worth noting that the spike is larger for sample B as it is expected, because both groups receive exactly 12 or 18 months of benefits as they have generated a new entitlement.

Similarly to the spike at month 12 we observe another but much smaller spike around month 18, which is the time of benefit expiration for the unemployed above 45. The coefficient estimates for both men and women is positive, which indicates that the treated group exhibits a higher exit rate compared to the control group. However, none of these effects are significantly different from zero, but illustrate a similar behavior around both the exhaustion points of month 12 and month 18. For men, we also observe that the exit rate in months 22-24 is significantly lower for the treated group but this is not observed for women.

In all specifications we control for a broad range of observable characteristics. The coefficients of model A with one treatment dummy are reported in Table A.3 in the Appendix. The coefficients show for example that for men a higher previous wage and previous employment duration is positively correlated with the re-employment probability, while the corresponding coefficients for females are positive but not significantly different from zero. For males and females we find a clear negative duration dependence, which is

significantly reduced once we control for unobserved heterogeneity.

Insert Table 4 about here

5.2 Employment Hazard

Table 5 presents the results for the employment hazard. For both samples and genders columns (1) and (3) show that the overall effect of extended benefit duration on the exit rate from subsequent employment is negative but small and not significantly different from zero. We investigate whether there are heterogeneous effects by interacting the treatment dummy with previous unemployment duration. As we discussed in section 2, there are two periods of interest. The first is the period until month 12, where both treated and controls receive benefits while the control group gets closer to the time benefits expire at month 12. The second period is the one between month 12 to month 18 in which only the treated group above age 45 received benefits. We observe from column (2) of Table 5 that the non-treated who find jobs close to the time benefits are exhausted and when they do not receive benefits anymore are significantly more likely to exit subsequent employment compared to their counterparts with extended benefit duration.

Insert Table 5 about here

For men, this can be seen in column (2) by the negative effect of the coefficient of being treated with previous unemployment duration of 10-12 months. Although both treated and controls find a job while being benefit recipients, the control group obtains jobs that last for a shorter period as they accept jobs closer to the time their benefits expire. Column (4) shows that this effect is smaller for the sample B. We also observe a significantly negative effect on the exit rate from employment for jobs found by the treated men after 16-18 months in unemployment. This suggests that jobs that are found while still receiving benefits last longer compared to jobs found after remaining in unemployment for the same period but with exhausted benefits. For women, we observe a similar effect for jobs found after 13-15 months in unemployment. Finally, for both genders and both samples the effect of extended benefit duration on employment stability remains even after benefits have elapsed, although this effect is smaller and in most cases not significant. For example, the interaction term of treatment with previous unemployment duration of 19-21 months (right after benefit exhaustion for the treated group) is still negative. Combining this observation with the evidence of a small spike in the unemployment hazard at around 19-21 for both genders suggests that the treated after receiving benefits for a longer period might not be less selective on the type of jobs they accept.

Similar to the transition process from unemployment to employment we control for a broad range of observable characteristics (see Table A.4 in the Appendix for coefficients of model A with one treatment dummy). Once again, the previous employment experience has an impact for men. The coefficients show that previous employment duration is negatively correlated with the probability of reentering unemployment, while previous wages do not have an impact. In contrast to the unemployment duration, we find a similar pattern for

females. Moreover, the results indicate that jobs are significantly less stable if they are found after 24 months of unemployment.

5.3 Re-Employment Wages

We extend our analysis considering the wages received in the sample of re-employed individuals. If extended benefit duration leads to better job match quality we should observe not only longer employment duration but also higher wages. The overall effect of extended benefit duration on re-employment wages is between 0-5%, but for none of the samples significantly different from zero. We also estimate a specification for wages similar with the one for the employment transition in which we interact the treatment dummy with previous unemployment duration. Table 6 shows for both men and women and for both samples that those who receive extended benefits obtain jobs with higher wages compared to the their counterparts with benefit duration of 12 months. The effect is significant for jobs that are found close to the benefit expiration of 12 months. This suggests that as benefits are exhausted for the control group there is a reduction in the reservation wages, which is reflected in re-employment wages. Jobs that are obtained when benefits lapse or when not receiving benefits are not only jobs that last for a shorter period but are associated with lower wages.

Insert Table 6 about here

The coefficients of the observable characteristics for model A with one treatment dummy are reported in Table A.5 in the Appendix. The results indicate that the re-employment wage is positively correlated with the previous wage. Moreover, the realized wages are decreasing the longer the workers have been unemployed. This may reflect a decreasing reservation wage the longer individuals are unemployed.

5.4 Sensitivity Analysis

We have performed additional analyses to investigate the sensitivity of our results. First, we estimated the transitions for a sample in which we excluded the unemployment spells that started one month before and one month after the age of 45. In Figure 2 we observed a slight difference in the inflow rate in unemployment around the threshold of 45. All findings are robust to the exclusion of these spells. If anything, the effect of treatment on the unemployment hazard increases in the restricted sample. This can also be seen in Figure 3 where the jump in the unemployment duration around the threshold is larger when excluding the spells very close to age 45. We also relaxed the independence assumption across transitions and we estimated the model allowing for correlated unobserved heterogeneity. The results indicate that modeling unobserved heterogeneity significantly improves the model fit and that the processes of leaving unemployment for a job and the subsequent employment stability are not independent from each other. However, the effect of extended benefit duration does not differ qualitatively between the models with and without unobserved heterogeneity. We still find a significant difference in the unemployment exit rates around month 12 for both genders in both samples. For the employment

hazard, we also find that jobs obtained while still receiving benefits last longer compared to jobs found after remaining in unemployment for the same period but with exhausted benefits.

