

Marginal Employment, Unemployment Duration and Job Match Quality*

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Abstract

In some countries like Germany unemployed workers can increase their income during job search by taking up “marginal employment” up to a threshold without any benefit deduction. We analyze the impact of entering marginal employment on employment outcomes of unemployed individuals. Our results suggest that marginal employment has on average no significant impact on the probability of leaving unemployment for a regular job, leads to more stable employment spells and has no impact on wages. We find evidence for time varying treatment effects: while we do not find any significant impact for the first 12 months of unemployment, job finding probabilities increase after one year and the impact on job stability is stronger if the jobs are taken up later in the unemployment spell.

Keywords: marginal employment, unemployment duration, job search, employment stability, timing of events model

JEL: J64, C41, C33

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1 Introduction

Unemployment insurance (UI) systems provide benefit payments for unemployed job seekers. The amount of benefits usually depends on previous earnings and is declining with elapsed unemployment duration. Many studies have shown that more generous benefit schemes go along with longer unemployment durations, while the empirical evidence of benefit generosity on job match quality is rather mixed and only some studies find positive impacts on post unemployment outcomes, see for example Belzil (2001) and Tatsiramos (2009) for positive impacts while van Ours and Vodopivec (2008) find no impact on job match quality. In general, UI systems have to balance the insurance component and providing the opportunity to search for suitable job matches on the one hand and disincentive effects and moral hazard on the other hand.

There exist – besides a decreasing profile of benefit payments – different strategies to increase the outflow probability from unemployment to employment and to avoid long spells of unemployment. These strategies include training programs, wage subsidies, public employment measures, job search assistance and monitoring schemes, see Card, Kluve, and Weber (2010) and Kluve (2010) for recent overviews of the effectiveness of these program types. In some countries like Germany and Austria the UI system is characterized by an additional feature: unemployed workers are allowed to work for some hours during job search by taking up “marginal employment”. Marginal employment – which is also called “mini-job” – is defined as employment below an income threshold with reduced social security contributions and job seekers can increase their income during unemployment up to a threshold without any benefit deduction. In this paper we analyze the causal impact of entering marginal employment on unemployment duration and job match quality of unemployed individuals.

On the one hand, marginal employment could increase the probability of taking up a regular job because it may lower human capital deterioration. Moreover, it may be used as a positive screening device by potential employers, it may increase the probability of getting job offers due to network effects, and some employers might use marginal employment as a probation period before offering a regular job. On the other hand, the additional income should increase the reservation wage for taking up a regular job, which should prolong the unemployment duration. These effects may have an impact on both, the unemployment duration and the job match quality. For example, the increased income due to marginal employment may allow

the unemployed to wait for a better and more stable job, which could decrease the risk of reentering unemployment. Hence, the overall impact of entering marginal employment on subsequent employment outcomes is theoretically ambiguous and it is the aim of this paper to assess this overall impact empirically.

There exists a number of empirical studies investigating “stepping stone effects” of different employment types to enter regular jobs. For example, Cockx and Picchio (2011) analyze the impact of short-term jobs on subsequent employment outcomes in Belgium based on a multivariate duration model and find evidence for short-term jobs to be spring-boards to long-term jobs. An earlier example for a multivariate duration model in the stepping stone literature is van den Berg, Holm, and van Ours (2002), who find that a job as a medical assistant increases the probability of becoming a medical specialist in the Netherlands. Zijl, van den Berg, and Heyma (2011) use a similar approach and find that temporary jobs shorten the unemployment duration in the Netherlands but do not lead to a higher fraction of unemployed workers having regular jobs. In Finland, unemployed workers are allowed to take up a part-time job during unemployment benefit receipt if they still search for a full-time job. Kyyrä (2010) applies a timing of events approach and his results suggests that this might have positive effects on the transition rate to regular jobs. For a similar institutional setting in Denmark Kyyrä, Parrotta, and Rosholm (2009) find heterogenous effects of taking up a part-time job during job search on the expected unemployment duration. Both studies do not take post unemployment outcomes into account. There exist two studies investigating the effects of marginal employment on subsequent employment outcomes. Freier and Steiner (2008) find for Germany that marginal employment leads to a reduction in future unemployment and slightly increases cumulated prospective earnings. In a study for Austria, Böheim and Weber (2011) find that marginally employed workers experience less regular employment, more unemployment and lower wages. Both studies apply a static propensity score matching approach and assume that conditional on observable characteristics entering a mini-job is not correlated with unobserved characteristics which have an impact on later outcomes.

In this paper we take the dynamic selection of unemployed job seekers into marginal employment into account by applying the “timing of events approach” following Abbring and van den Berg (2003). This approach allows to control for selection into treatment based on both observed and unobserved characteristics. One central assumption of this approach is the no-anticipation assumption, which implies that individuals do not know exactly when a treatment – in our case entering

marginal employment – will take place.¹ Since the unemployed workers have to search for a mini-job and the job finding probability depends on the job offer arrival rate and the probability that the characteristics of the mini-job are acceptable, it seems to be very plausible that the event of entering the treatment is – similar to the transition to a regular job – not deterministic. We additionally evaluate the treatment effect on the job match quality, i.e., we extend the model by estimating the duration of subsequent employment spells and a wage equation for the initial wage. For similar approaches in the context of sanction effects see Arnie, Lalive, and van Ours (2009) and van den Berg and Vikström (2009). This framework additionally allows to analyze effect heterogeneity with respect to observed characteristics like age and skill level and to investigate whether the treatment effect vary with the elapsed unemployment duration.

Our analysis is based on an inflow sample of male workers into unemployment for the year 2001 in West Germany. We focus on men because nearly all men work full-time if they have a regular job. Among female workers part-time work is much more common.² This implies that for females it is not in every case possible to distinguish between preferred part-time jobs and mini-jobs during job search in the data. Moreover, since we do not observe working hours, evaluating the impact on wages is more difficult for women than for men. We observe labor market states of individuals for three years after entering unemployment. Our dataset includes daily wages of employed workers, detailed sectoral information about marginal and regular employment and a firm identifier which allows to investigate at least at a descriptive level whether individuals find a regular job in the same firm in which they have a mini-job.

Our results suggest that having a mini-job does not have any effect on the probability of finding a regular job in the first 12 months of unemployment. However, we find a significantly positive impact on the outflow probability for long-term unemployed workers. Moreover, the jobs taken up by job seekers who entered a mini-job during their unemployment spell are more stable compared to jobs found by the non-treated individuals. These effects are stronger if the jobs are taken up later in the unemployment spell. We do not find any time-varying effects of taking up marginal employment on wages, but we find some evidence for effect heterogeneity with respect to observable characteristics: more skilled individuals and individuals

¹It is important to note that this does not imply that the individuals do not know the probability distribution of future events conditional on observable and unobservable characteristics.

²See e.g. Haan (2010) for an analysis of labor supply behavior of women in Germany.

who are not working in the construction sector seem to have slightly lower wages if they have taken up a mini-job during unemployment.

The paper is organized as follows: Section 2 describes the institutional background and Section 3 presents the data and descriptive statistics. Section 4 describes the econometric approach. The results of the empirical analysis are presented in Section 5 and Section 6 concludes.

2 Institutional Background

Marginal employment in Germany is subject to reduced social security contributions and is defined as employment below a certain income level or as temporary employment for a fixed period. The concept of exempting marginal employment from social security contribution was already introduced by the end of the 19th century. In the 1960s – a period in which labor demand exceeded labor supply – this instrument was implemented as an attempt to increase labor force participation of certain groups like students and housewives/-men. Since then marginal employment has been subject to several reforms. We restrict the discussion of institutional settings to the parts which are relevant for our observation period from 2001 to 2004. Since 1999 marginal employment was restricted to a maximum of €325 per month combined with a working time restriction of 15 hours per week. Temporary employment contracts are restricted to a maximum of two months or 50 working days per year. While employees have been exempted from social security contributions, employers paid only a fixed rate of 22%.

In April 2003 legal conditions for marginal employment changed due to the so-called mini-job reform. The reform was supposed to rise the attractiveness of the low-wage sector. Therefore, the income threshold increased from €325 to €400 and the working time restriction of 15 hours per week has been abolished. The social security contributions paid by the employer slightly increased to 23%. While marginal employment as a secondary job, that is beside regular employment, was completely subject to social security contributions and taxes before April 2003, after the reform one mini-job is allowed as a secondary job, i.e., exempted from both social security contributions and taxes for the employee.

