Unemployment Insurance and Underemployment

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Abstract. Should unemployment insurance (UI) systems provide coverage for underemployed job seekers? Based on a statistical analysis of Norwegian unemployment spells, we conclude that the answer to this question is yes. Allowing insured job seekers to retain partial UI benefits during periods of insufficient part-time work not only reduces UI expenditures during the part-time work period, but it also unambiguously reduces the time until a regular self-supporting job is found. Probable explanations are that even small temporary part-time jobs provide access to useful vacancy information and that such jobs are used by employers as a screening device when hiring from the unemployment pool.

1. Introduction

Should unemployment insurance (UI) systems provide coverage for underemployed job seekers, i.e. for persons who have some paid work, but would like to work more? Standard job search theory suggests that policy makers face a trade-off — see e.g. Ek and Holmlund (2015): Offering partial UI benefits to part-time workers seeking full-time employment reduces unemployment, as it becomes more attractive to substitute underemployment for unemployment, and hence the set of acceptable jobs is expanded. But at the same time it also makes part-time work relatively more attractive compared with full-time employment, potentially implying that search effort for full-time work declines and reservation wages increase. On the other hand, some part-time employment may represent a stepping stone toward full-time employment with the same employer, and also give enhanced access to informal networks with information about other relevant job openings. The overall impact of subsidized part-time work during job search is thus ambiguous, both with respect to the total duration of UI-subsidized job search and with respect to the quality of the job eventually obtained.

On the basis of exceptionally rich Norwegian administrative data, the present paper examines the impact of obtaining a UI-subsidized part-time job on the duration and the eventual outcome of UI spells. As an employment transition partly involves an investment decision, we define job quality not only on the basis of initial earnings, but on the basis of the much broader and longer term consequences of the job match in question, including its potential for

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providing a stepping stone for subsequent career advancements. We do this by taking into account realized earnings over a longer time period after the match (3 years in our main specification), regardless of the extent to which these earnings were directly related to the first job obtained after unemployment.

The obtainment (and upkeep) of a part-time job during the job search period is clearly a non-randomly assigned event; hence, empirical assessment of its causal effects is subject to a serious endogeneity problem. We deal with this problem by means of a timing-of-events methodology (Abbring and Van den Berg, 2003) based on a multivariate mixed proportional hazard rate model. The model accounts for endogenous transitions between partial and full unemployment (both ways), as well as for transitions to active labor market programs (ALMP). The endogenously modeled final outcomes include transitions to employment and subsequent earnings, as well as transitions to alternative social insurance programs.

Our paper builds on an existing research literature examining how UI design affects the attractiveness of part-time and full-time work. Important early contributions to this literature are McCall (1996, 1997), using USA and Canadian data, respectively. The former of these papers exploits across-state variation in the so-called earnings disregard — the labor income UI claimants are allowed to earn with no reduction in benefits — to examine the impacts of the level of this regard on the part-time and overall re-employment hazards. The main finding is that increasing the disregard significantly increases the transition rate to part-time jobs and also reduces the overall expected time until some form of employment is obtained. However, none of the McCall (1996, 1997) papers examine whether the obtainment of part-time-employment increases or reduces the duration until full-time employment. There is also a more recent empirical literature focusing on the impacts of obtaining a UI-subsidized part-time job on the hazard rate to full-time employment. Based on Finnish data, Kyyrä (2010) find no significant impacts of UI-supported part-time work on the transition rate to regular unsubsidized work. As the data used in this paper contain relatively few observations, statistical inference is seriously limited by large standard errors. Based on Danish data, Kyyrä *et al*. (2013) identify a sharp decline in the transition rate to full-time employment as job seekers move into UI-supported part-time work. After the return to full unemployment, however, there is a positive impact of having had some part-time work, suggesting that there is a favorable stepping stone effect. Hence, the latter study indicates that there is indeed a trade-off involved — between a negative lock-in effect during the period of part-time work and a positive stepping stone effect afterwards. Kyyrä *et al*. (2013) conclude that the net effect on UI duration is positive for some groups and negative for others. In a related paper, Cockx *et al*. (2013) analyze the effect of subsidized part-time work for long-term unemployed young women in Belgium. The authors find no evidence of lock-in effects, and conclude that low-paid part-time work serves as a stepping stone for regular employment in this sample.

In the present paper, partial employment during job search is found to unambiguously reduce the time used to find unsubsidized regular employment. That is, both post-program and on-program effects of working part-time during job search are positive. We find no sign of lock-in effects. Partial employment during job search does not have any effects on job quality. As subsidized part-time work presumably raises the reservation wage associated with full-time employment, this suggests that part-time work increases the job offer arrival rate considerably, as the employment experience potentially triggers a regular job offer from the part-time employer and/or provides access to more information about other job vacancies. The lack of effects of partial unemployment on job quality is at first sight a bit

counterintuitive, as higher reservation wages should tilt acceptable job matches toward higher quality jobs. A likely explanation is that occasional part-time work is more common in segments of the labor market characterized by low earnings and limited possibilities for career advancements.

The rest of the paper is organized as follows: Section 2 describes the data used in the analysis. The econometric model is formulated in Section 3, and identification is discussed in Section 4. Section 5 presents key estimates from our model, and Section 6 concludes the paper.

2. Data and institutional background

The Norwegian UI system is universal, with individual eligibility based on earnings history prior to job loss. In order to qualify, individuals are required to satisfy a minimum income requirement, based on total labor earnings in the calendar year before entry to unemployment (or the average over the previous three calendar years). In 2007, this minimum income level was 98,257 NOK (11,230 EUR). Students are not eligible for unemployment benefits. To receive unemployment benefits, job seekers must register with the unemployment office and file unemployment status forms every 14 days. Generally, unemployment benefits are paid after a 3-day waiting period, although the waiting period can be extended by at least 8 weeks for persons who quit their job voluntarily or who were at fault for losing their job. Job seekers who receive severance payments will generally be required to wait until the end of the severance period before they can receive unemployment benefits. The replacement rate is 62.4 per cent (capped at high earnings). In general, maximum UI duration is 2 years. For unemployed job seekers with low earnings prior to entering unemployment, maximum duration may be shorter (1 year). However, the sample will be constructed so that all individuals are entitled to 24 months UI.

The UI system makes a distinction between ordinary unemployment, the subject of this paper, and temporary layoffs, where the lack of work is expected to be temporary, resulting from circumstances beyond the employer's control. For temporary layoffs, with an explicit expectation of a recall, additional rules and conditions apply. Job seekers on temporary layoffs are entitled to UI benefits in the same way as persons on ordinary unemployment. However, they remain employees of the firm, and they face more lenient job search requirements. The maximum UI duration is also different for this group. When constructing the sample, we therefore exclude job seekers who are registered as being on temporary layoff.[1]

Persons whose previous employment and earnings history make them eligible for UI can work part-time and still receive benefits as long as their working hours are cut by at least 50 per cent, provided that they search actively for more work. That is, workers are able to receive partial benefits while working as long as their working hours are less than half of what they were before the job loss. Benefits are reduced in proportion to hours of work relative to normal hours worked prior to the unemployment spell. The possibility of retaining some unemployment benefits during partial unemployment should make taking up small part-time jobs more attractive to unemployed job seekers. Without this possibility, unemployed job seekers would have limited economic incentives to accept small part-time jobs, with less than 50 per cent of pre-unemployment hours, as this would typically reduce their income compared with remaining full-time unemployed.

The continued job search requirement means that all workers who are registered as partially unemployed job seekers have a (self-reported) preference to work longer hours. In other

words, the part-time unemployed workers in our sample should be regarded as underemployed workers. Taking up partial benefits rather than remaining full-time unemployed does not affect the maximum UI duration.