We have also estimated the model considering the exit rate out of the subsequent job instead of employment duration. The latter includes job-to-job transitions. We have also considered a 2-years window after entering unemployment to investigate the sensitivity of our results to the extent of right censoring. We also estimated both transitions after considering the transitions from unemployment to out of the labor force as right-censored spells. We find very similar results in all cases. For the wage regressions we also estimated a censored tobit model, which did not affect the findings.

6 Conclusion

We estimate the causal effect of extended benefit duration on unemployment duration and on the job match quality using a sharp discontinuity at age 45 on the maximum duration of unemployment benefits in Germany.

We show that there is a spike in the unemployment exit rate at the point when benefits are exhausted and that extending benefit duration reduces the job-finding rate. We also investigate the effect of extended benefit duration on subsequent employment stability and re-employment wages. Our analysis shows that unemployed who obtain jobs close and after the time when benefits are exhausted are significantly more likely to exit subsequent employment and receive lower wages compared to their counterparts with extended benefit duration.

These findings suggest that unemployment benefits do not only create disincentives but might also improve the quality of the jobs obtained after experiencing an unemployment spell. An important finding is that jobs that are accepted close and after benefits have expired are associated with worse post-unemployment outcomes. This suggests that the spikes in the unemployment hazard that have been found in a number of studies might be explained by the fact that workers become less selective as they get closer to benefit exhaustion. A role of policy might be to smooth the transition rate out of unemployment to prevent workers from being forced to obtain low quality jobs. These effects are likely to be mitigated by the possibility to receive unemployment assistance after unemployment insurance runs out, which is the case in Germany. Future research should shed more light on the interaction of unemployment insurance and unemployment assistance on the unemployment exit rate and the post-unemployment outcomes. Understanding for which sub-groups of the population the unemployment insurance job matching effect matters more is also another important question.

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Tables

Table 1: Maximum Duration of Unemployment Benefit

Length of Benefit Entitlement (in months)	Age (in years)	Months worked in last 7 years
6	-	12
8	-	16
10	-	20
12	-	24
14	45	28
16	45	32
18	45	36
20	47	40
22	47	44
24	52	48
26	52	52
28	57	56
30	57	60
32	57	64

Source: Social Code III (§117 et seq.)

Table 2: Number of Observations - Below and Above the Threshold

	Men		Women	
	Below	Above	Below	Above
Sample A	1,768	1,664	1,974	1,810
Sample B	1,147	1,094	1,442	1,334

Note: These are the number of men aged 44-44.99 (below) and 45-45.99 (above) conditional on having been employed for 36 months in the last seven years. For women the age range is 43.5-44.99 (below) and 45-46.5 (above). Sample B further restricts to individuals having worked for exactly 12 months in regular employment in the year prior to enter unemployment.

Table 3: Number of Transitions - Below and Above the Threshold

	Men		Women	
	Below	Above	Below	Above
Sample A				
Observations	1,768	1,664	1,974	1,810
Transitions				
From UE to E	1,318	1,198	1,512	1,321
in month 1-3	623	534	531	466
4-6	181	196	223	184
7-12	201	174	312	228
13-18	133	119	191	172
19-24	76	67	111	120
24-36	104	108	144	151
Censored	450	466	462	489
From E to UE	804	742	716	620
Censored	514	456	796	701
Sample B				
Observations	1,147	1,094	1,442	1,334
Transitions				
From UE to E	857	780	1,110	977
in month 1-3	392	329	374	328
4-6	108	114	145	122
7-12	145	122	246	166
13-18	90	89	152	143
19-24	52	48	81	100
24-36	70	78	112	118
Censored	290	314	332	357
From E to UE	463	431	474	411
Censored	394	349	636	566

Note: These are the number of transitions from unemployment (UE) to employment (E) and vice versa for the two samples.

Table 4: Unemployment Hazard Estimates by Gender

	Men							
	Sample A				Sample B			
	Coeff	SE	Coeff	SE	Coeff	SE	Coeff	SE
Treated	−0.149*	0.086			−0.184*	0.104		
Treated * t(1-3)			−0.192*	0.100			−0.244**	0.122
Treated * t(4-6)			0.032	0.130			−0.022	0.164
Treated * t(7-9)			0.052	0.160			0.044	0.196
Treated * t(10-12)			−0.510***	0.179			−0.614***	0.209
Treated * t(13-15)			−0.313*	0.189			−0.190	0.223
Treated * t(16-18)			−0.079	0.206			−0.122	0.248
Treated * t(19-21)			0.195	0.255			0.191	0.309
Treated * t(22-24)			−0.640**	0.258			−0.633**	0.305
Treated * t(25-28)			−0.059	0.199			0.093	0.240
Treated * t(29-36)			−0.070	0.222			−0.191	0.268
	Women							
	Sample A				Sample B			
	Coeff	SE	Coeff	SE	Coeff	SE	Coeff	SE
Treated	−0.149*	0.080			−0.158*	0.093		
Treated * t(1-3)			−0.090	0.097			−0.096	0.115
Treated * t(4-6)			−0.168	0.123			−0.150	0.150
Treated * t(7-9)			0.024	0.142			−0.098	0.165
Treated * t(10-12)			−0.674***	0.148			−0.734***	0.170
Treated * t(13-15)			−0.379**	0.168			−0.318*	0.186
Treated * t(16-18)			−0.013	0.168			−0.033	0.190
Treated * t(19-21)			−0.183	0.193			−0.070	0.219
Treated * t(22-24)			0.176	0.215			0.291	0.247
Treated * t(25-28)			−0.118	0.172			−0.158	0.194
Treated * t(29-36)			0.044	0.193			0.076	0.223

Note: ***/**/* indicate significance at the 1%/5%/10% levels. Full estimation results are available in Table A.3 in the Appendix.