We are interested in the effect of taking up a mini-job during unemployment. Therefore, we give a brief overview of the German unemployment insurance system. During our observation period from 2001 to 2004 the unemployment insurance system was characterized by two pillars: the unemployment benefits (“Arbeitslosen-

geld”) and means-tested unemployment assistance (“Arbeitslosenhilfe”). Individuals were eligible to unemployment benefits if they were regularly employed subject to social security contributions for at least 12 months within the last three years. The benefit level is related to previous average earnings with a replacement rate of 60% (67% with children living in the household) of net earnings whereby earnings are capped by the social security contribution assessment ceiling.³ After unemployment benefit entitlement expired – which ranged in that period from six to 32 months depending on age and time spent in employment in the previous seven years – individuals become eligible for means-tested unemployment assistance given they were still searching for a job. The replacement rate decreases to 53% (57% with children). For a detailed overview of the unemployment insurance system in Germany see e.g. Konle-Seidl, Eichhorst, and Grienberger-Zingerle (2010). In addition to these transfer payments, the unemployed in Germany are allowed to earn additional income from employment. This possibility is supposed to encourage the unemployed to take up marginal employment in order to stay attached to the labor market. Therefore, unemployment benefit recipients are allowed to keep €165/month of additional earnings without suffering a reduction in unemployment benefits as long as working time does not exceed 15 hours per week. Earnings above this threshold are fully withdrawn.

It is important to note that the mini-job reform in 2003 has no impact for the situation of unemployed workers. The conditions for additional earnings during unemployment benefit receipt, i.e., exemption rate of €165 and working time restrictions of maximally 15 hours per week, remained unchanged before and after the reform in 2003. Caliendo and Wrohlich (2010) show that only marginal employment as a secondary job and the labor supply of students increased significantly due to the reform in 2003. They do not find any evidence for a significant impact on the unemployed. This is plausible since the incentive for the unemployed to take up marginal employment did not change due to the reform. On the other hand, incentives for individuals in regular employment increased remarkably because income from one single mini-job is totally exempted from social security contribution and taxation. However, this is not part of our analysis.

³The social security contribution assessment ceiling is the maximum amount of earnings which is eligible to social security contribution. In 2001 it amounted to gross earnings of 4450 €/month and in 2004 to 5150 €/month in West Germany.

3 Data and descriptive statistics

3.1 Dataset and sample definition

Our analysis is based on data from the administrative part of the *IZA Evaluation Dataset*⁴. This dataset is based on the *Integrated Employment Biographies* (IEB) by the Institute for Employment Research (IAB) and consists of a random draw of unemployment entries between 2001 and 2008. The IEB consists of different sources, e.g., employment history, benefit recipient history, training participant history and job search history and therefore contains detailed information on employment subject to social security contributions, unemployment as well as participation in active labor market policy including wages and transfer payments. The data additionally include a broad range of socio-economic characteristic like education, family status and health restrictions. The data do not contain information about the working hours and periods in self-employment, as a civil servant or in inactivity. From this data we draw a random sample of inflows into unemployment in 2001. The unemployment spell has to last at least two weeks and before this unemployment entry the individuals have to be employed subject to social security contributions with a minimum duration of three months to ensure that we have a “real” inflow sample into unemployment. Moreover, we exclude individuals who had a mini-job during the three months before entering unemployment because we want to model the inflow into the treatment. We restrict our observation period from 2001 to 2004, since in 2005 a major reform of the German UI system has been introduced.

Our sample is based on male individuals in West Germany. We focus on males because nearly all men work full-time if they have a regular job. In contrast to that, part-time work is much more common among females (see e.g. Haan, 2010). This implies that for women it is in some cases difficult to distinguish between preferred part-time jobs and mini-jobs during job search in our dataset. Furthermore, the high share of part-timers among women makes an evaluation of wages in the first job after leaving unemployment difficult as we do not observe working hours. We focus on West Germany since during our observation period the labor markets in East and West Germany still substantially differ from each other. For example, the number of unemployed individuals entering public employment schemes is much higher in East than in West Germany. We further restrict our sample to men aged between 25 and 55. The first age restriction is motivated by the educational system and the

⁴For a detailed description of the *IZA Evaluation Dataset* see Caliendo, Falk, Kaiser, Schneider, Uhlendorff, van den Berg, and Zimmermann (2011).

second one by the retirement schemes in Germany. Our final sample consists of randomly drawn 10,000 individuals, which are followed for 36 months from entry into unemployment onwards. In Germany most of the employment spells start at the beginning of a month (and unemployment spells usually last until the end of a month). Therefore we construct discrete time spell data in which one month corresponds to one time unit.

In our dataset we define two mutually exclusive labour market states: unemployment and regular employment. Individuals who are either registered as unemployed at the Federal Employment Office (with or without benefit receipt) or participants of programs of Active Labor Market Policy are defined as being unemployed. During unemployment individuals might take up a mini-job. Periods in which individuals take up marginal employment without having a parallel unemployment spell are not included in our sample and individuals with a mini-job as a secondary job are defined to be regularly employed, i.e. the secondary job is ignored. Regular employment is defined as employment subject to social security contributions with a minimum monthly income of 600€. Any periods without information in the data and therefore not attributable to unemployment or employment are excluded and the corresponding spells are right-censored. In periods we do not have any information for individuals in our dataset they might be self-employed, employed as a civil servant or being not available to the labor market. One further reason for uncovered periods might be that individuals de-register as unemployment benefits elapse or are too low (compared to administrative burden) but still continue looking for a job. As our sample consists of prime-age men only, it is likely that individuals who are neither self-employed nor civil servants continue looking for a job independent of being registered as unemployed. Therefore, we examine the sensitivity of our results to this aspect in Section 5.4 and redefine uncovered periods as unemployment. This mainly leads to longer unemployment spells and more individuals who take up a mini-job during our observation period.

3.2 Descriptive statistics of transition processes

Table 1 provides the number of spells per individual that each individual spent in unemployment, in unemployment with a transition to a mini-job, and employment within our observation window.⁵

⁵A spell is defined as a continuous period of time within the same state without an interruption, i.e., no transitions to other states.

[INSERT TABLE 1 ABOUT HERE]

Due to the construction of our sample (inflows into unemployment) every individual has at least one unemployment spell. Almost the half of all individuals do have repeated unemployment spells and only a minority has five or more spells; in fact, 5,516 individuals have only one single unemployment spell while 82 individuals have five or more. Around 8,500 individuals never take up a mini-job during unemployment and for around 2,900 individuals we do not observe a transition to regular employment.

[INSERT FIGURE 1 ABOUT HERE]

To illustrate the dynamic transition process, Figure 1 provides an overview of all transitions within the observation period. In our setting we consider sequences, whereby each sequence consists of one unemployment spell (with or without entering marginal employment) and one employment spell, if the unemployed worker takes up a regular job. Each individual can have several sequences within the observation period. We see in Figure 1 that 10,000 individuals have in total 17,838 unemployment spells. Out of those 17,838 unemployment spells 4,915 are right censored and for 11,210 we observe a direct transition to regular employment without marginal employment before. We observe 927 transitions of treated individuals to regular employment, i.e., with having a mini-job during unemployment, and finally, 7,838 transitions back to unemployment after having been regularly employed within our observation period. If individuals enter a mini-job in month t , they are defined to be treated from month t onwards until the end of the sequence.

[INSERT FIGURE 2 ABOUT HERE]

Figure 2 depicts the respective hazard rates for the transition from unemployment to regular employment and the take-up rate of mini-jobs during unemployment. The probability of leaving unemployment for a regular job is first increasing and – after around 5 months – decreasing with elapsed unemployment duration. Compared to the transition from unemployment to employment the probability of entering a mini-job is rather low and does not vary strongly with the elapsed unemployment duration.

3.3 Differences in observable characteristics

Table 2 provides descriptive statistics measured at the initial entry into unemployment in 2001. Results are depicted for the full sample and in addition separated by treatment status, i.e., those who take up a mini-job during the 36 months and those who do not.

[INSERT TABLE 2 ABOUT HERE]

1,507 individuals take up a mini-job during unemployment within our observation window. Comparing both subgroups in column two and three suggests that the group of individuals who take up marginal employment are on average lower educated in terms of both schooling and professional training. For example, around 13.5% among the treated individuals have no schooling degree, while this share is only around 9% for the non-treated. More than 40% of the unemployed workers who take up a mini-job do not have any occupational degree. The corresponding share among the comparison group is less than 30%. The sectoral distribution, the mean age and the family status is rather similar between treated and non-treated individuals, while we observe a slightly higher local unemployment rate and a slightly lower local GDP, measured per capita, for individuals who enter a mini-job during unemployment. The local unemployment rate varies across time measured on a quarterly basis, while the local GDP per capita is measured on a yearly basis.