Our main source of data is monthly records on registered unemployment. When constructing the sample, data on registered unemployment are linked to data on jobs, annual earnings, and demographics. The starting point in constructing the sample is all new full-time unemployment spells with unemployment benefits, starting between January 2003 and December 2007. Unemployment status is recorded at the end of each month. As a consequence, our sample will exclude some very short spells, as individuals entering unemployment will fail to show up in the data if they exit registered unemployment before the end of the month. We will take the resultant left-truncation into account in our statistical analysis. To ensure that our claimants start out with a full 2-year maximum UI benefit period, we restrict the sample to individuals who were neither unemployed nor registered in education the last 12 months before entering unemployment, and who satisfied the income requirements for UI eligibility.[2] Restricting the sample population in this way ensures that every unemployed person entering the sample is eligible for unemployment benefits for a full 24-month period, such that we are able to describe UI entitlements correctly.[3]

In the first month of each spell, all job seekers are by definition on full-time unemployment, receiving benefits. In later months, those still looking for work can be in one of three mutually exclusive states: full-time unemployment, part-time unemployment, or participating in an ALMP. Similarly, each month, we observe whether they receive unemployment benefits. Temporary benefit loss can happen for a variety of reasons, such as a sanction if workers refuse to participate in activities or accept a suitable job offer, or when the person is sick or on vacation. Part-time unemployed workers will lose their benefits in periods when hours worked in their part time job exceed 50 per cent of hours in their old job.

In constructing the spells, a person is considered as leaving unemployment once he/she leaves registered unemployment altogether and does not re-enter for at least 3 months. Interruptions from unemployment lasting 3 months or less are censored, such that the spells continue when they return to unemployment (not including the missing months). Very short absences from registered unemployment are more likely to reflect registration issues, including cases where job seekers forget to file employment status forms, go on vacation, as well as cases where there are registration errors. Ignoring shorter absences from registered unemployment thus ensures that the way we measure exits from unemployment better reflects the end date of the unemployment episode as a whole.

Exits from unemployment are classified as either exits to employment or to other social insurance programs, primarily social assistance and health-related benefits. Transitions out of unemployment are classified as exits to employment only if the individual can be linked to a job in the employer–employee register with a recorded starting date between 30 days before exit from unemployment and 60 days after exit from unemployment. Exits from unemployment that cannot be classified into either category will be treated as right-censored.

Next, the unemployment spells are merged with individual characteristics that are thought to influence the job search process. For each individual, we attach data on age, gender, household size and number of kids under 18. In order to minimize disturbances related to exits to education and retirement, only people aged 25–55 are retained in the sample. The dataset includes dummies for family status (married, with or without children, cohabiting with joint children, unmarried with/without kids). Education is included as a set of dummy variables:

compulsory education only, some high school, high school graduates, some college, undergraduate degree, graduate degree (MA or PhD), and education unknown. As additional control variables, we include pre-unemployment earnings and indicators of personal liquidity (based on bank deposits) and a dummy for those qualifying for extended unemployment benefits. The latter is relevant during parts of the data period only, in which unemployed workers with a strong labor market attachment were eligible to continue receiving benefits after the maximum UI duration was reached, although at a significantly lower replacement rate. For workers who make a transition to employment, we attach data on subsequent earnings. The primary earnings measure used is total labor earnings averaged over the three calendar years following exit from unemployment; we also include labor earnings from the first year only, as an alternative, more short-term measure of job quality.

The sample consists of 27,403 unemployment spells, representing 27,294 persons counting a total of 251,604 person-month observations. This relatively small number of spells, as well as the fact that so few persons are registered with two or more spells, probably reflects the selection criteria where we condition on no prior unemployment experience in the 2 years before entering the sample. Table 1 presents some summary statistics of these spells.

Although maximum benefit duration is 24 months for all workers in the sample, the average spell duration is considerably shorter at 8.08 benefit months used at the end of the spell. Just 5 per cent of spells ever reach benefit exhaustion.

Subsidized part-time work is fairly common: 46 per cent of all spells have at least 1 month of partial unemployment. Subsidized part-time work is more common among women than men, and more common among persons who worked part-time before entering unemployment. Job seekers who have one or more period of partial employment appear to be largely similar to the rest of the sample in terms of age, education, family status and personal liquidity.

Having experienced subsidized part-time work is associated with longer unemployment durations and a higher share of spells reaching benefit exhaustion. This reflects the statistical artifact that longer spells imply a higher likelihood of ever receiving this 'treatment', and not that the probability of making a job transition is lower during part-time work. This is illustrated in Figure 1, which presents the observed transition rates to employment (regardless of job quality) by part-time status and UI duration. Panel (a) shows exit rates by current partial employment status, whereas panel (b) plots exit rates by previous partial employment status. It is clear that underemployed job seekers have higher exit rates than the full-time unemployed at all benefit durations. Exit rates for people who have finished one or more spell of subsidized part-time work appear to be quite similar, perhaps with slightly higher transition rates, compared with the rest of the sample.

For 41 per cent of spells involving one or more month of subsidized part-time work, we are able to link the part-time job to an employer in the employer–employee register. In 79 per cent of exits to employment with some prior subsidized part-time work, the part-time employer and the eventual employer in the regular job are identical. Looking only at transitions directly from partial employment, 85 per cent of job exits are to the same employer, suggesting that some firms use part-time work as a way of screening new workers when hiring from unemployment.

Finally, to investigate the relationship between recall unemployment and subsidized part time work, we look at spells ending in transition to regular (unsubsidized) employment, where we can credibly identify the employers in both the pre-unemployment job and the initial job after unemployment exit ($N = 4{,}287$). On average, 20.9 per cent of these job transitions involve

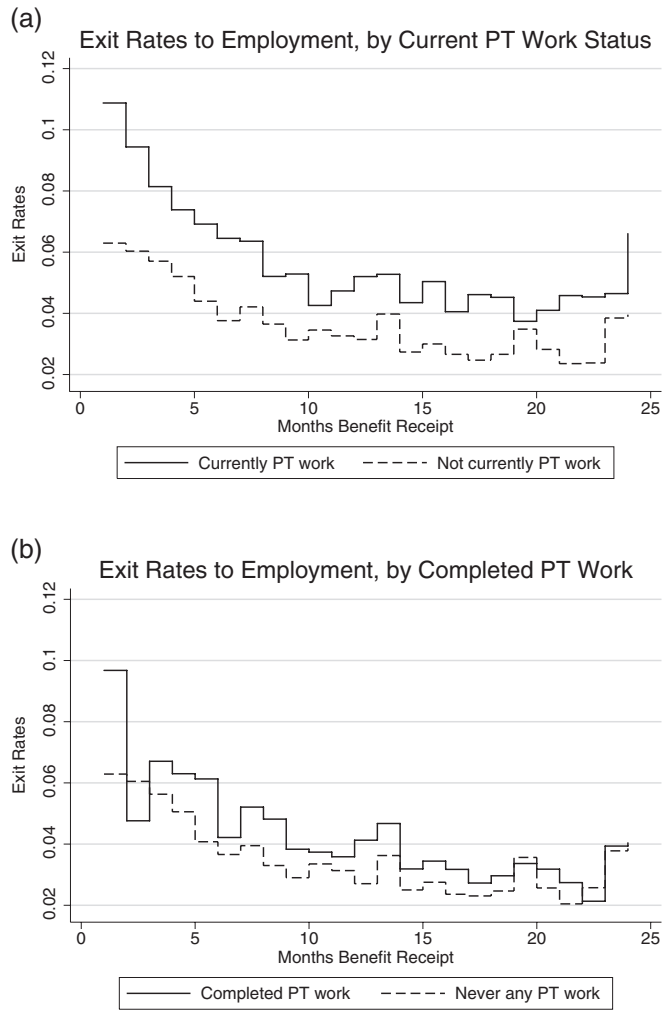
Table 1. Summary statistics, by partial employment status