Table 5: Employment Hazard Estimates by Gender

	Men							
	Sample A				Sample B			
	Coeff	SE	Coeff	SE	Coeff	SE	Coeff	SE
Treated	−0.067	0.107			−0.048	0.139		
Treated * (PUD 1-3)			0.029	0.118			0.112	0.157
Treated * (PUD 4-6)			0.044	0.160			0.110	0.222
Treated * (PUD 7-9)			−0.206	0.203			−0.077	0.252
Treated * (PUD 10-12)			−0.433*	0.258			−0.338	0.294
Treated * (PUD 13-15)			0.047	0.254			−0.035	0.313
Treated * (PUD 16-18)			−0.449	0.286			−0.737**	0.345
Treated * (PUD 19-21)			−0.264	0.385			−0.592	0.473
Treated * (PUD 22-24)			−0.038	0.389			−0.065	0.443
Treated * (PUD 25-28)			−0.436	0.329			−0.398	0.373
Treated * (PUD 29-36)			−0.220	0.526			−0.321	0.611
Previous Unemployment Duration (in months)								
(PUD 4-6)	0.103	0.075	0.088	0.114	0.073	0.106	0.061	0.161
(PUD 7-9)	0.165*	0.100	0.284**	0.143	0.281**	0.124	0.371**	0.183
(PUD 10-12)	−0.123	0.121	0.059	0.151	−0.009	0.141	0.171	0.182
(PUD 13-15)	−0.164	0.125	−0.172	0.171	−0.003	0.155	0.063	0.219
(PUD 16-18)	0.044	0.143	0.272	0.190	0.088	0.176	0.490**	0.217
(PUD 19-21)	0.102	0.181	0.263	0.324	0.191	0.229	0.584	0.380
(PUD 22-24)	0.172	0.189	0.206	0.242	0.527**	0.211	0.606**	0.266
PUD 25-28)	0.390**	0.164	0.616***	0.227	0.679***	0.187	0.952***	0.272
(PUD 28-36)	0.741***	0.264	0.879**	0.399	1.045***	0.304	1.278***	0.477
	Women							
	Sample A				Sample B			
	Coeff	SE	Coeff	SE	Coeff	SE	Coeff	SE
Treated	−0.047	0.114			−0.136	0.140		
Treated * (PUD 1-3)			0.056	0.135			−0.014	0.173
Treated * (PUD 4-6)			−0.139	0.170			−0.118	0.214
Treated * (PUD 7-9)			0.180	0.203			0.028	0.243
Treated * (PUD 10-12)			−0.066	0.217			−0.133	0.254
Treated * (PUD 13-15)			−0.460*	0.236			−0.634**	0.274
Treated * (PUD 16-18)			−0.047	0.274			−0.210	0.311
Treated * (PUD 19-21)			−0.335	0.278			−0.258	0.317
Treated * (PUD 22-24)			0.240	0.372			0.240	0.408
Treated * (PUD 25-28)			−0.349	0.302			−0.514	0.345
Treated * (PUD 29-36)			0.288	0.492			0.035	0.560
Previous Unemployment Duration (in months)								
PUD (4-6)	0.272***	0.082	0.362***	0.112	0.318***	0.106	0.367**	0.148
PUD (7-9)	0.188*	0.099	0.120	0.149	0.341***	0.122	0.320*	0.178
PUD (10-12)	0.038	0.104	0.093	0.129	0.295**	0.124	0.350**	0.153
PUD (13-15)	0.151	0.117	0.372**	0.154	0.238*	0.137	0.514***	0.182
PUD (16-18)	−0.012	0.137	0.036	0.203	0.272*	0.158	0.369	0.227
PUD (19-21)	0.431***	0.139	0.617***	0.184	0.533***	0.162	0.654***	0.221
PUD (22-24)	0.159	0.182	0.046	0.280	0.508**	0.199	0.341	0.318
PUD (25-28)	0.318**	0.152	0.507**	0.193	0.487***	0.174	0.714***	0.221
PUD (29-36)	0.535**	0.245	0.396	0.372	0.712**	0.280	0.671	0.418

Note: ***/**/* indicate significance at the 1%/5%/10% levels. Full estimation results are available in Table A.4 in the Appendix.

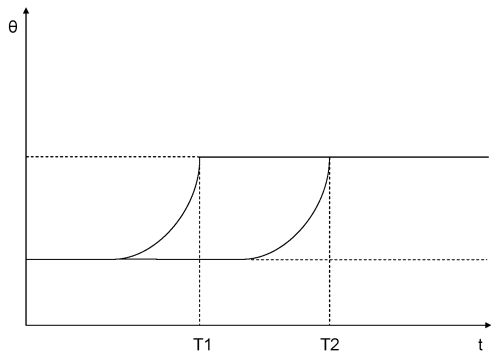
Table 6: Re-Employment Wage (in logs) Estimates by Gender