3.4 Characteristics of mini-job spells

To figure out to what extent mini-jobs serve as a stepping stone it is important to have more information on the mini-jobs itself.⁶ In our data we have information about the sector in which individuals have regular jobs and mini-jobs. Table 3 displays the sectoral distribution of mini-jobs in our sample. Mini-jobs are primarily provided by the service sector and the construction sector and this is similar among skilled and unskilled workers.

[INSERT TABLE 3 ABOUT HERE]

More interestingly, Table 4 and 5 depict a sectoral comparison of the mini-job with the previous and subsequent regular job, respectively. For instance, Table 4

⁶Mini-jobs in our sample have a mean (median) duration of 8.9 (6) months. Around 50% of the job-seekers leave the mini-job during unemployment, i.e., before they find a regular job or are right-censored.

shows that among all unemployed who take up a mini-job and previously worked in the construction sector, 70.3% have a mini-job in the same sector while the rest is marginally employed in a different sector. We can observe two patterns in Table 4. First, we see that many individuals take up a mini-job in the same sector in which they worked before entering unemployment. Second, if workers change the sector, they mainly take up mini-jobs in the service sector. Table 5 suggests a strong correlation between sectors for the mini-job and the subsequent regular job. For example, 82.4% of the individuals with a mini-job in the construction sector and for whom we observe a transition into a regular job find this job in the construction sector. These numbers indicate that the mini-jobs are related to the sectoral experience and skills of the unemployed workers, which suggests that they might be relevant for the job finding probability for example by lowering human capital deterioration, as a screening device for potential employers or by increasing the probability of getting job offers due to network effects.

[INSERT TABLE 4 AND 5 ABOUT HERE]

In addition to the finding that unemployed with a mini-job are likely to find regular employment in the same sector, we present in Table 6 the shares of treated individuals who find a regular job in the same firm in which they have been marginally employed. In the upper panel we consider all transitions to regular employment with a mini-job at any time before. In the lower panel we take only spells into account in which the unemployed worker was still marginally employed in the month of the exit from unemployment to employment, i.e. the individual has not left the mini-job before finding a new regular job. A large share of marginal employed individuals find a regular job within the same firm (45%), which suggests that mini-jobs are in some cases used as a probation period. The share of transitions within the same firm is with 52% higher in the first 12 months of unemployment than the corresponding share after one year of unemployment (30.3%). Within the group of individuals who are holding a mini-job in the month they find a new job the corresponding shares are slightly higher (60.0% and 39.3%, respectively).

[INSERT TABLE 6 ABOUT HERE]

As discussed in the chapter on the institutional background, the unemployed workers are allowed to earn up to 165€/month without suffering a reduction in transfer payments. This implies that the average treated individual in our sample can increase his income during unemployment by around 23%. Figure 3 depicts

the income distribution of mini-jobs during unemployment and it can be seen that indeed 50% earn 164€ per month or less. However, there is still a large fraction of job seekers which earn more than the amount they can keep. These higher earnings might be explained by labor demand side restriction, i.e., the offered jobs do not always have the exact number of working hours which would result in 165€/month. This supports the idea that there exist search frictions in the segment of the mini-jobs.

[INSERT FIGURE 3 ABOUT HERE]

4 Empirical Model

We are interested in the causal impact of taking up a mini-job on two outcomes, the unemployment duration and the job match quality. Individuals are defined to be treated if they enter a mini-job in month t of the unemployment spell from the corresponding month t onwards. This implies that individuals who have a mini-job for some time during unemployment and leave this marginal employment before they find a regular job are still defined to be “treated”.

In this section we start with the presentation of a bivariate duration model for the duration until leaving unemployment for a job and the duration until the treatment, which is entering marginal employment, following the “timing of events” approach (Abbring and van den Berg, 2003).⁷ In a next step we extend this by incorporating the job match quality similar to van den Berg and Vikström (2009).

As depicted in Table 1, our data set contains for some individuals multiple observations, which facilitates the identification and estimation of the joint distribution of the unobserved heterogeneity variables (see e.g. Honore, 1993). Moreover, our dataset includes time-varying variables like the local unemployment rate. Eberwein, Ham, and LaLonde (1997) and Gaure, Roed, and Zhang (2007) point out that time-varying covariates provide exclusion restrictions because past values affect current transition probabilities only through the selection process, i.e. time-varying covariates provide a more robust source of identification than time-invariant covariates. These features of the dataset imply that identification does not solely rely on the functional form of the model.

⁷We estimate a discrete time duration model. Abbring and van den Berg (2003) provide a proof for continuous time models. For identification in dynamic discrete models see Heckman and Navarro (2007).

4.1 Durations until employment and until treatment

We observe an inflow sample into unemployment. Hence, we do not have to take the initial condition problem into account (Heckman, 1981), because every individual is initially unemployed. We observe labor market states in discrete time and we assume that all individual differences in the probability of leaving unemployment for a job in period t can be characterized by observed characteristics x , unobserved characteristics V_u , and a treatment effect if a mini-job has been taken up before or at the discrete period t . Similarly, we assume that all individual differences in the probability of being treated in period t can be characterized by observable characteristics x and unobserved characteristics V_m . Given these assumptions the probability of leaving unemployment for a job $\theta_u(t)$ and the probability of taking up marginal employment $\theta_m(t)$ can be expressed by complementary log log specifications:

$$\theta_u(t|x, V_u, t_m) = 1 - \exp(-\exp(\lambda_{tu} + x'_t\beta_u + I(t \geq t_m)\delta_u + V_u)) \quad (1)$$

$$\theta_m(t|x, V_m) = 1 - \exp(-\exp(\lambda_{tm} + x'_t\beta_m + V_m)) \quad (2)$$

$I(\cdot)$ takes on the value one if $t \geq t_m$ and δ_u is the effect of being treated on the probability of finding a job. We assume that the treatment does not affect the probability of leaving unemployment for a job before the moment of accepting the job. This assumption is referred to as the no-anticipation assumption and is very likely to hold in our application. The unemployed workers have to search for a mini-job and – similar to the transition to a regular job – the job finding probability depends on the job offer arrival rate and the probability that the job characteristics are acceptable. This implies that the job finding process is stochastic. We assume that the unemployed workers do not know the exact timing of the treatment. However, they are allowed to know the probability distribution of future events conditional on observable and unobservable characteristics. Moreover, we assume that the unobserved heterogeneity components V_u and V_m are constant over time, i.e. across repeated spells of unemployed individuals, and that V_u and V_m are uncorrelated with observed characteristics x .

4.2 Post-unemployment outcomes

We measure the job match quality by the monthly wage and by the probability of reentering unemployment. We allow both outcomes to depend on unobserved characteristics which might be correlated with the unobserved factors V_u and V_s . In order to identify the causal impact of mini-jobs on realized wages, we assume that

the unobserved heterogeneity and the causal effect have an additive impact on the mean log wage. We specify following wage equation for the wage at the beginning of the new employment spell:

$$\ln w = x'_t \beta_w + I(t_m \leq t_u) \delta_w + t_u \eta_w + V_w + \varepsilon_w \quad (3)$$

The treatment effect is given by δ_w , V_w is the unobserved heterogeneity which is assumed to be constant across repeated spells, and ε_w is assumed to be normal distributed with mean zero and unknown variance σ_w . In addition, we allow the log wage to vary with respect to the previous unemployment duration t_u .

Similarly to the duration of unemployment we specify a duration of employment, described by the probability to leave employment and to reenter unemployment in period t . We assume that all individual differences in the probability of reentering unemployment in t can be characterized by observed characteristics x , unobserved characteristics V_e and a treatment effect δ_e if a mini-job has been taken up in the previous unemployment spell. The probability of leaving employment in period t is given by:

$$\theta_e(t|x, V_e, t_u, t_m) = 1 - \exp(-\exp(\lambda_{te} + x'_t \beta_e + I(t_m \leq t_u) \delta_e + t_u \eta_e + V_e)) \quad (4)$$

Similarly to the wage equation we allow θ_e to vary with respect to the previous unemployment duration t_u . In the empirical specification we include a linear and a quadratic term reflecting the previous unemployment duration in a flexible way. V_e is constant over time and uncorrelated with observed characteristics x . However, V_e and V_w might be correlated with the treatment indicator and the previous unemployment duration, which captures the dynamic selection into job matches.