	(1) All spells Mean	(2) No partial UI Mean	(3) With partial UI Mean
Background characteristics			
Age	37.29	37.00	37.64
Female	.51	.45	.58
Married, no kids	.07	.07	.08
Married, with kids	.38	.37	.38
Cohabiting	.11	.11	.11
Single, with kids	.08	.07	.09
Single, no kids	.36	.38	.34
Number of children if children present	1.73	1.72	1.73
Only compulsory education	.35	.32	.39
Secondary education	.56	.57	.54
Higher education	.09	.10	.07
Qualified for continued benefits	.70	.65	.75
Low liquidity	.50	.49	.50
Old job was part-time (if old job known)	.21	.12	.31
Outcomes			
Benefit months used at end of spell	8.08	5.99	10.47
To benefit exhaustion	.05	.02	.09
Ever temp. benefit stop	.25	.12	.40
Ever on partial benefits	.46	.00	1.00
Ever on ALMP	.19	.16	.22
To employment	.45	.49	.41
Other benefit	.09	.09	.08
Still ongoing December 2007	.08	.09	.08
Earnings — year 1	324.83	343.47	299.66
Earnings — 3-year average	330.59	350.16	304.18
New job is part-time (if job is known)	.19	.11	.30
New job is part-time (from full-time)	.11	.07	.18
New job is part-time (from part-time)	.49	.41	.53
Observations	27,403	14,664	12,739

Notes: Table shows summary statistics of all spells; column 2 represents spells with no episodes of part-time work, and column 3 represents spells with at least one episode of part-time work during the period of registered unemployment. 'Qualified for continued benefits' is an indicator variable that is equal to one for individuals whose earnings and employment history make them eligible for extended unemployment benefits. 'Low liquidity' is an indicator that is equal to one for people whose liquidity — defined as total household bank deposits adjusted for household size — is below sample median.
ALMP, active labor market program; UI, unemployment insurance.

a return to the previous employer.[4] The figure is 9.4 percentage point higher for spells with one or more month of subsidized part time work (26.7 per cent). This could happen if workers who are let go during bad times are hired back on a part-time basis when conditions start to improve. These persons can then return to full-time work when conditions improve further. In other words, subsidized part-time work may be a feature of persons returning to their old employer after being laid off. While this is difficult to address in a formal model — partly due to data issues, i.e. the inability to credibly identify previous and new employer in the register data — this pattern should be kept in mind when interpreting the results of the econometric model.

Figure 1. Exit rates to employment, by partial benefit status: (a) to employment, current recipient; (b) to employment, previous recipient



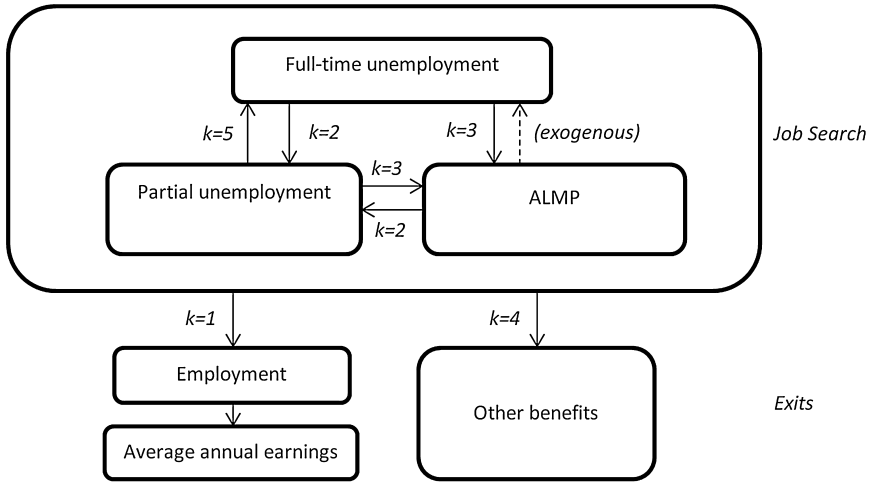
Notes: Figure shows empirical exit rates to employment by UI duration. In panel (a), the solid line represents exit rates for partially employed job seekers, whereas the dashed line plots exit rates for other job seekers. In panel (b), the solid line represents exit rates for full-time unemployed job seekers who have completed one or more month of partial employment, and the dashed line plots exit rates for other full-time unemployed job seekers [underemployed job seekers currently working part-time are not represented in the figure in panel (b)].

3. Econometric model

We set up a competing risks model of unemployment durations. We model five transitions, indexed by $k = 1, \ldots, 5$:

1. to employment;
2. to participation in active labor market program;
3. to partial employment;

Figure 2. Modeled transitions/outcomes



4. to other benefits (sickness benefits, disability, social assistance); and
5. for workers on partial employment: return to full-time unemployment.

In addition, for all transitions to employment, we also model as an endogenous outcome the average annual earnings level over the subsequent three calendar years. Events 1 and 4 terminate the unemployment spell. Participation in ALMPs and working part-time during job search do not terminate the unemployment spell. Current and past participation in these programs is allowed to have causal effects on all other transitions. For persons in subsidized part-time employment, the return to full employment is modeled as an endogenous event, to ensure that our causal estimates are not biased by selectivity in the durations of part-time jobs. The ALMPs, offered through the local employment office, will have a fixed duration (e.g. training courses for job seekers have a maximum duration of 10 months, unpaid work placement schemes have a maximum duration of 12 months for non-disabled workers). Typically there is limited opportunity for participants to either return to full-time unemployment before the program is completed, or extend the duration of program participation. The duration of ALMP participation is therefore assumed to be predetermined (unless a job is found), so transitions from ALMP back to full-time unemployment are not modeled as endogenous events. The model is illustrated in Figure 2, where the solid arrows represent the modeled (endogenous) transitions.

Formally, let λ_{kit} be individual is hazard rate for event k. We assume hazard rates are proportional in observed and unobserved characteristics. Employment status is observed monthly, so we write the model in terms of grouped integrated hazard rates. Assuming the underlying continuous time hazard rates are constant within each month, we define the monthly integrated hazard rates θ_{kit} as functions of observable and unobservable individual characteristics

$$\theta_{kit} = \int_{t-1}^{t} \lambda_{kis} ds = \exp(\phi_{kit} + v_{ki}) \quad [1]$$

where ϕ_{kit} is an index function of (possibly time-varying) observables. The unobserved covariate v_{ki} is a time-invariant scalar variable summarizing individual i's intrinsic propensity to make a transition of type k.

For spells that end in a transition to employment, we implement the following model of (log) average earnings over the three following calendar years, w_{it}:

$$w_{it} = \exp(\phi_{6it} + v_{6i} + \varepsilon_i) \quad [2]$$

where ϕ_{kit} is an index function of observable characteristics, v_{ki} is unobserved individual characteristic related to earnings capacity, and ε_i is a random error term, assumed to be normally distributed with mean 0 and variance σ^2.

For events $k = 1, \ldots, 5$, the index function ϕ_{kit} is defined as

$$\phi_{kit} = \beta^q_{kt} q_{it} + \beta^d_{kdt} d_{it} + \beta^z_k z_{it} + \beta^r_k r_{it} + \beta^x_k x_{it}, k = 1, \ldots, 5 \quad [3]$$

d_{it} are dummies for UI duration, measured by months of unemployment benefit receipt. We use months with UI claims as our fundamental duration concept, implying that the 'duration-clock' is stopped in periods without UI benefits (due to e.g. sanctions or program participation). In this way, our duration measure will reflect remaining time to benefit exhaustion — that is, at 18-month duration, all spells will have another 6 months of potential benefit receipts remaining. This makes it easier to interpret duration effects in light of changing incentives to return to work as benefit exhaustion approaches. At the point of UI exhaustion after 24 UI months, all spells are right-censored. The reason for this is that the termination of UI entitlements implies the removal of the main incentive to register at the employment office and thus a significant drop in data reliability. In addition, more than 95 per cent of spells have already ended at this point.

z_{it} is an indicator of a cut in benefits before benefit exhaustion. It is assumed to have the same effect on persons in full-time and part-time unemployment. Such temporary cuts are not modeled as endogenous events, and thus estimates of $\hat{\beta}^z$ should not be given a causal interpretation.

r_{it} is a vector of four dummies indicating ongoing or completed participation in ALMP or partial employment, capturing on-program and post-program effects of interventions. q_{it} are monthly calendar time dummies.

x_{it} is a vector of observables: gender, age (dummy-coded), education (dummy-coded, seven groups), family type (married, cohabiting, single, with or without kids), household size, log annual earnings before entry to unemployment, and a set of indicators of low liquidity and qualifications for extended unemployment benefits. Log annual earnings before entry to unemployment are included as a control for heterogeneity and should not be given a causal interpretation.

