Can reduced activity be a stepping stone for the unemployed?

Florent Fremigacci* Antoine Terracol†

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Preliminary version, work in progress

Abstract

This article evaluates the effects of "reduced activity" (*activité réduite*) on the transitions from unemployment to employment, and from employment to unemployment. Under the French unemployment insurance system, an individual receiving UI benefits can receive both his salary and parts of his benefits if working less than a given number of hours; and extend his benefit entitlement period. Using an administrative dataset, we estimate a five-variate duration model based on Abbring and van den Berg (2003) to control for non random censoring, for the endogeneity of the timing of entry into reduced activity and of the duration of reduced activity spells, as well as the subsequent employment spell. We find that reduced activity involves a significant lock-in effect which reduces the hazard out of unemployment. Individuals with a reduced activity spell earlier during their unemployment spell experience a significant increase in their hazard rate, but only if they are not currently receiving UI benefits. Simulations show that the lock-in effect dominates for UI recipients, leading to an overall negative impact for this population; while non UI recipients face a shorter lock-in effect and experience an improvement in their return to employment after 7 months.

JEL codes: J64, J68, C41

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*EPEE, Université d'Evry
florent.fremigacci@univ-evry.fr
†EQUIPPE (Universités de Lille) and Université Paris 1 Panthéon Sorbonne
terracol@univ-paris1.fr

1 Introduction

Since the early 1980s, high and persistent unemployment encountered in France has been a major concern of policy makers. Reforms of the unemployment insurance system emerged as a necessity and an increasing emphasis has been placed on Active Labour Market Programmes (ALMP) in reducing (long-term) unemployment, enhancing job seekers employability and promoting labour force participation. Kluve (2007) reports more than fifty different measures introduced in France since 1974. Among those, UNEDIC [1] introduced a new regime which created a unique link between unemployment benefits and Active Labor Market Programmes by allowing benefits recipients to perceive simultaneously both benefits and wage income from a reduced activity[2]. Facing rapid growth of atypical jobs (temporary and/or part time)[3], policymakers intended to improve work incentives, encourage more intensive job search and prevent the formation of "unemployment traps" by enlarging the set of acceptable job offers. Reduced activity was also expected to provide work experience and keep the unemployed in the proximity of the labour market, serving thus as a stepping stone to regular employment.

Since the introduction of the measure in 1986, the number of job seekers practicing reduced activity or occasional employment keeps increasing. Between 1995 and 2005, their number has more than doubled and reached 1 212 999 individuals by June 2005, which corresponds to 32.6 percent of all unemployed registered with French Employment Agency (ANPE)[4]. This evolution appears even more spectacular if considering unemployment benefit recipients only. The number of such unemployed involved in reduced activity increased by 3.5 times over the same period and reached 837 800 persons by June 2005 (34.8 percent of all unemployment benefit recipients). Reduced activity has become a common practice among French unemployed and deserves a particular attention in evaluation studies.

Despite potential positive effects of the reduced activity regime, critics and concerns have been expressed about the system. Actually, it may be argued that this measure may contribute to the precariousness of participant labour market status by compromising job stability and increasing the recurrence of unemployment. In addition, extension of the benefit entitlement period may slow down the return to employment of recipients. Overall, the impact of reduces activity on individual labour market path remains ambiguous.

This paper aims to assess the impact of reduced activity on individual transitions

[1]UNEDIC is the French institution providing benefits. It is distinct from the Public Employment Agency (ANPE)

[2]Several European countries (Austria, Belgium, Finland, Germany, Greece, Luxembourg, Spain, Switzerland) provide a similar regime.

[3]By March 2001, atypical jobs represented a quarter of total employment, while in 1990 this share was only 16 percent.