4.3 Distribution of unobserved heterogeneity

We specify the distribution of unobserved heterogeneity G to have a discrete support with M support points. In order to force the corresponding probabilities to be between zero and one and to sum to one we use a multinomial logit parameterization of the class probabilities:

$$\pi_m = \frac{\exp(\omega_m)}{\sum_{m=1}^M \exp(\omega_m)}, \quad m = 1, \dots, M, \quad \omega_1 = 0 \quad (5)$$

Each of the six components of the unobserved heterogeneity V takes on a specific value at support point m , whereby for identification reasons the values are set to be zero for $m = 1$. This implies that for a model with $M = 2$ G would be describe

by 5 parameters, for $M = 3$ we estimate 10 parameters, etc.⁸ This approach allows for a flexible covariance matrix for the unobserved components. For a similar model for unobserved heterogeneity in the context of timing of events models see Crepon, Ferracci, Jolivet, and van den Berg (2010) and in the context of random coefficient models in the statistical literature see e.g. Aitkin (1999). Gaure, Roed, and Zhang (2007) provide Monte Carlo evidence that modeling selection based on unobservables by a flexible discrete distribution works well in the context of timing of events models. In the estimation we increase the number of support points until the model fit cannot be improved further by an additional support point, evaluated on the basis of the Akaike Criterion (AIC) and Bayesian Information Criterion (BIC).

4.4 Likelihood function

Given this setup, the likelihood contribution of an individual with one unemployment spell of length t_u and one employment spell of length t_e for given unobserved and observed characteristics V and x is given by:

$$\begin{aligned}
L_{is}(x, V) = & \prod_{t=1}^{t_m} \left[1 - \theta_m(t|x, V_m) \right] \left(\frac{\theta_m(t_m|x, V_m)}{1 - \theta_m(t_m|x, V_m)} \right)^{\kappa_m} \\
& \prod_{t=1}^{t_u} \left[1 - \theta_u(t|x, V_u, t_m) \right] \left(\frac{\theta_u(t_u|x, V_u, t_m)}{1 - \theta_u(t_u|x, V_u, t_m)} \right)^{\kappa_u} \\
& \prod_{t=t_u+1}^{t_u+t_e} \left[1 - \theta_e(t|x, V_e, t_u, t_m) \right]^{\kappa_u} \left(\frac{\theta_e(t_e|x, V_e, t_u, t_m)}{1 - \theta_e(t_e|x, V_e, t_u, t_m)} \right)^{\kappa_u \kappa_e} \\
& \left(\frac{1}{\sqrt{2\pi\sigma^2}} \exp \left(-\frac{(\ln w_i - \widehat{\ln w_i})^2}{2\sigma^2} \right) \right)^{\kappa_u} \tag{6}
\end{aligned}$$

The indicators κ_m , κ_u and κ_e take on the value one if a transition to a mini-job, to regular employment or to unemployment, respectively, is observed and zero otherwise. $\ln w_i$ is the logarithm of the observed wage in our data – in case we observe a transition from unemployment to a regular job – and $\widehat{\ln w_i}$ corresponds to the predicted value based on the coefficients β_w . We observe multiple spells for some individuals in our dataset. Therefore, the likelihood contribution of an individual corresponds to the product of the likelihood contributions of S sequences of unemployment and employment spells.

⁸For $M = 2$ we estimate the parameters V_{u2} , V_{m2} , V_{e2} , V_{w2} , ω_2 . For $M = 3$ we estimate V_{u2} , V_{m2} , V_{e2} , V_{w2} , ω_2 and V_{u3} , V_{m3} , V_{e3} , V_{w3} , ω_3 .

$$L_i(x, V) = \prod_{s=1}^S L_{is}(x, V)$$

Since we do not know the unobserved characteristics for an individual i , the “unconditional” log-likelihood contribution corresponds to the weighted sum of the contributions corresponding to the M points of support. The log-Likelihood function for the sample with N individuals is given by:

$$\ln L = \sum_{i=1}^N \ln \sum_{m=1}^M \pi_m L_i(x, V(m)) \quad (7)$$

5 Results

We estimate the duration until finding a mini-job, the duration of unemployment, the duration of employment and the reemployment wage with jointly distributed unobserved heterogeneity. We estimate different empirical specifications of this model. Starting with a baseline model which allows for homogeneous treatment effects we introduce in a second step effect heterogeneity with respect to selected observable characteristics. In a third step we estimate interaction effects of the treatment indicator with elapsed unemployment duration. Finally, we reestimate our model on a sample in which we re-define uncovered periods in the data also as unemployment in order to test whether our results are robust with respect this alternative specification of employment states.

5.1 Baseline results

In Table 7 we report the treatment effects on different outcomes. We control for observable characteristics reported in Table 2 and allow for flexible duration dependencies for the duration in unemployment, the duration until treatment and the employment duration. Moreover, we control for the yearly quarter in which the corresponding spell starts and include time-varying dummy indicators for the current quarter to capture seasonal effects. The complete set of coefficients including the distribution of the unobserved heterogeneity is reported in the Appendix in Table A.1. Our final specification includes 9 mass points ($M=9$), i.e. we estimate 40 additional parameters for the distribution of unobserved characteristics compared to a model without unobserved heterogeneity. A further increase of the mass points does not lead to a better model fit, evaluated on the basis of the AIC and the BIC.

In column 1 we report the coefficient of the time-varying treatment dummy for the probability of leaving unemployment for a regular job in a model without controlling for selection based on unobserved characteristics. The parameter is positive and significantly different from zero. Once we control for unobserved heterogeneity, the treatment effect clearly decreases and is not significantly different from zero any more, see column 2. This suggests that mini-jobs are not stepping-stones to regular jobs, but they also do not lead to longer spells of unemployment.

[INSERT TABLE 7 ABOUT HERE]

In a model without unobserved heterogeneity we do not find any effect of the mini-job dummy on employment stability (column 3). However, once we control for selection, the estimated parameter suggests that treated individuals re-enter unemployment with a lower probability than individuals who have not been treated (column 4). Moreover, these individuals have nearly the same wages compared to the non-treated individuals when they take up a regular job (column 6). In the “naive” model without controlling for dynamic selection based on unobserved characteristics we estimate a significantly negative impact of mini-jobs on wages (column 5). These results underline the importance of controlling for dynamic selection. The correlation coefficients of the unobserved components, reported in Table A.1, suggest that individuals who take up a mini-job during unemployment have unobserved characteristics which go along with longer unemployment durations on the one hand, and with more stable jobs and higher wages on the other hand. For example, the correlation coefficient between V_u and V_m is 0.3, while the correlation between V_e and V_m is 0.58.

Overall, the baseline model suggests that mini-jobs are not increasing the outflow probability out of unemployment and do not lead to higher paid jobs, but the treated individuals end up in more stable employment spells.

5.2 Heterogenous treatment effects

To investigate effect heterogeneity we interact the treatment dummy with selected observable characteristics. These characteristics include the logarithm of age, a dummy variable for being unskilled, a dummy variable for having worked in the construction sector in the last regular job, and the local unemployment rate. We particularly investigate the treatment effect for the construction sector because this sector is characterized by strong seasonal employment patterns, which might imply

a specific role of mini-jobs for periods of unemployment. The reference person is an individual of mean age located in a region with the mean local unemployment rate, not working in the construction sector and not being unskilled. The results are reported in Table 8.

[INSERT TABLE 8 ABOUT HERE]

We do not find any evidence for effect heterogeneity with respect to the transition probability from unemployment to regular employment. None of the additional interaction effects is significantly different from zero. For the duration of employment we find some weak evidence for working in the construction sector. For these workers the positive effect on employment stability is weaker compared to the reference person, whereby this deviation is significantly different from zero only at a 10% level.

For the impact on the initial wage in a new job we find some evidence for effect heterogeneity. While the reference person – skilled worker not working in the construction sector – takes up jobs with lower wages, this is not the case for unskilled workers nor for workers in the construction sector. Moreover, the treated individuals enter higher paid jobs when the local unemployment rate is lower. This indicates that mini-jobs are more effective for low skilled workers and for workers living in areas with better labor market conditions, since they find more stable jobs without having lower wages.