The index function for earnings is given by

$$\phi_{6it} = \beta^q_{6t} \bar{q}_{it} + \beta^d_{6dt} \bar{d}_{it} + \beta^z_6 z_{it} + \beta^r_6 r_{it} + \beta^x_6 x_{it} \quad [4]$$

where $\bar{d}_{it}$ is the duration of the completed unemployment spell, and $\bar{q}_{it}$ indicates calendar month of exit to employment.

As there are five modeled events and a wage equation, each person is characterized by a six-dimensional unobserved heterogeneity vector. We do not impose any restrictions on the way these unobservables are correlated. We estimate the joint distribution non-parametrically along the lines suggested by Heckman and Singer (1984). This implies that we add new

support points and location vectors to the heterogeneity distribution until it is no longer possible to increase the likelihood function. Our estimation algorithm also deals with the potential left-truncation problem arising from our monthly point-in-time sampling schedule, implying that very short spells — those starting and stopping between two observation posts — are lost from the sample; see Gaure *et al.* (2007).[5] The likelihood function is presented in Appendix A.

All explanatory variables are included in all transitions except where it is logically impossible, e.g. current participation in ALMP is not included in the hazard rate to ALMP participation. The final model contains 860 parameters to be estimated, not counting the parameters of the distribution of unobserved heterogeneity. The large number of parameters reflects that we have taken advantage of our large dataset to impose a minimum of functional form restrictions on the way various control variables affect the hazard rates. This has been done to prevent invalid restrictions from distorting our results.

4. Identification

The model presented in the previous sections raises some rather intricate identification issues related to the disentanglement of causal effects from potential sorting on unobserved heterogeneity. In particular, we need to ensure that our estimates regarding duration dependencies and the impacts of part-time work and participation in ALMPs really capture the presumed causal effects, and not the selectivity associated with the already realized events.

For the mixed proportional hazard rate model that we use in the present paper, the causal impacts of spell duration and of endogenous events have been shown to be non-parametrically identified, provided that some regularity conditions are met — see Van den Berg (2001), Abbring and Van den Berg (2003), and Drepper and Effraimidis (2015). Identification then relies on a no-anticipation assumption, requiring that individuals do not foresee and act ex ante upon the realization of the stochastic process determining future events. The causal parameters of primary interest in our case are those representing the on-treatment and post-treatment effects of obtaining a part-time job with partial UI benefits. The no-anticipation assumption will be violated if, say, an unemployed job seeker is informed that a part-time job will be available at some specific time in the future, and at the same time responds to this information by changing job search behavior immediately. Because we cannot rule out such violations, we find it hard to believe that they are empirically important in our context. Both part-time jobs and ALMP slots typically become available at very short notice, and are implemented quickly once the relevant decisions have been made. Note also that the no-anticipation assumption does not rule out behavioral responses toward changes in event probabilities insofar as these are captured by the systematic part of the model.

Because the standard identification results referred to above rely heavily on the proportional hazards assumption, it has been shown in the literature that the proportionality assumption can be relaxed if there is sufficient time variation in the explanatory covariates (Brinch, 2007; McCall, 1994). The intuition behind this result is that time-varying covariates provide implicit 'exclusion restrictions' in the sense that past values of these variables are assumed to have no direct causal effects (conditional on their current values), and therefore correlate with current outcomes only via the sorting process (Eberwein *et al.*, 1997). Of particular value for identification in our case is the substantial calendar time variation in both labor market tightness (providing time variation in transitions to the two employment states as well as to part-time work) and in the scale of labor market programs (providing

time-varying in the transition to ALMPs), which we capture in the most flexible way possible, i.e. by means of a large number of calendar time dummy variables.

Identification of the earnings equation (equation [2]) is discussed in Gaure *et al.* (2012). They argue that provided that the distribution of unobserved characteristics directly affecting the transitions (v_1, v_2, v_3, v_4, v_5) is identified through the event history part of the model — which it is in our case — their correlation with the unobserved earnings potential ($\upsilon 6$) can be traced out through the observed distribution of realized earnings conditional on the realized event history.

5. Results

Table 2 contains selected estimated effects, in the form of exponentiated parameter estimates (with *t*-values in parentheses).[6] These numbers represent the proportional shifts in the hazard rates generated by unit changes in the explanatory variables. For example, the number 1.599 in the upper left-hand cell indicates that ongoing part-time work raises the hazard rate to unsubsidized employment by 59.9 per cent, ceteris paribus. The full estimation results (in the form of parameter estimates with standard errors) can be found in Appendix B.

Column 1 of Table 2 presents estimated effects on transitions to employment. The model finds positive effects of subsidized part-time employment on transitions to regular employment both during and after part-time employment. Ongoing part-time work increases the hazard rate to employment by around 60 per cent. The post-program effect is somewhat smaller — 18.4 per cent — but still highly statistically significant. In this model, ALMP appears to have substantial negative effects on transitions to employment during participation. The post-program effect is not statistically significant.

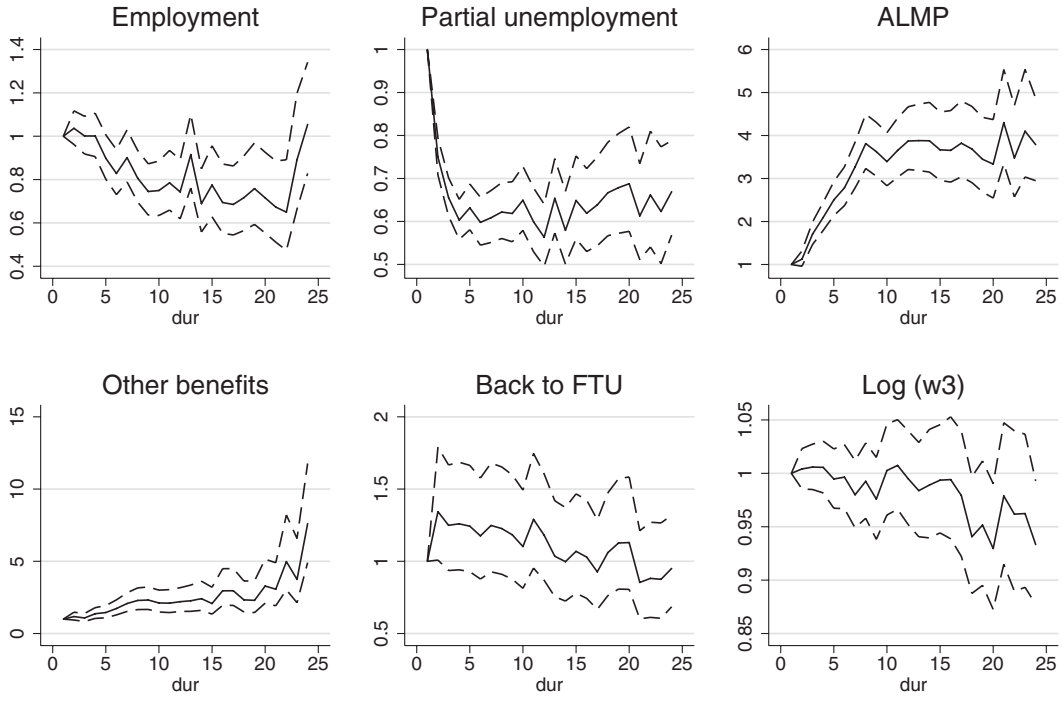
Column 6 shows estimated effects on job quality, as measured by average annual earnings over the 3-year period following after the year of employment entry. Subsidized part-time work does not appear to have any effect on job quality. Estimates are negative, but close to zero and not statistically significant.[7]