	Men							
	Sample A				Sample B			
	Coeff	SE	Coeff	SE	Coeff	SE	Coeff	SE
Treated	0.025	0.024			0.049	0.030		
Treated * (PUD 1-3)			−0.001	0.026			0.001	0.033
Treated * (PUD 4-6)			0.044	0.037			0.071	0.045
Treated * (PUD 7-9)			0.096*	0.050			0.115**	0.054
Treated * (PUD 10-12)			0.095*	0.054			0.148**	0.067
Treated * (PUD 13-15)			0.074	0.060			0.169**	0.076
Treated * (PUD 16-18)			−0.069	0.076			−0.079	0.096
Treated * (PUD 19-21)			0.061	0.091			0.167	0.126
Treated * (PUD 22-24)			−0.036	0.103			−0.092	0.131
Treated * (PUD 25-28)			0.063	0.075			0.087	0.089
Treated * (PUD 29-36)			0.015	0.120			0.154	0.167
Previous Unemployment Duration (in months)								
(PUD 4-6)	−0.070***	0.017	−0.091***	0.022	−0.055***	0.021	−0.089***	0.026
(PUD 7-9)	−0.065***	0.024	−0.116***	0.038	−0.057**	0.026	−0.117***	0.039
(PUD 10-12)	−0.109***	0.027	−0.150***	0.038	−0.148***	0.035	−0.208***	0.049
(PUD 13-15)	−0.120***	0.029	−0.154***	0.041	−0.121***	0.037	−0.200***	0.058
(PUD 16-18)	−0.140***	0.037	−0.103**	0.050	−0.219***	0.048	−0.175***	0.065
(PUD 19-21)	−0.170***	0.046	−0.204***	0.062	−0.251***	0.060	−0.344***	0.103
(PUD 22-24)	−0.088**	0.045	−0.078*	0.047	−0.153**	0.058	−0.120**	0.059
PUD 25-28)	−0.225***	0.038	−0.258***	0.059	−0.308***	0.043	−0.353***	0.075
(PUD 28-36)	−0.292***	0.059	−0.299***	0.094	−0.271***	0.078	−0.358**	0.141
	Women							
	Sample A				Sample B			
	Coeff	SE	Coeff	SE	Coeff	SE	Coeff	SE
Treated	−0.008	0.042			0.032	0.049		
Treated * (PUD 1-3)			−0.053	0.044			−0.006	0.053
Treated * (PUD 4-6)			−0.031	0.061			−0.035	0.073
Treated * (PUD 7-9)			0.063	0.071			0.067	0.085
Treated * (PUD 10-12)			0.150*	0.085			0.262**	0.093
Treated * (PUD 13-15)			0.074	0.098			0.168	0.109
Treated * (PUD 16-18)			−0.091	0.109			−0.032	0.126
Treated * (PUD 19-21)			−0.001	0.128			0.061	0.144
Treated * (PUD 22-24)			−0.077	0.161			−0.184	0.182
Treated * (PUD 25-28)			−0.072	0.114			−0.070	0.133
Treated * (PUD 29-36)			0.071	0.141			0.029	0.161
Previous Unemployment Duration (in months)								
PUD (4-6)	−0.115***	0.027	−0.125***	0.034	−0.079**	0.033	−0.066	0.042
PUD (7-9)	−0.137***	0.033	−0.195***	0.048	−0.142***	0.039	−0.177***	0.056
PUD (10-12)	−0.410***	0.041	−0.488***	0.054	−0.401***	0.046	−0.502***	0.062
PUD (13-15)	−0.241***	0.047	−0.298***	0.071	−0.270***	0.052	−0.351***	0.080
PUD (16-18)	−0.538***	0.053	−0.514***	0.078	−0.574***	0.061	−0.557***	0.089
PUD (19-21)	−0.463***	0.063	−0.486***	0.086	−0.505***	0.071	−0.536***	0.102
PUD (22-24)	−0.569***	0.077	−0.550***	0.120	−0.530***	0.088	−0.416***	0.136
PUD (25-28)	−0.565***	0.055	−0.554***	0.076	−0.566***	0.064	−0.533***	0.091
PUD (29-36)	−0.529***	0.070	−0.591***	0.095	−0.571***	0.080	−0.586***	0.101

Note: ***/**/* indicate significance at the 1%/5%/10% levels. Full estimation results are available in Table A.5 in the Appendix.