5.3 Treatment effects and elapsed unemployment duration

In Table 9 we report the coefficients of the interaction effects of the treatment indicator with elapsed unemployment duration. In the first column we report the estimates of a model which allows for different treatment effect in months 1-6, in months 7-12 and in months 13-36. The results suggest a significantly positive effect of entering a mini-job after one year of unemployment, while we do not observe any significant impact on the probability of finding a job for the first 12 months. These results suggest that there exist stepping stone effects of mini-jobs to regular jobs, but that these effects are relevant only for long-term unemployed workers. In column 2 we additionally allow for an effect in the months 25-36. For this period we do not find a significantly positive effect on the outflow probability. However, the number of observations is decreasing over time and these estimates are based on a small number of unemployed individuals.

[INSERT TABLE 9 ABOUT HERE]

For the effect on employment stability we find a negative effect of having a mini-job on the probability of re-entering unemployment already for regular jobs which are found during months 1-6 of the unemployment spell (column 3). These effects are stronger if the jobs are taken up after 12 in the unemployment spell. In contrast to this we do not find evidence for time-varying treatment effects on initial wages. None of the estimated coefficients are significantly different from zero, see columns 5 and 6.

Given our descriptive evidence on a decreasing share of transitions within the same firm after 12 months of unemployment, the positive impact on the employment stability is probably not driven by an increasing role of mini-jobs as a probation period. The results suggest that the positive effects of entering marginal employment – which might occur due to signaling effects, network effects, or the reduced deterioration of human capital – seem to lead to both an increase of the job finding probability and an increase of the employment stability. These effects seem to be less relevant at the beginning of an unemployment spell, which is plausible given that the contact frequency to former colleagues (network) and the deterioration of human capital are probably time-dependent.

5.4 Sensitivity Analysis

We have estimated the model based on an alternative definition of unemployment. In contrast to our preferred specification, here we additionally define periods of our sample members which are not covered by the data as unemployment. This leads to longer unemployment spells and a higher number of treated individuals. Overall, we get very similar results for this alternative definition of unemployment (see Tables A.2 - A.4 in the Appendix).

In the baseline model the effect of entering a mini-job on the job finding probability is significantly positive at the 5%-level, which is probably driven by an increasing number of observations with longer unemployment duration. In line with this we find stronger evidence for positive interaction effects of the treatment indicator with elapsed unemployment duration, see Table A.4. In this specification the treatment effect is significantly positive for unemployment durations between 25-36 months. Similar to the main specification we do not find any evidence for effect heterogeneity for the unemployment duration. In contrast to the main specification where we find a weakly significant impact of working in the construction sector on

the employment stability, this effect is not significant any more. Also for the initial wages the effect for the construction sector is not significantly different from zero any more, while the significant effects for the skill level and the local unemployment rate are stable. Although we increased the sample size, we again do not find any evidence for different effects depending on the elapsed unemployment duration on initial wages.

6 Conclusion

In some countries like Germany and Austria unemployed workers are allowed to work for some hours during job search by taking up “marginal employment”. Marginal employment is defined as employment below an income threshold with reduced social security contributions and job seekers can increase their income during unemployment up to a threshold without any benefit deduction. We analyze the causal impact of entering marginal employment on unemployment duration and job match quality of unemployed individuals and investigate potential effect heterogeneity with respect to observed characteristics and elapsed unemployment duration.

Based on a random inflow sample of male workers in West Germany into unemployment our results suggest that the treatment effects are varying with the time spent in unemployment. While we do not find any significant impact for the first 12 months of unemployment, job finding probabilities clearly increase after one year and the impact on job stability is stronger for individuals who are longer unemployed. For wages, we do not find any evidence for an interaction effect with elapsed unemployment duration. However, the impact on wages seem to vary with the skill level and the sector. Skilled individuals and individuals who have not been working in the construction sector before entering unemployment have a lower wage in the initial job after leaving unemployment if they had a mini-job. Moreover, the results indicate that the wage effects are increasing if the situation on the local labour market is better.

Our descriptive analysis suggests that the positive impact on unemployment exit and employment stability especially for longer unemployed workers is probably not driven by an increasing role of mini-jobs as a probation period. It seems to be more plausible that mechanisms which might be less relevant at the beginning of an unemployment spell, like the deterioration of human capital and changing networks for example due to changing contact frequency with colleagues, could drive these effects. However, our analysis is based on administrative data and we do not have

information about the search behavior of unemployed individuals with and without mini-jobs nor on the changes in the human capital over time. Future research should shed more light on the underlying mechanisms which might explain the positive effect of entering marginal employment on the employment outcomes.

Our results lead to the policy conclusion that – at least at the individual level – mini-jobs can be an effective instrument to help long-term unemployed individuals to find (stable) jobs. One advantage of this instrument is that it does not involve any direct program costs and that the administrative burden is low since the unemployed workers are searching for mini-jobs on their own. These findings are also relevant for the design and the timing of active labor market programs. Future research should shed some light on the interaction of marginal employment and measures like job search and training programs and for unemployed workers. However, having a mini-job does not seem to have the same effect for all groups and the results suggest the instrument does not help to increase the job finding probabilities at the beginning of the unemployment spells.

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Tables

Table 1: Spells per person

Number of Spells	Unemployment	Mini-Job (while being UE)	Employment
0	—	8,493	2,919
1	5,516	1,337	3,931
2	2,415	137	1,595
3	1,574	30	1,362
4	413	3	149
≥ 5	82	0	44

Note: Depicted are the number of spells per person. For instance, 5,516 individuals have only one single unemployment spell while 82 individuals have five or more. Each column sums up to the total number of individuals (N=10,000).

Table 2: Descriptive statistics of observed characteristics

	Full sample	Having a Mini-Job	
		No	Yes
Number of individuals	10,000	8,493	1,507
Age (in years)	37.4 (8.2)	37.5 (8.1)	37.2 (8.2)
Married	52.5	52.2	54.2
Children	33.2	32.9	35.0
Children \leq 10 years	21.5	21.2	23.2
Non-German	15.7	14.6	21.6
Severely handicapped	2.1	2.2	1.5
Health restrictions	12.4	12.0	14.8
School leaving certificate			
No degree	9.5	8.8	13.5
Lower secondary school	59.6	58.9	63.7
Middle secondary school	15.7	15.7	15.3
(Specialized) Upper secondary school	15.2	16.6	7.5
Professional training			
Unskilled	30.1	28.1	41.5
Apprenticeship or technical college degree	63.6	65.0	55.6
University degree	6.3	6.9	2.9
Sector of last job			
Construction	25.8	26.3	23.1
Production	21.3	21.3	21.3
Wholesale/Retail	13.0	13.0	12.9
Private sector services	26.6	25.9	30.8
Others (public sector, agriculture)	13.3	13.5	11.9
Local macroeconomic conditions			
Unemployment rate	7.6 (2.4)	7.5 (2.4)	8.0 (2.3)
Real GDP per capita ^{a)} (in €)	28.6 (11.5)	28.7 (11.7)	28.2 (10.6)

Note: All statistics are percentages (if not differently indicated) and measured at entry into unemployment; standard deviations in parenthesis.

^{a)} Normalized to prices in 2005.

Table 3: Sectoral distribution of mini-jobs

	All	Professional training background	
		Unskilled	Skilled
Number of spells	911	352	559
Construction	28.6	29.5	28.1
Production	8.6	8.2	8.8
Wholesale/Retail	11.6	8.8	13.4
Private sector services	40.7	43.5	39.0
Others (public sector, agriculture)	10.4	9.9	10.7

Note: All statistics are percentages (if not differently indicated). Individuals who have no professional degree at entry into unemployment are categorized as “unskilled” and as “skilled” otherwise.

Table 4: Sectoral transition matrix: From previous job to mini-job

Sector of previous job	Sector of mini-job				
	Constr.	Prod.	Retail	Services	Others
Construction	70.3	5.3	3.9	16.3	4.2
Production	18.2	23.9	13.8	36.5	7.5
Wholesale/Retail	6.7	7.6	33.3	43.8	8.6
Private sector services	6.8	4.2	12.5	70.8	5.7
Others (public sector, agriculture)	8.0	6.0	5.0	34.0	47.0

Note: Depicted is the sectoral distribution of mini-jobs during unemployment conditional on the sector of the previous jobs; all statistics are in percentages. For instance, among all treated individuals who previously worked in the construction sector, 70.3% also take up a mini-job in the same sector.

Table 5: Sectoral transition matrix: From mini-job to subsequent job

Sector of mini-job	Sector of subsequent job				
	Constr.	Prod.	Retail	Services	Others
Construction	82.4	8.0	3.4	4.6	1.5
Production	10.3	62.8	5.1	15.4	6.4
Wholesale/Retail	6.6	11.3	42.5	34.9	4.7
Private sector services	8.1	9.4	8.4	68.7	5.4
Others (public sector, agriculture)	9.5	4.2	1.1	26.3	58.9

Note: Depicted is the sectoral distribution of subsequent jobs conditional on the sector of the mini-job during unemployment; all statistics are in percentages. For instance, out of all unemployed individuals who have a mini-job in the construction sector, 82.4% also find regular employment in the same sector.