Table 2. Main model: selected exponentiated estimates

Variable	(1) Employment	(2) PT Work	(3) ALMP	(4) Other Ben	(5) To FTU	(6) w_3
PT Work (on)	1.599***		.608***	.665***		.984
	(10.104)		(–8.737)	(–3.686)		(–1.412)
PT Work (post)	1.184***	2.461***	.838***	1.019		.988
	(3.535)	(23.847)	(–3.605)	(.204)		(–1.115)
ALMP (on)	.524***	.685***		.392***		.969*
	(–9.485)	(–8.211)		(–8.028)		(–1.823)
ALMP (post)	1.088	1.398***	.976	.851*	.824***	1.003
	(1.571)	(8.03)	(–.478)	(–1.82)	(–3.549)	(.25)
Observations	269,704	211,607	254,264	269,704	58,097	11,917

Notes: Table shows selected estimates from model with 25 mass points in the distribution of unobserved heterogeneity. Exponentiated coefficients, *t*-values in parentheses. 'PT Work' refers to taking up a part-time job while remaining in (partial) unemployment. 'Other Ben' includes transitions to rehabilitation benefits, long-term sick leave, disability pensions and social assistance. 'To FTU' refers to transitions from partial employment to full-time unemployment. Additional controls: age, gender, family status, education, calendar time, liquidity, qualification for extended benefits, and temporary benefit stop.
*, **, *** Significant at the 10, 5, 1 percent level.

Figure 3. Duration dependence



Notes: Figure plots estimated duration dependence with 95 per cent confidence intervals. Exponentiated coefficients plus minus 2 standard deviations. Preferred model specification with unobserved heterogeneity (25 mass points). All spells treated as censored after benefit exhaustion.

Figure 3 shows estimated duration dependence for the five modeled transitions, together with estimated effects of completed spell duration on realized earnings. All duration profiles are normalized to unity in the first month. Note that the scale of the y-axis varies in the six panels in order to be able to show the shapes of the different duration profiles. The hazard to partial unemployment drops off quickly early in the unemployment spell and then stays flat. The ALMP hazard rises nearly linearly during the first 8 months of benefit receipt. The transition rate out of registered unemployment to other benefits exhibits positive duration dependence, rising dramatically toward the end of the unemployment benefits eligibility period.

The duration dependence of the employment hazard rate falls during the first 22 months duration (with a bump at 13-month duration). The hazard rate then peaks as benefit exhaustion approaches. Exits from unemployment are only registered as transitions to employment if the individual is registered with an employer at exit. The peak in exit rates is thus likely to reflect an actual employment response, rather than merely reflecting changes in registration behavior.

The effect of completed spell duration on job quality is less clear. Estimated effects are close to zero for unemployment spells lasting up to 12 months. For longer durations, estimated effects are more negative, although mostly not statistically significant. Perhaps

Table 3. Estimated correlations between random coefficients

Outcome	Employment	PT Work	ALMP	Other Ben	To FTU
PT work	−.0056				
ALMP	.4448	−.2933			
Other Ben	−.0259	.2161	.0748		
To FTU	−.0521	−.4127	.0067	−.0159	
w_3	.1513	.0886	−.0998	−.0044	−.3222

Notes: Table shows estimated correlations between random coefficients (exp(v)) in the preferred model specification with 25 mass points in the distribution of v.

surprisingly given the peak in the employment hazard at 24 months, there is no corresponding drop in effects on job quality around 24 months, when job seekers are 'pushed' out into employment.

Finally, we consider the estimated distribution of unobserved heterogeneity parameters to shed some light on selection on unobservables. Table 3 contains estimated correlations between (exponentiated) random coefficients. The unobserved components of earnings and employment are positively correlated. The estimated correlation in unobserved heterogeneity terms for employment and part-time work is close to zero. Meanwhile, the unobserved propensity for part-time work is negatively correlated with the unobserved propensity to return to full-time unemployment, i.e. individuals who are more inclined to take up partial employment during job search are also more likely to stay in these jobs longer.

In our model, we find a positive and significant effect of ongoing partial employment on transitions to regular employment. In an extended model, the on-program effect is examined in more detail: We allow this effect to vary according to the duration of partial employment, by including a set of dummy variables $d^p = \{d_1^p, \ldots, d_5^p\}$, indicating the duration of the current spell of part-time work. After the fifth month, on-program effects are assumed to be constant. As we simultaneously model transitions back from part-time work to full-time unemployment, the model should in principle be able to account for dynamic selection over the course of part-time work.

Estimates are shown in Table 4. The positive on-program effects of partial employment appear to be driven mainly by transitions in the first 2 months of part-time work. After the second month, estimated effects of part-time work on transitions to regular employment remain positive, but smaller and not statistically significant. This could reflect employers using a short period of partial unemployment as a screening device when recruiting from unemployment. Meanwhile, we find no lock-in effects of partial employment even when allowing the effect to vary with duration of part-time work.

Looking at non-work transitions, however, we do find evidence of lock-in effects: Being partially employed rather than being a full-time unemployed job seeker reduces the hazard to ALMP and other benefits; the effect increases in absolute value with the duration of part-time work. In addition, we find indications of negative duration dependence in transitions back to full-time unemployment from subsidized part-time work, consistent with part-time employment becoming more stable with tenure.

As discussed in Section 2, the measure of job quality based on total labor earnings 3 years after leaving unemployment will capture the extent to which the initial job can offer opportunities of career advancement. By looking 3 years ahead, we would expect the measure of job

Table 4. On-program duration

Variable	(1) Employment	(2) PT Work	(3) ALMP	(4) Other Ben	(5) To FTU	(6) w_3
PT (on), 1	1.761***		.822***	.82*		.991
	(13.125)		(–3.121)	(–1.674)		(–.844)
PT (on), 2	1.166***		.498***	.563***	.814***	.983
	(2.754)		(–7.619)	(–4.087)	(–6.435)	(–1.197)
PT (on), 3	1.07		.407***	.464***	.72***	.972*
	(.983)		(–7.571)	(–4.445)	(–7.847)	(–1.659)
PT (on), 4	1.039		.378***	.433***	.67***	.996
	(.483)		(–7.015)	(–4.127)	(–7.625)	(–.186)
PT (on), 5	1.015		.182***	.373***	.589***	.985
	(.204)		(–14.587)	(–5.661)	(–10.518)	(–.841)
PT Work (post)	1.223***	2.565***	.881***	1.014		.997
	(4.446)	(26.794)	(–2.736)	(.171)		(–.324)
ALMP (on)	.593***	.634***		.352***		.991
	(–7.702)	(–9.962)		(–8.903)		(–.579)
ALMP (post)	1.24***	1.29***	.966	.86*	1.062	1.015
	(3.924)	(6.112)	(–.689)	(–1.751)	(1.096)	(1.297)
Observations	269,704	211,607	254,264	269,704	58,097	11,917

Notes: Table shows estimates from model where on-program effects of partial employment vary with duration of part time work (24 mass points). Exponentiated coefficients, *t*-values in parentheses.
*, **, *** Significant at the 10, 5, 1 percent level.