[4]Source: STMT-DARES, ANPE. We consider here the DEFM relative to categories 1, 2, 3, 6, 7 and 8.

from unemployment to employment and on recurrence into unemployment. We use an administrative dataset of the French Employment Agency which provides detailed records on labor market histories between January 2001 and December 2004. The empirical analysis applies a methodology based on the "timing of events" approach recently developed by Abbring and van den Berg (2003) and extensively used in applied literature ever since (Crépon, Dejemeppe, and Gurgand (2005), Richardson and van den Berg (2006), Hujer, Thomsen, and Zeiss (2006), Crépon, Ferracci, and Fougère (2007)). The timing of events approach is often used to estimate causal treatment effects in the presence of “selectivity on unobservables”. It usually involves the estimation of models that simultaneously explain the duration until entry into the programme (reduced activity) and the duration until employment. Additionally, we take into account the duration of reduced activity (possibly endogenous), non random censoring and the duration of subsequent employment (to study long term effects of reduced activity), which leads to the estimation of a five-variate multi-spell duration model. We also address lock-in effects, the changes in the causal effect of reduced activity over time, as well as possible heterogeneity in the treatment effect.

The reminder of this paper is organized as follows. The next section is devoted to a brief presentation of the French regime of reduced activity. Section 3 discusses some theoretical considerations on the effect of reduced activity on behavior of job seekers. Section 4 describes the data. Section 5 presents the statistical model. Results are discussed in Section 6, and policy simulations are shown in Section 7. Section 8 finally concludes.

2 Reduced activity regime

In France, since 1986, job seekers are allowed to accumulate unemployment benefits with earnings from occasional or reduced activity. The introduction of such measure has announced an important change in the practice of the UNEDIC compensation policy. Prior to this date, any reprise of economic activity resulted in suspension of the entitlement to unemployment benefits by UNEDIC. But the rise in long term unemployment and the development of precariousness in the labour market have pushed the social partners to adjust the existing regulations in order to ensure the financial feasibility of the system. The enhancement of employment became a new priority in policy considerations, while rapid expansion of atypical jobs compromised its classical definition. In this context, all necessary means are engaged to avoid job seeker dissuasion in taking or conserving any employment which could facilitate their further insertion in the labour market.

By giving the unemployed the possibility to partially accumulate unemployment benefits and salaries, the reduced activity regime intends to improve work incentives, encourage job search activities and prevent the formation of "unemployment traps" by enlarging the set of acceptable job offers to those with a wage below the level of replacement income. In the same time, this regime contributes to a redefinition of the frontier between unemployment and employment by creating a number of intermediate situation between these two states. Registered as job seekers with ANPE while performing in the labour market, individuals involved in reduced activity enjoy the dual status of unemployed/worker, which contrasts with the conventional ILO definition of unemployment. The complex nature of this phenomenon resulted in the adoption of two distinct definitions by French administrations (see box 1).

Box1: Administrative definition of reduced activity

Since the reform of 1951, the French Labour Law (article L. 351-20) authorises unemployed registered with ANPE to undertake a reduced professional activity or occasional employment while keeping their entitlement for unemployment benefits. The administrative terminology distinguishes two definitions of reduced activity.

For UNEDIC, the notion of reduced activity is tightly related to the indemnity status of the job seeker (benefit recipient or not). Introduced in 1986, the RAUC system (Reduced Activity and Unemployment Compensation - French ARAC) defines the conditions of accumulation of activity salary and replacement income, which only concerns unemployment benefit recipients. The announced objective of the RAUC is to avoid job seeker dissuasion in taking or conserving an employment which could facilitate their further insertion in the labour market.

The ANPE, in contrast, adopts a definition related to the position of job seekers in the labour market. Since 1995, individuals undertaking a reduced activity exceeding 78 hours monthly may conserve the status of unemployed but are considered as not immediately available for work. Accounted under the ANPE categories 6, 7 and 8, these "invisible unemployed" stay at the margin of official statistics.