Table 6: Transition from UE (with mini-job) to RE within same firm

	All	Timing of transition to employment	
		≤ 12 months	> 12 months
All transition to RE	911	617	294
Within same firm (in %)	45.0	52.0	30.3
Direct transition to RE	484	395	89
Within same firm (in %)	56.2	60.0	39.3

Note: Depicted is the share of treated transitions from unemployment to employment which take place within the same firm, i.e., the mini-job during unemployment and the subsequent regular job are within the same firm. UE - Unemployment, RE - Regular employment.

Table 7: Baseline estimation results

	Transition UE to RE		Transition RE to UE		Linear wage equation	
	(1)	(2)	(3)	(4)	(5)	(6)
Mini-Job	0.129*** (0.037)	0.030 (0.049)	0.007 (0.045)	-0.277*** (0.065)	-0.074*** (0.010)	-0.002 (0.009)
Unobs. Het. (M=9)	No	Yes	No	Yes	No	Yes

Note: The estimation also includes control variables for duration dependence, seasonal dummies, individual socio-demographics, information on last job and local macroeconomic conditions. Table A.1 in the appendix provides the full set of estimated coefficients. UE - Unemployment, ME - Marginal employment, RE - Regular employment.

Table 8: Effect heterogeneity

	Transition	Transition	Linear wage
	UE to RE (1)	RE to UE (2)	equation (3)
Mini-Job	0.002 (0.064)	-0.325*** (0.085)	-0.028** (0.011)
Mini-Job \times Ln(Age)	-0.128 (0.187)	-0.002 (0.248)	0.038 (0.036)
Mini-Job \times Unskilled	0.014 (0.081)	-0.018 (0.102)	0.038*** (0.014)
Mini-Job \times Construction	0.016 (0.084)	0.188* (0.109)	0.034** (0.015)
Mini-Job \times Local UE-Rate	1.445 (1.562)	-2.477 (1.970)	-0.652** (0.275)
Unobs. Het. (M=9)	Yes	Yes	Yes

Note: The estimation also includes control variables for duration dependence, seasonal dummies, individual socio-demographics, information on last job and local macroeconomic conditions. Individuals who have no professional degree at entry into unemployment are categorized as “unskilled”. UE - Unemployment, ME - Marginal employment, RE - Regular employment.

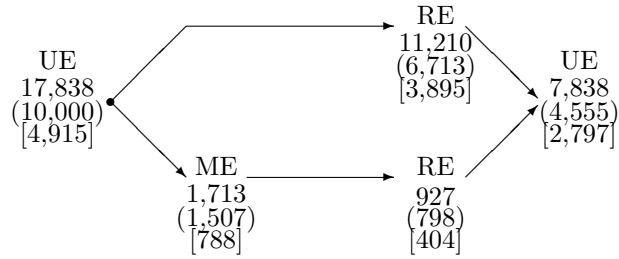
Table 9: Treatment effect and elapsed unemployment duration

	Transition UE to RE		Transition RE to UE		Linear wage equation	
	(1)	(2)	(3)	(4)	(5)	(6)
Mini-Job	-0.097 (0.066)	-0.096 (0.066)	-0.153* (0.085)	-0.153* (0.085)	-0.011 (0.012)	-0.011 (0.012)
Mini-Job × 7-12 months	0.127 (0.096)	0.125 (0.096)	-0.131 (0.119)	-0.133 (0.119)	0.027 (0.017)	0.027 (0.017)
Mini-Job × 13-36 months	0.345*** (0.096)		-0.370*** (0.131)		0.019 (0.018)	
Mini-Job × 13-24 months		0.405*** (0.101)		-0.425*** (0.136)		0.024 (0.019)
Mini-Job × 25-36 months		0.168 (0.141)		0.153 (0.270)		-0.007 (0.032)
Unobs. Het. (M=9)	Yes	Yes	Yes	Yes	Yes	Yes

Note: The estimation also includes control variables for duration dependence, seasonal dummies, individual socio-demographics, information on last job and local macroeconomic conditions. UE - Unemployment, ME - Marginal employment, RE - Regular employment.

Figures

Figure 1: Description of transitions

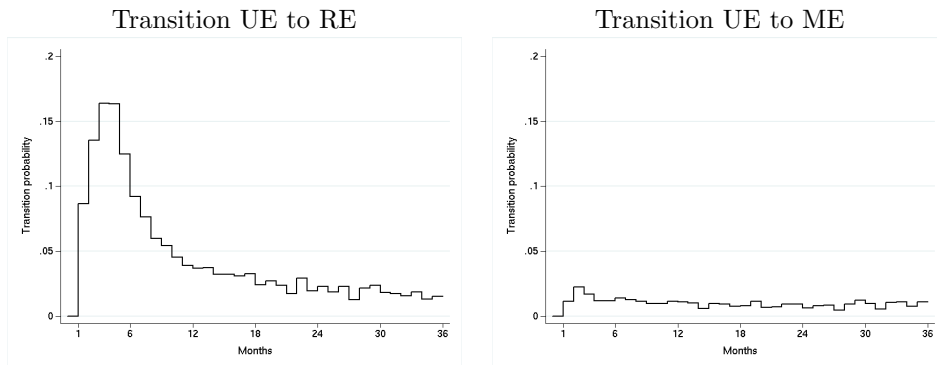


Legend:

spells
 (# individuals)
 [# right censored spells]

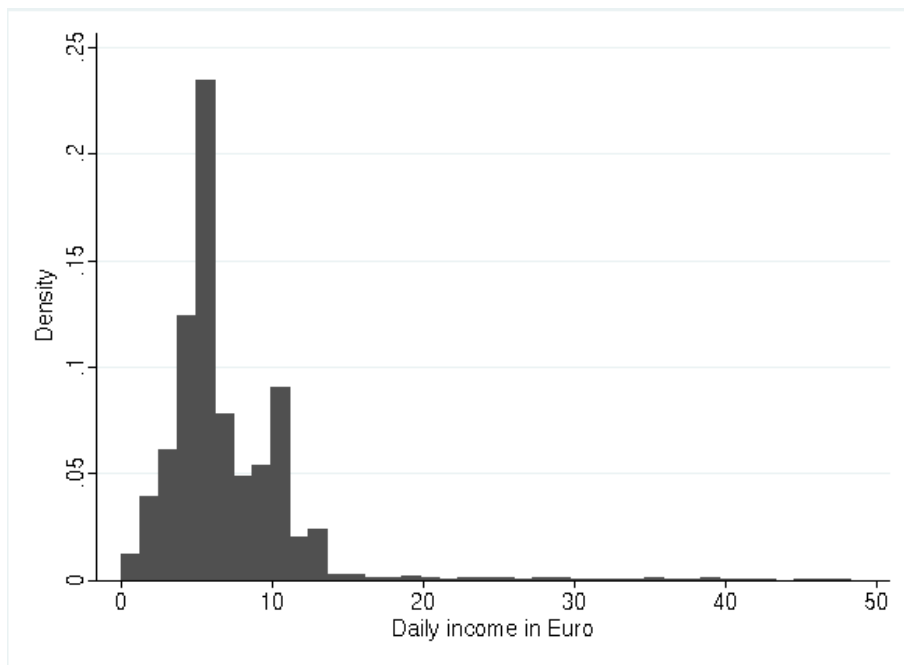
Note: UE - Unemployment, ME - Marginal employment, RE - Regular employment.

Figure 2: Hazard functions



Note: Depicted are unconditional transitions probabilities. UE - Unemployment, ME - Marginal employment, RE - Regular employment.

Figure 3: Income distribution of mini-jobs during unemployment



Note: The mean and median of the income distribution amount to 6.9 and 5.4 Euro respectively; whereby these daily incomes correspond to 207 and 164 Euro per months.