Table 5. Short-term outcomes — year 1

Variable	(1) Employment	(2) PT Work	(3) ALMP	(4) Other Ben	(5) To FTU	(6) w_3
PT Work (on)	1.599***		.586***	.65***		1.005
	(10.93)		(–9.604)	(–4.055)		(.462)
PT Work (post)	1.203***	2.486***	.828***	1.048		1.003
	(4.227)	(25.006)	(–4.069)	(.578)		(.273)
ALMP (on)	.609***	.664***		.372***		.956***
	(–8.093)	(–9.085)		(–8.991)		(–2.935)
ALMP (post)	1.181***	1.367***	1.026	.843**	.827***	.984
	(3.414)	(7.683)	(.54)	(–2.013)	(–3.569)	(–1.48)
Observations	269,704	211,607	254,264	269,704	58,097	11,917

Notes: Table shows estimates from model where job quality is defined using earnings year 1 after leaving unemployment only (19 mass points). Exponentiated coefficients, *t*-values in parentheses.
*, **, *** Significant at the 10, 5, 1 percent level.

quality to better reflect any stepping stone effects of the initial job. In an alternative specification, the measure of job quality is based on short-term outcomes, using only registered earnings the first year after leaving unemployment. Selected estimates are shown in Table 5.

Estimated program effects to transitions other than employment are overall similar to those found in the main model specification. As before, taking up part-time work during job search increases the hazard rate to employment both during and after the program. There are not significant effects on wages — estimates are now positive, but small and not significant.

To summarize, our estimated models find that subsidized part-time work appears to increase transitions to employment, both during and after the end of part-time work. This result is somewhat counterintuitive from the point of view of job search theory, where collecting UI while working part-time would increase reservation wages, thus have a negative effect on the job hazard rate. An extended model suggests that the positive on-program effects are primarily driven by transitions occurring during the first months of partial employment, consistent with firms using partial employment as a screening device.

Moreover, models fail to identify significant wage effects. Again, this is somewhat counter to what one would expect from standard job search theory: Increased reservation wages relative to the case with full-time unemployment should show up in the data as positive effects on job quality. The absence of such effects then suggests the presence of additional mechanisms working in the opposite direction. One possibility is that working part-time during job search increases the job offer arrival rate compared with full-time unemployment. These additional job offers could then be more likely to come from low-quality segments of the job market, for instance if the type of firms where part-time work is most readily available pays less even in regular jobs or offers fewer opportunities for advancement. Moreover, as discussed in Section 2, recall to previous employer is more common among job seekers on partial employment compared with full-time unemployed individuals. This could be another mechanism behind the positive estimated effect of partial employment during job search on transitions to unsubsidized employment. In these cases, however, we would typically have less reason to expect any effects on wages, given that recalled workers are typically rehired at their previous wage.

6. Conclusions

This paper was motivated by the question of whether UI systems should provide coverage to underemployed job seekers. To answer this question, we have used a timing-of-events approach to estimate the effects of underemployed job search — taking up part-time work while continuing to look for regular employment — rather than remaining full-time unemployed on the hazard of finding regular employment. In our model, underemployed job search is found to unambiguously reduce the time to find unsubsidized, regular employment. Relative to the baseline case of full-time unemployment with no experience of part-time work during job search, both on-program and post-program effects of part-time work on the job finding hazard rates are positive.

As discussed in the introduction, standard job search theory predicts a decline in the hazard to regular employment for partially employed job seekers who receive partial UI, as reservation wages increase relative to full-time unemployment. The estimated positive on-program effects appear to go against these predictions. Rather, subsidized part-time work appears to serve as a stepping stone toward regular work. Model extensions suggest that the first month of partial employment is especially important in increasing the employment hazard rate. In 81 per cent of transitions from underemployed job search to regular work, the employer in the part-time job and the regular job are identical, suggesting employers to some extent use part-time work as a screening device when hiring from unemployment.

The data used in this paper allow us to track individuals for several years after they leave registered unemployment. First, this lets us distinguish between finding a job and other exits from registered unemployment. There is no a priori reason why the effects of underemployed

job search should be the same on the job finding hazards and the hazards to other, primarily health-related benefits. Working part-time while searching for work is found to decrease the hazard rate to other benefits.

Second, the data are used to model job quality, as reflected in subsequent earnings over a 3-year period. Although underemployed job search is estimated to have positive effects for transitions to employment, it does not seem to matter for the quality of the job that is eventually obtained.

We conclude then that the answer to the question asked at the beginning of this paper is yes: UI systems should provide continued support to job seekers obtaining part-time work. Not only does it reduce benefit expenditures and ensure partial employment during the job search period, it also shortens the overall length of job search, and it does so without reducing the quality of the eventual job match.

Appendix A

Likelihood function

Setting up the likelihood function, we follow Røed and Westlie (2012) and Gaure *et al*. (2012). The probability that individual i makes a transition to state k during time period t is

$$p_k(\phi_{kit}+v_{ki})=\left(1-\exp\left(-\sum_{k\in K_{it}}\exp(\phi_{kit}+v_{ki})\right)\right)\frac{\exp(\phi_{kit}+v_{ki})}{\sum_{k\in K_{it}}\exp(\phi_{kit}+v_{ki})} \quad [A1]$$

where K_{it} is the set of feasible transitions for individual i in period t. Define indicator variable y_{kit}, $k=1,\ldots,5$, equal to 1 if there is a transition to state k, 0 otherwise, and let Y_i denote the complete set of outcome indicators available for individual i. For individuals who make a transition to employment at time t, let w_{it} denote total labor earnings (3-year average in the main specification). Conditional on the vector of unobserved variables v_i, the likelihood contribution of individual i can be written:

$$L_i(v_i)=\prod_{y_{kit}\in Y_i}\left[\prod_{k\in K_{it}}[p_k(\phi_{kit}+v_{ki})]^{y_{kit}}\right]\times\left[\exp\left(-\sum_{k\in K_{it}}\exp(\phi_{kit}+v_{ki})\right)\right]^{\left(1-\sum_{k\in K_{it}}y_{kit}\right)}$$
$$\times\left[\frac{1}{\sigma\sqrt{2\pi}}\exp\left(-\frac{(\ln w_{it}-\phi_{6it}-v_{6i})^2}{2\sigma^2}\right)\right]^{y_{1it}} \quad [A2]$$

We integrate out the unobserved heterogeneity v_i, taking into account the left-truncation problem in our data: Individuals are included in the dataset conditional on having a spell that survives to the first observation point. We assume that inflows to registered unemployment are uniformly distributed within each calendar month. As we never observe exits in the inflow months, we need to make an assumption regarding the duration effect of the inflow month. We assume that it is equal to the effect in the first observed month. For similar reasons, we assume that the calendar time effect in the very first inflow month, December 2002, is equal to the effect of the following month, January 2003. We let $\overline{t}_i$ denote the inflow month for

individual i. $\phi_{i\bar{t}_i} = (\phi_{1i\bar{t}_i}, \ldots, \phi_{5i\bar{t}_i})$ Then, using Bayes' rule, the density of unobserved heterogeneity conditional on being included in the sample $f(v_i \mid d \geq 1)$ is related to the unconditional density $f(v_i)$ by

$$f(v_i \mid d \geq 1) = \frac{Pr\left(\sum_k y_{ki\bar{t}_i} = 0 \mid \phi_{i\bar{t}_i} + v_i\right)}{E_{v_i} Pr\left(\sum_k y_{ki\bar{t}_i} = 0 \mid \phi_{i\bar{t}_i} + v_i\right)} f(v_i) \qquad [A3]$$

where

$$Pr\left(\sum_k y_{ki\bar{t}_i} = 0 \mid \phi_{i\bar{t}_i} + v_i\right) = \int_0^1 exp(-(1-s)) \sum_k \exp(\phi_{ki\bar{t}_i} + v_{ki})\, ds$$
$$= \frac{1 - \exp\left(-\sum_k \exp(\phi_{ki\bar{t}_i} + v_{ki})\right)}{\sum_k \exp(\phi_{ki\bar{t}_i} + v_{ki})} \qquad [A4]$$

Let Q be the (a priori unknown) number of support points and let $\{v_l, q_l\}$, $l = 1, 2, \ldots, Q$ be the associated location vectors and probabilities. In terms of observed variables, the likelihood function is given by:

$$L = \prod_{i=1}^{N} \sum_{l=1}^{Q} q_l \frac{Pr\left(\sum_k y_{ki\bar{t}_i} = 0 \mid \phi_{i\bar{t}_i} + v_l\right)}{\sum_{l=1}^{Q} q_l \left[Pr\left(\sum_k y_{ki\bar{t}_i} = 0 \mid \phi_{i\bar{t}_i} + v_l\right)\right]} L_i(v_l), \quad \sum_{l=1}^{Q} q_l = 1 \qquad [A5]$$

with $L_i(v_l)$ from equation [2] and $Pr(\sum_k y_{ki\bar{t}_i} = 0 \mid \phi_{i\bar{t}_i} + v_i)$ from equation [4].