Specific criteria are to be fulfilled for the accumulation of unemployment benefits and earnings from reduced activity to be possible. First, a limitation on the number of hours worked in reduced or occasional employment (all jobs together) should be respected. In 1995, the monthly threshold for reduced activity was fixed at 136 hours which corresponds - in case of legal employment contract of 39 hours weekly - to 90 percent of a full time employment. Second, the return to a professional activity may be accompanied by partial maintenance of unemployment benefits if the gross earnings from this activity do not exceed 70 percent of previous salary (associated with the job preceding the unemployment spell)[5]. If either one of these conditions is not satisfied, the job seeker does not receive unemployment benefits, while the entitlement period is still maintained and delayed in time.

[5]Since January 2006, the threshold for reduced activity was brought down to 110 hours monthly and the duration of possible earning accumulation was limited to 15 months.

When accumulation is authorized, the job seeker continues to perceive unemployment benefits, except for a number J of days[6], determined as the ratio of gross earnings form reduced activity W and daily earnings reference level X. The days of non-entitlement to benefit are shifted to the future. For a given month, the total earnings of an unemployed involved in reduced activity (with authorized accumulation) can be written as follows:

$$R = W - b(n - J) = W + b(n - \frac{W}{X}) = nb - (1 - q)W \qquad (1)$$

where b denotes the daily amount of unemployment benefit, n the number of days in the month and $q = \frac{b}{X}$ the replacement ratio (which corresponds here to the rate of taxation on the income from reduced activity).

In order to insure that involvement in reduced activity is temporary and works as a "stepping stone" towards regular employment, the accumulation of unemployment benefit with earnings from reduced activity is limited, within the same unemployment spell, to 18 months[7].

Job seekers who do not perceive unemployment benefits are not subject to accumulation authorization, but can still benefit from reduced activity. While keeping their registration with the ANPE - which allows them to continue using ANPE services (job offers, training offers, monitoring and personalized follow up) - they practice a remunerated activity and recharge therefore their entitlement to unemployment insurance. The flexibility proposed by this measure also encourages the acceptation of temporary job offers, since it allows the unemployed to avoid a heavy and time consuming procedure of deregistration/new registration with the ANPE.

3 Theoretical effects of reduced activity regime

In order to frame the interpretation of the empirical results, we present herein some theoretical considerations on the effects of reduced activity on job seekers behavior.

The reduced activity regime implemented by UNEDIC allows to partially accumulate unemployment benefits with the earnings from a reduced or occasional employment. Therefore, total earnings of an unemployed involved in reduced activity always exceeds the earnings he would have perceived in the absence of this programme, unconditionally on the type of employment contract considered. As a consequence, reduced activity always brings a financial gain for unemployed. The possibility of revenue accumulation shifts the distribution of net offered wages upwards, enlarging *ceteris paribus* (level of reservation wage remaining unchanged) the zone of acceptation of job offers

[6]For those aged 50 years or more, the number of days of non-entitlement is reduced by 20 percent.

[7]The restriction does not concern the CES (Solidarity Employment Contracts) or the unemployed aged 50 years or more.

and increasing chances for an unemployed to accept the proposed activity (reduced or occasional). In line with Gurgand (2002) results, the compensation mechanism therefore stimulates the return to activity which differs, however, from return to employment (since the job seekers remain registered with ANPE). Nevertheless, as soon as activity is accepted, this same mechanism induces a transitory increase in the reservation wage. Actually, since total earnings of the unemployed reaches a higher level during the period of reduced activity, one can expect the re-evaluation of job seeker wage expectations (upwards). This may result in a reduction of unemployed instantaneous exit rate to employment and may reinforce the lock-in effect. Once the activity is completed[8], the reservation wage is expected to return to its previous level and one gets back to a standard job search model without accumulation. Concerning the days of non-entitlement to benefit (due to accumulation or due to surpass of official threshold), those are shifted to the future, meaning the *de facto* extension of the entitlement period for insured unemployed. According to a job search model, such extension should slow down the decrease in reservation wage and have a negative impact on the unemployed search effort, postponing thus exit to employment. Implemented with the aim to reduce the disincentive effects of unemployment insurance system, the reduced activity mechanism therefore encourages unemployment benefit recipients to return to activity. But paradoxically, it also compromises the return to employment by contributing to lengthen unemployment spells. It should be noted however that this effect remains specific to the recipients of unemployment insurance benefits (non recipients are not subject to accumulation mechanism).