A Appendix

Table A.1: Estimation results

	Without unobs. het.		M=9	
Log-likelihood	77,145		74,694	
<i>Equation 1: Transition from unemployment to employment</i>				
Constant	-2.026***	(0.034)	-1.565***	(0.050)
Timing of transition (Ref. 1-2 months)				
3-4 months	0.400***	(0.022)	0.494***	(0.025)
5-6 months	-0.002	(0.029)	0.179***	(0.032)
7-8 months	-0.442***	(0.038)	-0.209***	(0.042)
9-10 months	-0.691***	(0.048)	-0.430***	(0.051)
11-12 months	-0.895***	(0.057)	-0.603***	(0.061)
13-18 months	-1.105***	(0.044)	-0.744***	(0.050)
19-36 months	-1.502***	(0.043)	-1.036***	(0.055)
Quarter of transition (Ref. 1st quarter)				
2nd quarter	0.107***	(0.023)	0.174***	(0.024)
3rd quarter	-0.101***	(0.029)	-0.028	(0.030)
4th quarter	-0.724***	(0.031)	-0.671***	(0.032)
Quarter of entry into unemployment (Ref. 1st quarter)				
2nd quarter	-0.395***	(0.030)	-0.403***	(0.034)
3rd quarter	-0.266***	(0.029)	-0.280***	(0.032)
4th quarter	-0.125***	(0.022)	-0.145***	(0.026)
Ln(Age) (Ref.: mean age)	-0.480***	(0.044)	-0.574***	(0.054)
Married	0.098***	(0.022)	0.109***	(0.026)
Children	0.100***	(0.029)	0.102***	(0.035)
Children ≤ 10 years	-0.031	(0.031)	-0.025	(0.037)
Non-German	-0.192***	(0.027)	-0.250***	(0.033)
Severely handicapped	-0.283***	(0.078)	-0.303***	(0.090)
Health restrictions	-0.370***	(0.031)	-0.422***	(0.037)
School leaving certificate (Ref. No degree or lower secondary school)				
Middle secondary school	-0.116***	(0.025)	-0.138***	(0.030)
(Specialized) Upper secondary school	-0.116***	(0.034)	-0.178***	(0.041)
Professional training (Ref. Unskilled)				
Apprenticeship or technical college	0.177***	(0.020)	0.193***	(0.025)
University degree	0.050	(0.055)	0.111*	(0.065)
Sector of last job (Ref. Others (public sector, agriculture))				
Construction	0.215***	(0.027)	0.189***	(0.034)
Production	-0.152***	(0.030)	-0.201***	(0.036)
Wholesale/Retail	-0.160***	(0.034)	-0.192***	(0.041)
Private sector services	-0.114***	(0.028)	-0.167***	(0.035)
Local macroeconomic conditions				
Unemployment rate (Ref.: mean rate)	-5.932***	(0.375)	-7.302***	(0.445)
Real GDP per capita (Ref.: mean GDP)	-0.007***	(0.001)	-0.007***	(0.001)
Mini-Job	0.129***	(0.037)	0.030	(0.049)

To be continued.

Table A.1 continued.

	Without unobs. het.		M=9	
<i>Equation 2: Transition from unemployment to marginal employment</i>				
Constant	-4.203***	(0.101)	-4.770***	(0.101)
Timing of transition (Ref. 1-2 months)				
3-4 months	-0.172**	(0.071)	-0.049	(0.074)
5-6 months	-0.320***	(0.084)	-0.110	(0.092)
7-8 months	-0.381***	(0.098)	-0.089	(0.106)
9-10 months	-0.610***	(0.116)	-0.264**	(0.126)
11-12 months	-0.457***	(0.118)	-0.068	(0.129)
13-18 months	-0.758***	(0.096)	-0.299***	(0.110)
19-36 months	-0.772***	(0.082)	-0.199*	(0.112)
Quarter of transition (Ref. 1st quarter)				
2nd quarter	0.131*	(0.067)	0.136*	(0.070)
3rd quarter	0.096	(0.072)	0.110	(0.075)
4th quarter	-0.050	(0.067)	-0.060	(0.070)
Quarter of entry into unemployment (Ref. 1st quarter)				
2nd quarter	0.165**	(0.077)	0.105	(0.086)
3rd quarter	0.131*	(0.075)	0.043	(0.084)
4th quarter	0.178***	(0.063)	0.063	(0.072)
Ln(Age) (Ref.: mean age)	-0.208*	(0.117)	-0.135	(0.144)
Married	-0.010	(0.056)	-0.007	(0.070)
Children	0.091	(0.077)	0.135	(0.096)
Children ≤ 10 years	0.080	(0.079)	0.076	(0.100)
Non-German	0.160**	(0.064)	0.184**	(0.078)
Severely handicapped	-0.628***	(0.202)	-0.664***	(0.232)
Health restrictions	0.110*	(0.069)	0.128	(0.084)
School leaving certificate (Ref. No degree or lower secondary school)				
Middle secondary school	-0.060	(0.063)	-0.077	(0.080)
(Specialized) Upper secondary school	-0.678***	(0.110)	-0.747***	(0.131)
Professional training (Ref. Unskilled)				
Apprenticeship or technical college	-0.166***	(0.052)	-0.176***	(0.065)
University degree	-0.242	(0.182)	-0.229	(0.207)
Sector of last job (Ref. Others (public sector, agriculture))				
Construction	0.054	(0.079)	0.034	(0.101)
Production	-0.004	(0.083)	-0.013	(0.103)
Wholesale/Retail	0.091	(0.091)	0.083	(0.112)
Private sector services	0.249***	(0.076)	0.221**	(0.094)
Local macroeconomic conditions				
Unemployment rate (Ref.: mean rate)	6.794***	(0.906)	7.115***	(1.057)
Real GDP per capita (Ref.: mean GDP)	-0.005**	(0.002)	-0.004*	(0.003)

To be continued.

Table A.1 continued.

	Without unobs. het.		M=9	
<i>Equation 3: Transition from employment to unemployment</i>				
Constant	-2.820***	(0.058)	-3.094***	(0.073)
Timing of transition (Ref. 1-2 months)				
3-4 months	-0.189***	(0.043)	-0.077*	(0.045)
5-6 months	-0.234***	(0.043)	-0.048	(0.046)
7-8 months	0.089**	(0.040)	0.316***	(0.045)
9-10 months	0.732***	(0.039)	1.033***	(0.045)
11-12 months	-0.035	(0.054)	0.318***	(0.060)
13-18 months	-0.872***	(0.054)	-0.462***	(0.060)
19-36 months	-0.923***	(0.047)	-0.399***	(0.059)
Quarter of transition (Ref. 1st quarter)				
2nd quarter	-0.667***	(0.043)	-0.692***	(0.044)
3rd quarter	-0.350***	(0.040)	-0.422***	(0.041)
4th quarter	0.900***	(0.031)	0.846***	(0.033)
Quarter of entry into employment (Ref. 1st quarter)				
2nd quarter	0.302***	(0.030)	0.357***	(0.035)
3rd quarter	0.177***	(0.037)	0.212***	(0.042)
4th quarter	0.108***	(0.041)	0.144***	(0.046)
Ln(Age) (Ref.: mean age)	0.231***	(0.056)	0.230***	(0.068)
Married	-0.016	(0.027)	-0.004	(0.033)
Children	-0.051	(0.037)	-0.039	(0.045)
Children ≤ 10 years	-0.030	(0.039)	-0.050	(0.047)
Non-German	0.162***	(0.032)	0.173***	(0.039)
Severely handicapped	0.221**	(0.097)	0.218*	(0.111)
Health restrictions	0.004	(0.038)	-0.003	(0.046)
School leaving certificate (Ref. No degree or lower secondary school)				
Middle secondary school	-0.138***	(0.031)	-0.194***	(0.037)
(Specialized) Upper secondary school	-0.386***	(0.045)	-0.455***	(0.054)
Professional training (Ref. Unskilled)				
Apprenticeship or technical college	-0.134***	(0.026)	-0.137***	(0.032)
University degree	-0.476***	(0.076)	-0.498***	(0.088)
Sector of last job (Ref. Others (public sector, agriculture))				
Construction	0.046	(0.035)	0.046	(0.044)
Production	-0.266***	(0.039)	-0.316***	(0.048)
Wholesale/Retail	-0.383***	(0.045)	-0.447***	(0.054)
Private sector services	-0.123***	(0.036)	-0.180***	(0.044)
Local macroeconomic conditions				
Unemployment rate (Ref.: mean rate)	4.640***	(0.448)	5.210***	(0.529)
Real GDP per capita (Ref.: mean GDP)	-0.002*	(0.001)	-0.003**	(0.001)
Duration of previous unemployment				
Level (in months)	0.030***	(0.006)	0.047***	(0.008)
Squared	-0.001***	(0.000)	-0.002***	(0.000)
Mini-Job	0.007	(0.045)	-0.277***	(0.065)

To be continued.