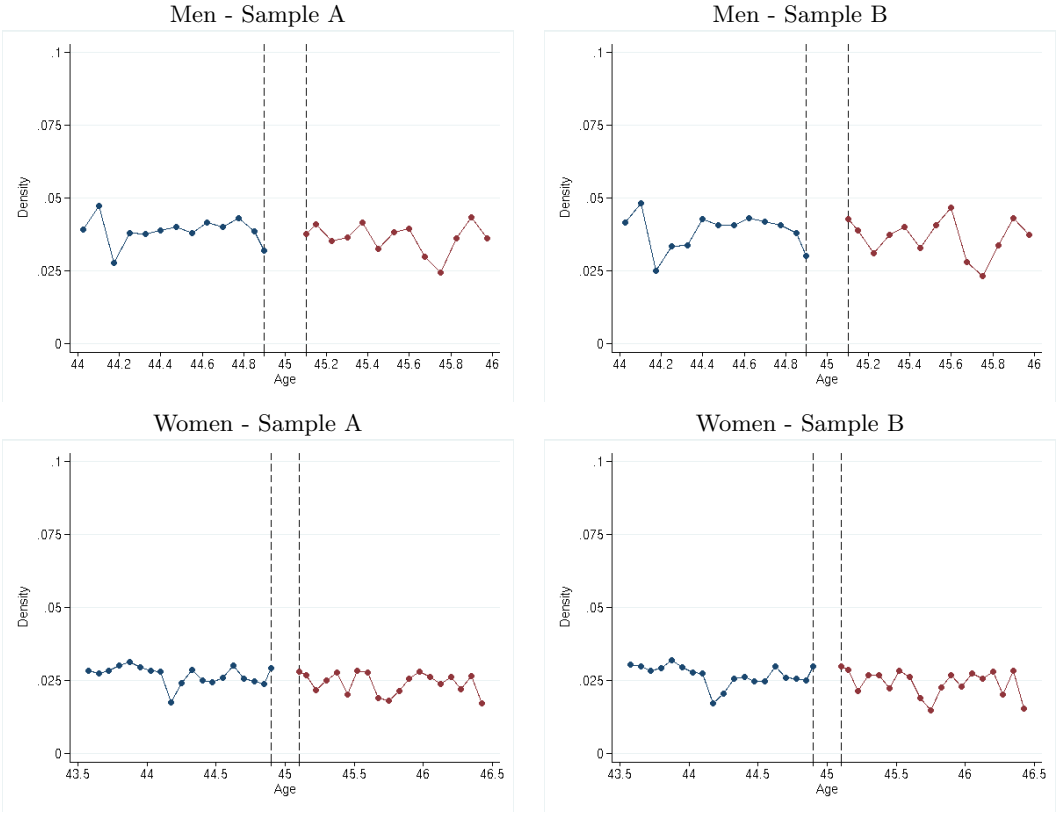
Figures

Figure 1: Stylized Expected Treatment Effect



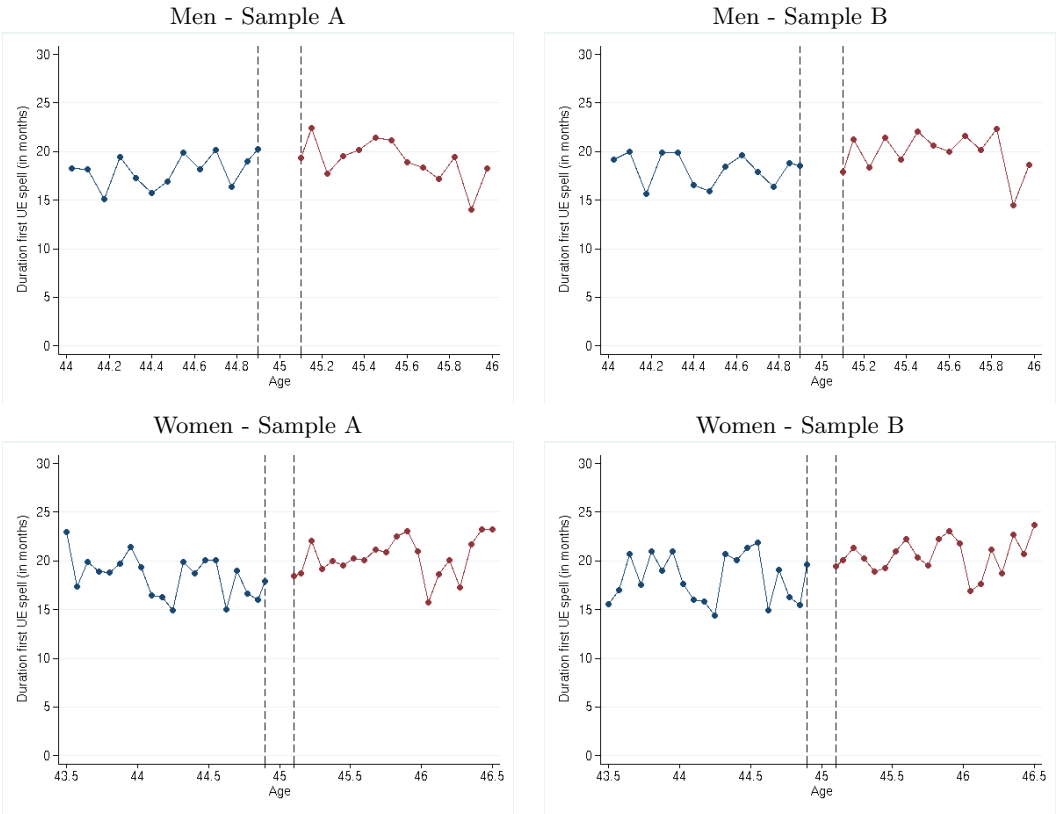
Note: In our empirical analysis T1 = 12, while T2 = 18.

Figure 2: Density of the Forcing Variable (Inflows by Age)



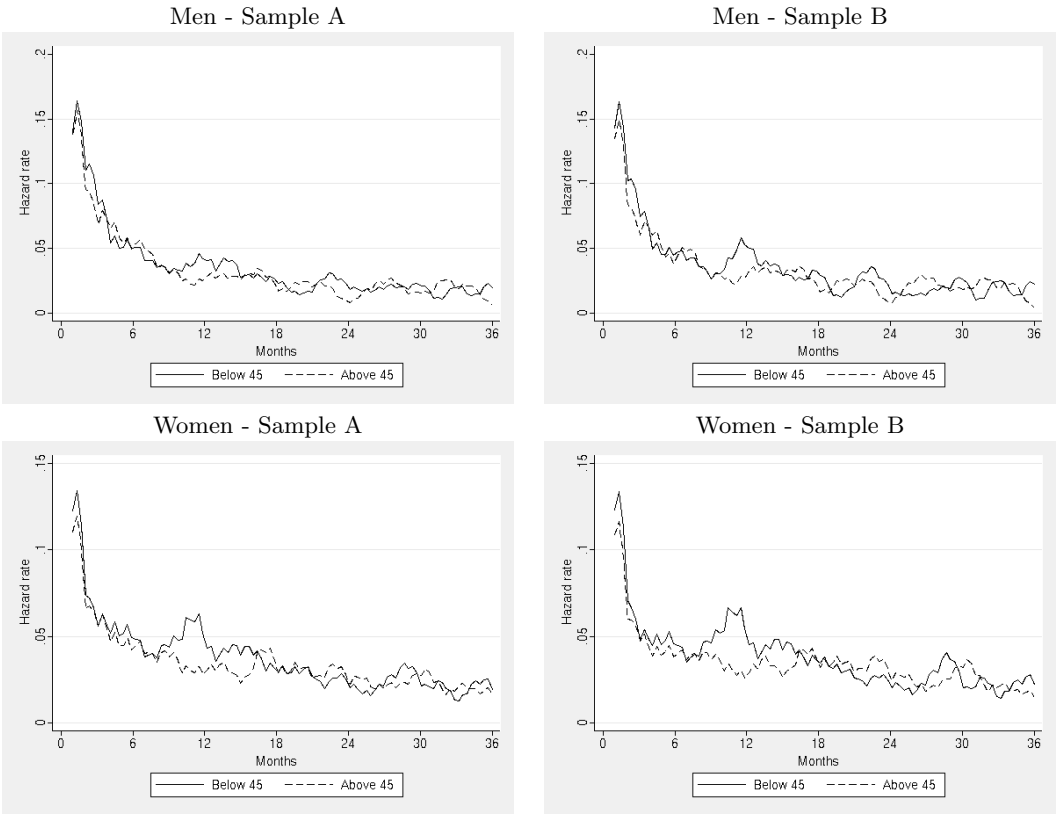
Source: IZA Evaluation Data Set, own calculations.