As the majority of ALMP programmes, the reduced activity regime may create a lock-in effect: when practicing the reduced activity, the unemployed decrease their search intensity (search less for other jobs), which delays exit from unemployment.

The empirical studies assessing the duration of unemployment usually point out the existence of an inverse relationship between the time spent in this state (unemployment) and the probability to find a job[9]. Human capital depreciation, progressive marginalization and estrangement from a professional sphere, as well as discouragement and stigmatization phenomenon affect negatively the individual employability, motivation and search effort and reduce the rate of job offer receipt. The practice of a reduced activity encourages professional relations and contact with the employer, keeping thus the job seekers at the proximity to the labour market and increasing their chances to receive an employment offer or being informed on new job vacancies. In addition, reduced activity can be detected as a positive signal of motivation by potential employers. Finally, reduced or occasional employment prevents obsolescence of productive capacities of unemployed, encourages them to develop new skills and increases the scope of their job

[8]Except for the case when the individual adjusts with his wage expectations with a delay and reservation wage is subject to inertia mechanism.

[9]Most of these studies provide the modelling of unobserved heterogeneity in order to account for a "mover-stayer" phenomenon.

search.

The long term effects of the measure are questionable. On the one hand, it encourages unemployed to undertake one or several "waiting jobs" while searching for a stable and better remunerated employment. Reduced activity can therefore be seen as a stepping stone to regular employment : far from being a break in labour market history, it would rather be one of its elements. On the other hand, this system promotes the practice of short term, temporary, and low paid jobs and indirectly induces a substitution from permanent to temporary employment in the direction of the unemployed search effort (McCall (1996)). This may naturally lead to precariousness of individual labour market trajectories. Repeated practice of occasional activity may have an important and permanent effect on future labour market history of the individuals by generalizing the practice of instable employment and increasing unemployment recurrence. Based on a phone survey conducted (between September 1997 and September 1998) on a sample of 1600 job seekers randomly selected among the individuals who had practiced reduced or occasional employment during the unemployment spell, Gurgand and Letablier (1999) reveal however that, on average, unemployed undertaking occasional activity renew their former employment conditions. Concerning the persons with instable career profiles (alternating employment and unemployment spells), reduced activity represents direct continuity with individual labour market history.

Overall, the theoretical effect of reduced activity on individual transitions from unemployment to employment and the recurrence of unemployment spells is ambiguous, which creates the necessity for an empirical analysis. Despite the importance of the question, empirical studies on the subject are scarce. Using data from the Fichier Historique Statistique of French Employment Agency, Granier and Joutard (1999) reveal a positive effect of reduced activity on individual transitions from unemployment to employment, especially when almost one year elapsed since entry into unemployment. Long term unemployed women experience, however, worst employment perspectives when involved in a reduced activity. Cockx, Robin, and Goebel (2006) evaluate the effect of an income-support policy (known as AGR) run in Belgium for unemployed persons accepting to work part-time. Similarly to reduced activity, unemployed workers who have accepted a part-time job and who are still looking for full-time employment are allowed to keep a fraction of their unemployment benefits. Controlling for unobserved heterogeneity, they conclude that AGR had a positive, though insignificant, effect on long-term unemployed young women transitions to full-time employment. Zijl, van den Berg, and Heyma (2004) investigate whether temporary work increases the transition rate to regular work on Dutch longitudinal survey data. They find that temporary employment does not affect the duration until regular work (i.e. no stepping stone effect) but negatively affects unemployment durations (i.e. positive re-employment effect of temporary work).