Table A.1 continued.

	Without unobs. het.	M=9
<i>Equation 4: Linear wage equation (wage in first month of regular employment)</i>		
Constant	4.140*** (0.008)	4.269*** (0.011)
Quarter of entry into employment (Ref. 1st quarter)		
2nd quarter	-0.024*** (0.007)	-0.009* (0.006)
3rd quarter	-0.059*** (0.008)	-0.027*** (0.006)
4th quarter	-0.086*** (0.008)	-0.054*** (0.006)
Ln(Age) (Ref.: mean age)	0.193*** (0.011)	0.168*** (0.012)
Married	0.026*** (0.005)	0.022*** (0.006)
Children	0.036*** (0.007)	0.016** (0.008)
Children \leq 10 years	0.016** (0.008)	0.027*** (0.008)
Non-German	-0.093*** (0.006)	-0.078*** (0.007)
Severely handicapped	-0.003 (0.020)	-0.026 (0.023)
Health restrictions	-0.065*** (0.008)	-0.060*** (0.009)
School leaving certificate (Ref. No degree or lower secondary school)		
Middle secondary school	0.046*** (0.006)	0.050*** (0.007)
(Specialized) Upper secondary school	0.198*** (0.007)	0.207*** (0.009)
Professional training (Ref. Unskilled)		
Apprenticeship or technical college	0.093*** (0.005)	0.094*** (0.006)
University degree	0.305*** (0.011)	0.360*** (0.014)
Sector of last job (Ref. Others (public sector, agriculture))		
Construction	0.150*** (0.007)	0.128*** (0.008)
Production	0.061*** (0.007)	0.039*** (0.009)
Wholesale/Retail	0.042*** (0.008)	0.038*** (0.010)
Private sector services	-0.031*** (0.006)	-0.022*** (0.008)
Local macroeconomic conditions		
Unemployment rate (Ref.: mean rate)	-0.895*** (0.089)	-0.974*** (0.088)
Real GDP per capita (Ref.: mean GDP)	-0.001*** (0.000)	0.000 (0.000)
Duration of previous unemployment (in months)		
Level	-0.015*** (0.001)	-0.005*** (0.001)
Squared	0.000*** (0.000)	0.000*** (0.000)
Ln(σ)	-1.208*** (0.004)	-1.742*** (0.006)
Mini-Job	-0.074*** (0.010)	-0.002 (0.009)

To be continued.

Table A.1 continued.

	Without unobs. het.	M=9
<i>Unobserved heterogeneity</i>		
V_{u2}		-0.018 (0.071)
V_{u3}		-0.707*** (0.058)
V_{u4}		-0.357*** (0.096)
V_{u5}		-0.535*** (0.067)
V_{u6}		-1.393*** (0.112)
V_{u7}		-1.700*** (0.115)
V_{u8}		0.373*** (0.093)
V_{u9}		-0.839*** (0.108)
V_{m2}		-0.448 (0.380)
V_{m3}		0.262 (0.194)
V_{m4}		3.022*** (0.171)
V_{m5}		1.125*** (0.159)
V_{m6}		-0.968* (0.517)
V_{m7}		0.155 (0.220)
V_{m8}		-0.351 (0.483)
V_{m9}		0.796*** (0.228)
V_{e2}		-0.226*** (0.072)
V_{e3}		0.151** (0.072)
V_{e4}		0.684*** (0.114)
V_{e5}		0.025 (0.063)
V_{e6}		-2.223*** (0.529)
V_{e7}		2.266*** (0.109)
V_{e8}		0.954*** (0.085)
V_{e9}		0.196** (0.096)
V_{w2}		0.400*** (0.010)
V_{w3}		-0.196*** (0.007)
V_{w4}		-0.192*** (0.014)
V_{w5}		-0.604*** (0.010)
V_{w6}		-0.176*** (0.015)
V_{w7}		-0.513*** (0.014)
V_{w8}		-0.363*** (0.013)
V_{w9}		-1.030*** (0.014)
ω_2		-1.759*** (0.106)
ω_3		0.459*** (0.121)
ω_4		-2.018*** (0.191)
ω_5		-0.784*** (0.101)
ω_6		-0.208 (0.166)
ω_7		-1.150*** (0.145)
ω_8		-2.270*** (0.203)
ω_9		-2.161*** (0.139)
Correlations between unobserved terms		
Corr(V_u, V_m)		0.302*** (0.117)
Corr(V_u, V_e)		0.232* (0.122)
Corr(V_u, V_w)		0.410*** (0.039)
Corr(V_m, V_e)		0.579*** (0.145)
Corr(V_m, V_w)		-0.390*** (0.062)
Corr(V_e, V_w)		-0.262*** (0.033)

Note: V_{u2} - V_{u9} , V_{m2} - V_{m9} and V_{e2} - V_{e9} are the masspoints for the unemployment, treatment and employment probability; V_{w2} - V_{w9} are the masspoints for the wage equation. ω_2 - ω_9 are the parameters to calculate the distribution of the masspoints as depicted in Equation 5 For identification V_{u1} , V_{m1} , V_{e1} , V_{w1} and ω_1 are set to be zero.

Table A.2: Alternative definition of unemployment: Baseline estimation results

	Transition UE to RE		Transition RE to UE		Linear wage equation	
	(1)	(2)	(3)	(4)	(5)	(6)
Mini-Job	0.178*** (0.034)	0.100** (0.047)	-0.001 (0.041)	-0.188*** (0.062)	-0.074*** (0.009)	0.002 (0.009)
Unobs. Het. (M=9)	No	Yes	No	Yes	No	Yes

Note: Depicted are estimation results using an alternative definition of unemployment. In contrast to the preferred specification (see Table 7), here we additionally define periods not covered by the data as unemployment. The estimation also includes control variables for duration dependence, seasonal dummies, individual socio-demographics, information on last job and local macroeconomic conditions. UE - Unemployment, ME - Marginal employment, RE - Regular employment.

Table A.3: Alternative definition of unemployment: Effect heterogeneity

	Transition	Transition	Linear wage
	UE to RE (1)	RE to UE (2)	equation (3)
Mini-Job	0.087 (0.060)	-0.210*** (0.079)	-0.023** (0.012)
Mini-Job \times Ln(Age)	-0.077 (0.172)	-0.082 (0.215)	0.059 (0.037)
Mini-Job \times Unskilled	0.047 (0.076)	-0.013 (0.090)	0.049*** (0.014)
Mini-Job \times Construction	-0.054 (0.080)	0.081 (0.100)	0.024 (0.016)
Mini-Job \times Local UE-Rate	2.094 (1.425)	-2.381 (1.718)	-0.575** (0.284)
Unobs. Het. (M=9)	Yes	Yes	Yes

Note: Depicted are estimation results using an alternative definition of unemployment. In contrast to the preferred specification (see Table 8), here we additionally define periods not covered by the data as unemployment. The estimation also includes control variables for duration dependence, seasonal dummies, individual socio-demographics, information on last job and local macroeconomic conditions. Individuals who have no professional degree at entry into unemployment are categorized as “unskilled”. UE - Unemployment, ME - Marginal employment, RE - Regular employment.

Table A.4: Alternative definition of unemployment: Treatment effect and elapsed unemployment duration

	Transition UE to RE		Transition RE to UE		Linear wage equation	
	(1)	(2)	(3)	(4)	(5)	(6)
Mini-Job	-0.075 (0.064)	-0.074 (0.064)	-0.138* (0.083)	-0.138* (0.083)	-0.006 (0.013)	-0.006 (0.013)
Mini-Job × 7-12 months	0.167* (0.091)	0.161* (0.091)	-0.067 (0.105)	-0.067 (0.106)	0.021 (0.018)	0.021 (0.018)
Mini-Job × 13-36 months	0.508*** (0.088)		-0.198* (0.112)		0.016 (0.018)	
Mini-Job × 13-24 months		0.562*** (0.094)		-0.251** (0.117)		0.024 (0.018)
Mini-Job × 25-36 months		0.326*** (0.125)		0.225 (0.210)		-0.013 (0.031)
Unobs. Het. (M=9)	Yes	Yes	Yes	Yes	Yes	Yes

Note: Depicted are estimation results using an alternative definition of unemployment. In contrast to the preferred specification (see Table 9), here we additionally define periods not covered by the data as unemployment. The estimation also includes control variables for duration dependence, seasonal dummies, individual socio-demographics, information on last job and local macroeconomic conditions. UE - Unemployment, ME - Marginal employment, RE - Regular employment.