Figure 3: Duration of First Unemployment Spell



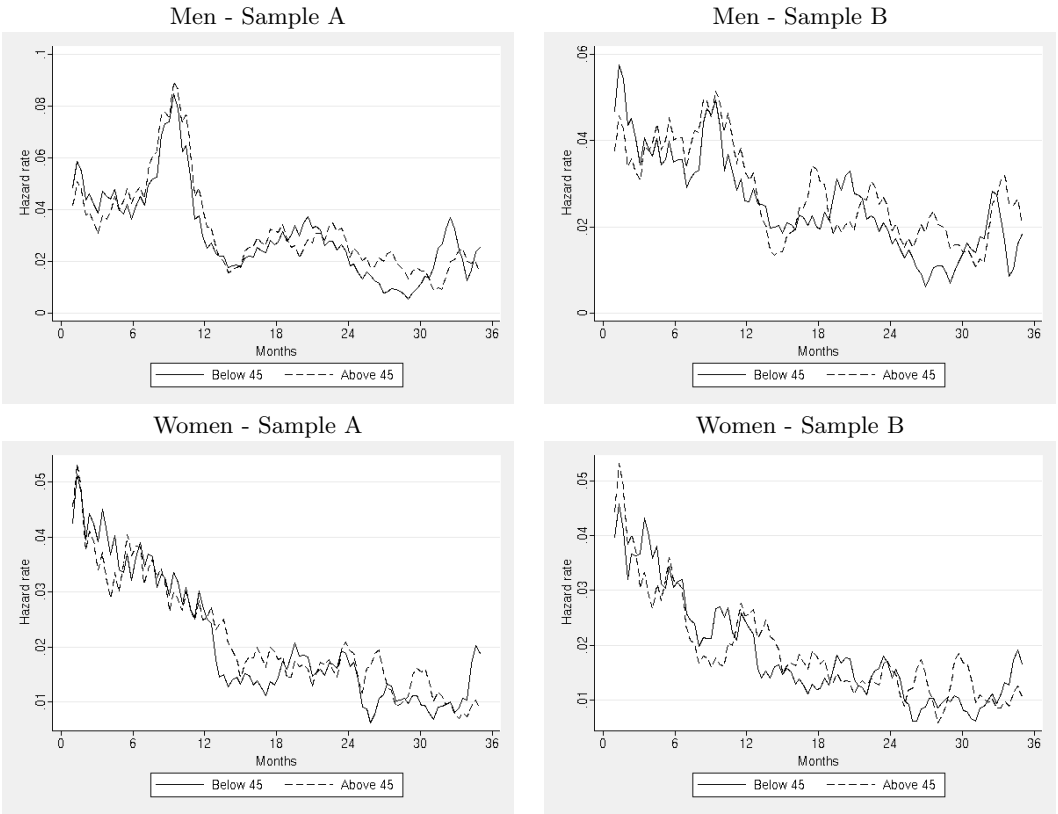
Source: IZA Evaluation Data Set, own calculations.

Figure 4: Empirical Unemployment Hazard Function by Treatment



Source: IZA Evaluation Data Set, own calculations.

Figure 5: Empirical Employment Hazard Function by Treatment



Source: IZA Evaluation Data Set, own calculations.

A Supplementary Tables

Table A.1: Selected Descriptives and t-Test of Mean Equality for the Two Samples - Men

Age Group	Sample A			Sample B		
	Below	Above	p-value	Below	Above	p-value
N	1768	1664		1147	1094	
Age (in years)	44.49	45.50	0.00	44.49	45.50	0.00
Marital status						
Married	0.63	0.64	0.52	0.63	0.64	0.70
Nationality						
Non-German	0.10	0.10	0.77	0.09	0.09	0.71
Migration background	0.04	0.03	0.14	0.04	0.03	0.72
Children $\leq$ 10 years	0.17	0.14	0.01	0.18	0.15	0.12
School Degree						
No degree	0.08	0.09	0.39	0.08	0.09	0.47
Low	0.60	0.60	0.97	0.56	0.54	0.53
Medium	0.16	0.14	0.12	0.18	0.15	0.13
High	0.16	0.17	0.43	0.18	0.21	0.09
Apprenticeship (yes)	0.81	0.79	0.25	0.79	0.78	0.43
University Degree (yes)	0.11	0.13	0.26	0.14	0.16	0.16
Occupational Group						
Agriculture, Other	0.04	0.03	0.75	0.02	0.02	0.76
Manufacturing	0.48	0.50	0.50	0.46	0.46	0.91
Technical Occupations	0.06	0.06	0.97	0.08	0.08	0.80
Services	0.42	0.41	0.58	0.44	0.44	0.91
Labor Market History						
Last daily income (in Euro)	75.92	75.94	0.99	81.44	82.00	0.72
Employment last 3 years (in months)	30.66	30.64	0.95	33.82	33.80	0.91
Employment last 4-7 years (in months)	39.00	39.33	0.40	39.41	39.44	0.95
Unemployed last 7 years (in months)	5.38	5.39	0.94	3.21	3.16	0.80
Months in employment - Year t-1	10.50	10.44	0.55	12.00	12.00	
t-2	10.02	10.11	0.45	11.11	11.19	0.45
t-3	10.16	10.11	0.64	10.71	10.62	0.45
Year cohort						
2001	0.27	0.27	0.96	0.26	0.26	0.84
2002	0.35	0.34	0.45	0.37	0.36	0.70
2003	0.38	0.39	0.49	0.37	0.38	0.57