Appendix B

Full estimation results

In this section we present the full estimates from the main model. Table 6 contains all estimated parameters minus the coefficients on spell duration, calendar time, and the distribution of unobserved heterogeneity. The seven education levels are compulsory education only (reference group), some high school, high school graduates, some college, undergraduate degree, graduate degree (MA or PhD), and education unknown. The four household types are married, cohabiting with kids, single with children, and single without children.

Figure A1 plots estimated calendar time effects for the six modeled transitions.

Table 6. Main model: estimates

Variable	(1) Employment	(2) PT Work	(3) ALMP	(4) Other Ben	(5) To FTU	(6) w_3
PT Work (on)	.469***		−.497***	−.408***		−.016
	(.046)		(.057)	(.111)		(.012)
PT Work (post)	.169***	.901***	−.176***	.019		−.012
	(.048)	(.038)	(.049)	(.093)		(.011)
ALMP (on)	−.645***	−.378***		−.936***		−.032*
	(.068)	(.046)		(.117)		(.017)
ALMP (post)	.084	.335***	−.024	−.161*	−.193***	.003
	(.054)	(.042)	(.051)	(.089)	(.054)	(.013)
No Ben.	.649***	−.164***	−.196***	1.938***	−.342***	.007
	(.035)	(.042)	(.069)	(.065)	(.038)	(.009)
Ln(w0)	.445***	−.39***	−.061	−.284***	.141***	.513***
	(.038)	(.037)	(.045)	(.085)	(.052)	(.007)
Female	−.146***	.296***	−.205***	−.001	−.414***	−.143***
	(.027)	(.026)	(.032)	(.059)	(.035)	(.006)
Low liq.	−.116***	−.09***	.012	.248***	.091***	−.009*
	(.024)	(.023)	(.03)	(.054)	(.031)	(.005)
Qual.	−.015	.123***	0	.003	−.126**	−.036***
	(.044)	(.04)	(.053)	(.089)	(.054)	(.009)
Ed. lvl 2	.19***	.173***	.021	−.03	−.086*	.001
	(.044)	(.039)	(.048)	(.082)	(.051)	(.01)
Ed. lvl 3	.343***	.141***	.005	−.114*	−.056	.047***
	(.033)	(.03)	(.037)	(.065)	(.04)	(.007)
Ed. lvl 4	.45***	.058	.149*	−.31*	−.02	.095***
	(.065)	(.064)	(.077)	(.159)	(.084)	(.013)
Ed. lvl 5	.58***	.087**	−.127***	−.42***	−.045	.11***
	(.038)	(.035)	(.045)	(.088)	(.047)	(.008)
Ed. lvl 6	.653***	−.101*	−.103	−.958***	.248***	.195***
	(.056)	(.059)	(.073)	(.201)	(.081)	(.012)
Ed. lvl 7	−.216***	−.195***	−.316***	−.063	.177**	.035**
	(.074)	(.058)	(.079)	(.126)	(.083)	(.015)
HH type 1	.041	.013	−.116	−.121	−.105	−.011
	(.078)	(.071)	(.088)	(.156)	(.096)	(.017)
HH type 2	.025	.016	−.169	.096	.128	.005
	(.095)	(.093)	(.113)	(.206)	(.126)	(.021)
HH type 3	.01	.098	−.217*	.058	.168	−.013
	(.103)	(.1)	(.122)	(.225)	(.136)	(.023)
HH type 4	−.048	.207**	−.12	.235	−.012	.019
	(.089)	(.084)	(.104)	(.184)	(.112)	(.02)
HH size 2	−.02	.008	.147*	.095	.106	−.008
	(.068)	(.062)	(.076)	(.133)	(.085)	(.015)
HH size 3	.029	.059	.231**	−.064	−.164	−.004
	(.086)	(.084)	(.101)	(.185)	(.114)	(.019)
HH size 4	.087	.205**	.279**	−.081	−.305**	−.005
	(.103)	(.1)	(.122)	(.225)	(.138)	(.022)
HH size 5	.041	.373***	.036	−.367	−.296*	−.028
	(.12)	(.117)	(.149)	(.271)	(.158)	(.027)
HH size 6	−.045	.248	−.037	−.484	−.008	−.077*
	(.187)	(.172)	(.225)	(.366)	(.232)	(.042)
HH size 7	.168	.124	−.423	−.672	−.066	−.021
	(.343)	(.359)	(.42)	(.731)	(.868)	(.074)
HH size 8	.624	−.495	.51	−.472	.964	.18*
	(.439)	(.539)	(.784)	(1.155)	(.676)	(.105)
Kids — 1	.016	−.191***	.013	−.156	−.01	.013
	(.05)	(.049)	(.063)	(.113)	(.066)	(.011)
Kids — 2	.058	−.201***	−.027	−.197	.002	.027**
	(.059)	(.058)	(.073)	(.136)	(.078)	(.013)
Kids — 3	.022	−.286***	.29**	.205	.109	.08***
	(.094)	(.087)	(.113)	(.205)	(.115)	(.02)