Source: IZA Evaluation Data Set, own calculations.
Note: p-value for t-test of mean equality between above/below age groups.

Table A.2: Selected Descriptives and t-Test of Mean Equality for the Two Samples - Women

Age Group	Sample A			Sample B		
	Below	Above	p-value	Below	Above	p-value
N	1974	1810		1442	1334	
Age (in years)	44.24	45.75	0.00	44.24	45.74	0.00
Marital status						
Married	0.62	0.64	0.13	0.62	0.65	0.07
Nationality						
Non-German	0.06	0.06	0.73	0.06	0.05	0.33
Migration background	0.02	0.02	0.64	0.02	0.02	0.35
Children $\leq$ 10 years	0.08	0.05	0.00	0.07	0.05	0.01
School Degree						
No degree	0.06	0.07	0.19	0.05	0.06	0.45
Low	0.50	0.53	0.07	0.47	0.52	0.01
Medium	0.28	0.26	0.22	0.28	0.27	0.26
High	0.17	0.15	0.07	0.19	0.15	0.01
Apprenticeship (yes)	0.80	0.79	0.39	0.81	0.81	0.58
University Degree (yes)	0.10	0.10	0.63	0.12	0.09	0.06
Occupational Group						
Agriculture, Other	0.02	0.02	0.98	0.01	0.01	0.69
Manufacturing	0.17	0.16	0.51	0.15	0.15	0.50
Technical Occupations	0.02	0.02	0.54	0.02	0.02	0.41
Services	0.79	0.80	0.69	0.82	0.82	0.83
Labor Market History						
Last daily income (in Euro)	49.96	50.53	0.59	53.22	52.63	0.63
Employment last 3 years (in months)	31.39	31.26	0.59	33.84	33.91	0.67
Employment last 4-7 years (in months)	36.37	37.28	0.04	36.15	37.31	0.03
Unemployed last 7 years (in months)	4.21	4.15	0.74	2.87	2.64	0.20
Months in employment - Year t-1	10.80	10.76	0.57	12.00	12.00	
t-minus2	10.38	10.27	0.31	11.22	11.24	0.76
t-minus3	10.21	10.23	0.85	10.63	10.68	0.66
Year cohort						
2001	0.28	0.30	0.20	0.26	0.28	0.14
2002	0.33	0.33	0.93	0.34	0.33	0.55
2003	0.39	0.37	0.27	0.40	0.39	0.45

Source: IZA Evaluation Data Set, own calculations. *Note:* p-value for t-test of mean equality between above/below age groups.

Table A.3: Unemployment Hazard Estimates by Gender

	Men		Women	
	Coeff	SE	Coeff	SE
Treated	−0.149*	0.086	−0.149*	0.080
Age (untreated)	0.185*	0.107	−0.074	0.066
Age (treated)	−0.035	0.103	0.098	0.064
School Degree (Ref.: No Degree)				
Low	0.102	0.081	0.066	0.090
Medium	−0.107	0.097	0.035	0.096
High	−0.106	0.105	−0.084	0.109
Apprenticeship	0.223***	0.068	0.211***	0.058
University Degree	0.003	0.095	−0.051	0.092
Occupational Group (Ref.: Agriculture, Other)				
Manufacturing	−0.111	0.129	0.463**	0.186
Technical Occupations	−0.348**	0.157	0.216	0.230
Services	−0.358***	0.132	0.459**	0.180
Marital Status				
Married	0.227***	0.046	0.040	0.042
Children $\leq$ 10 years	−0.066	0.062	−0.206**	0.087
Nationality				
Non-German	−0.209***	0.079	−0.140	0.090
Migration background	0.245**	0.109	0.407***	0.126
Labor Market History				
Last daily income (in Euro)	0.002***	0.001	0.001*	0.001
Employment last 3 years (in months)	0.013***	0.003	0.002	0.003
Employment last 4-7 years (in months)	0.005**	0.002	0.000	0.001
Entry into Unemployment (Ref.: 2001)				
2002	−0.111*	0.057	−0.140***	0.051
2003	0.044	0.054	−0.169***	0.049
Duration Dependence (Ref.: t(1-3), in months)				
t(4-6)	−0.867***	0.063	−0.715***	0.062
t(7-9)	−1.289***	0.078	−0.993***	0.071
t(10-12)	−1.457***	0.086	−0.856***	0.071
t(13-15)	−1.501***	0.092	−1.121***	0.083
t(16-18)	−1.609***	0.101	−1.022***	0.084
t(19-21)	−2.023***	0.125	−1.252***	0.096
t(22-24)	−1.911***	0.124	−1.401***	0.106
t(25-28)	−2.033***	0.098	−1.483***	0.085
t(29-36)	−2.173***	0.110	−1.623***	0.096
Constant	−2.703***	0.194	−2.714***	0.234

Note: ***/**/* indicate significance at the 1%/5%/10% levels. This refers to column (1) in Table 4 (Sample A with treatment dummy).