Table 6. Continued

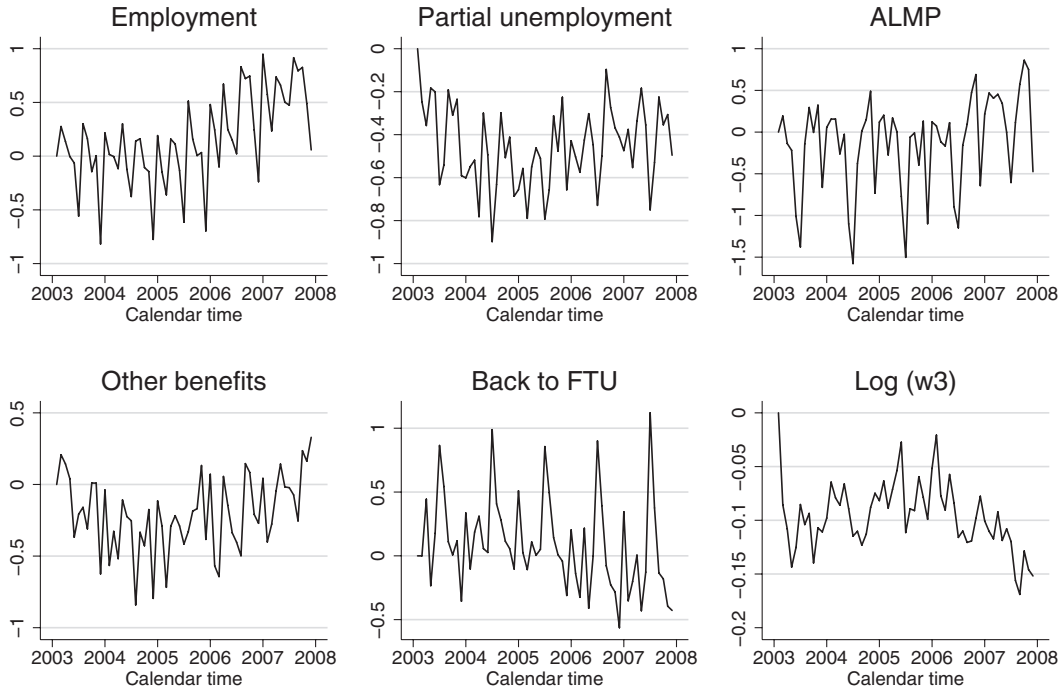
Variable	(1) Employment	(2) PT Work	(3) ALMP	(4) Other Ben	(5) To FTU	(6) w_3
Kids — 4	−.058	−.275	.432*	.435	−.222	.109**
	(.205)	(.18)	(.225)	(.35)	(.258)	(.044)
Kids — 5	−.555	.066	.04	.573	.042	.008
	(.423)	(.42)	(.707)	(.854)	(.888)	(.106)
Age 26	−.09	−.035	.136	.303	.17	−.014
	(.094)	(.083)	(.149)	(.265)	(.123)	(.021)
Age 27	−.12	−.108	.01	.357	.082	−.002
	(.093)	(.086)	(.153)	(.264)	(.128)	(.021)
Age 28	−.135	−.005	.06	.32	.085	.001
	(.091)	(.085)	(.151)	(.26)	(.123)	(.02)
Age 29	−.182**	−.051	.103	.224	.098	.015
	(.09)	(.085)	(.149)	(.262)	(.124)	(.02)
Age 30	−.185**	−.032	.092	.116	.158	.002
	(.09)	(.084)	(.148)	(.265)	(.121)	(.02)
Age 31	−.111	−.09	−.022	.018	.059	.027
	(.089)	(.084)	(.15)	(.266)	(.123)	(.02)
Age 32	−.266***	−.056	.216	.379	.041	.028
	(.091)	(.085)	(.146)	(.258)	(.123)	(.02)
Age 33	−.323***	−.078	.119	.233	.112	.022
	(.092)	(.085)	(.148)	(.26)	(.123)	(.02)
Age 34	−.279***	−.095	.129	.543**	.188	.042**
	(.091)	(.086)	(.149)	(.257)	(.124)	(.021)
Age 35	−.305***	−.053	.106	.254	.083	.015
	(.092)	(.086)	(.15)	(.266)	(.124)	(.021)
Age 36	−.394***	−.13	.173	.296	.022	.042**
	(.094)	(.087)	(.148)	(.264)	(.126)	(.021)
Age 37	−.425***	−.018	.25*	.262	.04	.022
	(.095)	(.086)	(.147)	(.26)	(.124)	(.021)
Age 38	−.29***	−.061	.26*	.214	.108	.037*
	(.095)	(.086)	(.147)	(.267)	(.124)	(.021)
Age 39	−.391***	−.011	.17	.309	.224*	.031
	(.096)	(.086)	(.15)	(.266)	(.126)	(.021)
Age 40	−.347***	.025	.283*	.318	.087	.038*
	(.097)	(.088)	(.149)	(.267)	(.127)	(.022)
Age 41	−.397***	−.017	.271*	.098	.1	.052**
	(.097)	(.088)	(.151)	(.276)	(.127)	(.021)
Age 42	−.353***	.031	.178	−.012	.042	.045**
	(.098)	(.09)	(.153)	(.281)	(.133)	(.022)
Age 43	−.371***	.035	.134	.344	.115	.038*
	(.1)	(.091)	(.154)	(.273)	(.132)	(.023)
Age 44	−.435***	.009	.193	.301	.103	.057**
	(.102)	(.093)	(.155)	(.276)	(.133)	(.023)
Age 45	−.38***	−.013	.249	.27	.062	−.004
	(.101)	(.092)	(.154)	(.278)	(.135)	(.023)
Age 46	−.413***	−.029	.174	.455*	.109	.039*
	(.103)	(.091)	(.158)	(.274)	(.135)	(.024)
Age 47	−.386***	−.06	.157	.431	.081	.026
	(.104)	(.093)	(.158)	(.275)	(.136)	(.024)
Age 48	−.405***	.007	.227	.453	−.003	.029
	(.105)	(.095)	(.163)	(.276)	(.138)	(.024)
Age 49	−.552***	−.121	.232	.33	.07	.017
	(.109)	(.095)	(.16)	(.284)	(.137)	(.025)
Age 50	−.639***	.108	.401***	.364	−.137	.044*
	(.11)	(.094)	(.154)	(.279)	(.14)	(.025)
Age 51	−.591***	.155*	.074	.521*	−.094	.002
	(.109)	(.094)	(.16)	(.274)	(.134)	(.025)
Age 52	−.549***	.072	.235	.61**	−.03	−.008
	(.114)	(.098)	(.162)	(.279)	(.14)	(.026)

Table 6. Continued

Variable	(1) Employment	(2) PT Work	(3) ALMP	(4) Other Ben	(5) To FTU	(6) w_3
Age 53	−.521***	.067	.215	.386	.023	.016
	(.111)	(.096)	(.161)	(.285)	(.144)	(.025)
Age 54	−.614***	.066	.309*	.427	.021	.001
	(.116)	(.099)	(.16)	(.288)	(.145)	(.027)
Age 55	−.728***	−.088	.032	.771***	.053	−.001
	(.12)	(.103)	(.171)	(.278)	(.144)	(.028)
Age 56	−.698***	−.059	.285	.045	.222	−.011
	(.146)	(.121)	(.183)	(.336)	(.165)	(.037)
Age 57	−1.492***	.086	−.03	−.261	−.012	−.107*
	(.336)	(.189)	(.287)	(.481)	(.234)	(.062)
Sigma						.202***
						(.003)
Observations	269,704	211,607	254,264	269,704	58,097	11,917

Notes: Table shows full estimates from the model of the main model, containing 18 mass points in the distribution of v, minus the coefficients on spell duration, calendar time, and the distribution of unobserved heterogeneity. The seven education levels are compulsory education only (reference group), some high school, high school graduates, some college, undergraduate degree, graduate degree (MA or PhD), and education unknown. The household types are single without children (reference group), married without children (type 1), married with children (type 2), cohabiting, with kids (type 3), and single with children (type 4). 'HH size' and 'Kids' are indicators for the number of family members and the number of children under 18: HH size 8 indicates 8 or more household members, whereas Kids 5 indicates 5 or more children under age 18.
*, **, *** Significant at the 10, 5, 1 percent level.

Figure A1. Calendar time effects — main model specification



Note: Figure plots estimated calendar time effects.

Notes

[1] This does not remove all recall unemployment. Rather, we remove individuals where both the workers and firms expect the layoff to be temporary. In practice, some workers on ordinary layoffs will be recalled to the previous employer, and some job seekers on temporary layoff will be hired by new employers.

[2] Income thresholds are calculated using a 'base amount', which is adjusted annually — in 2007 the earnings requirement for 24 months UI eligibility was defined as having had total labor income of at least 131,010 NOK, equivalent to around 14,970 EUR, the calendar year before entering unemployment.

[3] To the extent that individuals experience multiple unemployment spells over a short period of time, this implies that our sample is designed to be representative for their first experiences of unemployment.

[4] Given the institutional context, these are likely to be largely unexpected recalls. For expected recalls, firms have incentives to declare a temporary layoff, as the laid off workers would remain more closely attached to the firm.

[5] The optimization algorithm is further described at http://www.frisch.uio.no/docs/NPMLE.html, and available for downloading at http://folk.uio.no/sgaure/ubuntu/.

[6] The preferred model has 25 mass points in the distribution of unobserved heterogeneity, meaning that we estimate an additional 150 parameters of the unobserved heterogeneity distribution.

[7] These results are not sensitive to the presence of outliers — censoring the top/bottom 2 per cent of the 3-year earnings distribution yields similar estimated treatment effects.

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