Table A.4: Employment Hazard Estimates by Gender

	Men		Women	
	Coeff	SE	Coeff	SE
Treated	−0.067	0.107	−0.047	0.114
Age (untreated)	0.222*	0.124	0.102	0.094
Age (treated)	−0.071	0.128	−0.064	0.092
School Degree (Ref.: No Degree)				
Low	0.037	0.098	0.180	0.128
Medium	−0.218*	0.123	0.103	0.138
High	−0.110	0.142	0.054	0.154
Apprenticeship	0.131	0.087	−0.150*	0.083
University Degree	−0.318**	0.138	−0.094	0.124
Occupational Group (Ref.: Agriculture, Other)				
Manufacturing	−0.069	0.130	−0.187	0.199
Technical Occupations	−0.308*	0.180	−0.507	0.310
Services	−0.309**	0.135	−0.318*	0.191
Marital Status				
Married	−0.135**	0.058	−0.220***	0.058
Children $\leq$ 10 years	0.042	0.077	−0.303**	0.130
Nationality				
Non-German	0.253***	0.093	0.066	0.127
Migration background	0.029	0.128	0.008	0.179
Labor Market History				
Last daily income (in Euro)	−0.001	0.001	−0.001	0.001
Employment last 3 years (in months)	−0.029***	0.004	−0.024***	0.004
Employment last 4-7 years (in months)	−0.013***	0.003	−0.007***	0.002
Entry into Unemployment (Ref.: 2001)				
2002	0.057	0.069	0.190**	0.073
2003	0.203***	0.066	0.263***	0.071
Previous Unemployment Duration (in months)				
PUD (4-6)	0.103	0.075	0.272***	0.082
PUD (7-9)	0.165*	0.100	0.188*	0.099
PUD (10-12)	−0.123	0.121	0.038	0.104
PUD (13-15)	−0.164	0.125	0.151	0.117
PUD (16-18)	0.044	0.143	−0.012	0.137
PUD (19-21)	0.102	0.181	0.431***	0.139
PUD (22-24)	0.172	0.189	0.159	0.182
PUD (25-28)	0.390**	0.164	0.318**	0.152
PUD (29-36)	0.741***	0.264	0.535**	0.245
Duration Dependence (Ref.: t(1-3), in months)				
t(4-6)	−0.032	0.086	−0.201**	0.084
t(7-9)	0.384***	0.082	−0.300***	0.091
t(10-12)	0.320***	0.093	−0.427***	0.100
t(13-15)	−0.740***	0.135	−1.050***	0.131
t(16-18)	−0.376***	0.123	−0.942***	0.131
t(19-21)	−0.258**	0.125	−1.014***	0.142
t(22-24)	−0.354**	0.140	−0.845***	0.140
t(25-28)	−0.980***	0.149	−1.223***	0.139
t(29-36)	−0.589***	0.171	−1.397***	0.210
Constant	−1.655***	0.229	−1.860***	0.271

Note: ***/**/* indicate significance at the 1%/5%/10% levels. This refers to column (1) in Table 5 (Sample A with treatment dummy).

Table A.5: Re-Employment Wage (in logs) Estimates by Gender

	Men		Women	
	Coeff	SE	Coeff	SE
Treated	0.025	0.024	−0.008	0.042
Age (untreated)	0.014	0.029	0.035	0.035
Age (treated)	−0.016	0.027	−0.001	0.033
School Degree (Ref.: No Degree)				
Low	−0.011	0.023	0.005	0.044
Medium	0.015	0.029	0.151***	0.048
High	0.036	0.035	0.187***	0.057
Apprenticeship	0.090***	0.021	0.101***	0.031
University Degree	0.117***	0.036	0.165***	0.047
Occupational Group (Ref.: Agriculture, Other)				
Manufacturing	0.000	0.033	0.102	0.083
Technical Occupations	0.111**	0.045	0.389***	0.118
Services	−0.031	0.034	0.102	0.080
Marital Status				
Married	0.066***	0.014	−0.127***	0.021
Children $\leq$ 10 years	0.031*	0.016	−0.185***	0.058
Nationality				
Non-German	−0.049**	0.025	0.096**	0.043
Migration background	−0.010	0.028	0.017	0.069
Labor Market History				
Last daily income (in Euro)	0.004***	0.000	0.005***	0.001
Employment last 3 years (in months)	0.002**	0.001	0.001	0.001
Employment last 4-7 years (in months)	0.002***	0.001	0.001	0.001
Entry into Unemployment (Ref.: 2001)				
2002	−0.025	0.015	−0.042	0.026
2003	−0.033**	0.015	−0.087***	0.025
Previous Unemployment Duration (in months)				
PUD (4-6)	−0.070***	0.017	−0.115***	0.027
PUD (7-9)	−0.065***	0.024	−0.137***	0.033
PUD (10-12)	−0.109***	0.027	−0.410***	0.041
PUD (13-15)	−0.120***	0.029	−0.241***	0.047
PUD (16-18)	−0.140***	0.037	−0.538***	0.053
PUD (19-21)	−0.170***	0.046	−0.463***	0.063
PUD (22-24)	−0.088**	0.045	−0.569***	0.077
PUD (25-28)	−0.225***	0.038	−0.565***	0.055
PUD (29-36)	−0.292***	0.059	−0.529***	0.070
Constant	3.664***	0.055	3.365***	0.105

Note: ***/**/* indicate significance at the 1%/5%/10% levels. This refers to column (1) in Table 6 (Sample A with treatment dummy).