4 Data

The empirical analysis is based on longitudinal data from the *Fichier Historique Statistique* (FHS) provided by ANPE[10]. The FHS is an administrative dataset containing exhaustive information on individual characteristics (such as gender, nationality, children, marital status, educational level, age, region of residence, reason of entry into unemployment, welfare transfer) as well as detailed records on the timing of events since July 1993. Therefore, one can trace with precision individual labour market histories on a monthly basis, which allows modeling durations in discrete time.

We use a 1/12 nationally representative sample randomly drawn from the FHS from which we only keep unemployment entrants in the period between January and December 2001. Job seekers are observed up until December 2004. In order to focus on a homogenous sample, we adopt conventions similar to Crépon, Dejemeppe, and Gurgand (2005) and we drop spells related to unemployed classified as handicapped or "not immediately available for work". Since job seekers aged over 55 are subject to specific programmes, we also truncate spells where an individual reaches that age. The sample of interest consists of 478 602 spells (among which 192 438 include a period of reduced activity) corresponding to 251 224 individuals.

Our data are subject to three types of censoring: (i) right censoring due to end of sample, (ii) exits to other destinations than employment[11] and (iii) censoring due to administrative reasons[12] (when we loose the possibility to trace the individual). The first two types of censoring are addressed in a standard way, while the third, being non random, is modeled as an additional competing risk.

Estimation sample In this preliminary version, we only use a sub-sample of our data. We randomly draw 8324 individuals entering unemployment during the year 2001, and follow them until the end of 2004. These 8324 individuals contribute 18100 labour market spells. We censor ongoing spells at 36 months because information becomes less reliable after three years. Table 1 provides a more precise description of our sample.

[10]In France, most job seekers resort to the ANPE in their search for a job. Actually, people have to register with the ANPE in order to claim for unemployment benefits. Besides, a significant share of unemployed who are not eligible for benefits also register in order to find a job and have access to ANPE services such as vacancy posting, training...

[11]This includes training, illness, pregnancy, job accident, job search exemption, retirement, military service

[12]Absence at control, expulsion for some misbehavior, absence after a notification, training or job refusal, fake statement, lack of positive action to search for a job and other unspecified cases.

Table 1: Descriptive statistics

	N	Censored	Exiting	Mean length
Individuals	8324			
Unemployment spells	18100	13472	4628	8.959
To Attrition	18100	8953	9147	8.959
To RA spells	18100	10807	7293	5.599
In RA spells	7293	731	6562	3.142
Employment spells	4628	2026	2602	15.752

5 Statistical model

5.1 A multivariate duration model

We wish to assess the impact of the occurrence of reduced activity (RA hereafter) on two dimensions: (a) the duration of the ongoing unemployment spells; and (b) the duration of the subsequent employment spells for individuals exiting from unemployment to employment. With respect to the first dimension of our evaluation, RA is a dynamically assigned treatment in the sense that it occurs at some time t_r after the start of the unemployment spell. In the general case, the timing of entry into RA cannot be assumed to be independent from the unemployment and employment durations. For example, individuals with higher savings or unearned income might be less keen on applying to a part-time job and, at the same time, have a lower exit rate to employment (Lentz and Tranaes, 2001; Bloemen and Stancanelli, 2001; Algan and Terracol, 2002; Bloemen, 2002). On the other hand, highly skilled individuals with a high exit rate out of unemployment might not wish to get a part-time job that will not improve their human capital, nor their social network. Those (or others) unobserved characteristics might also influence their subsequent employment spell. Ignoring such unobserved characteristics creates a selectivity bias; and one therefore has to model the timing of RA jointly with the other processes under study. The empirical evaluation on dynamically assigned treatments has been the subject of a growing literature since Abbring and van den Berg (2003) provided a proof of identification of such effects in a multivariate duration models framework (also see Heckman and Navarro (2005) for a more general approach). We therefore follow the literature and estimate the causal effect of RA in a duration model framework. The remainder of this section first describes the Abbring and van den Berg (2003) model for causal effect in a duration framework, then introduces the process of treatment duration used to model lock-in effects, and the employment duration process allowing to evaluate the effect of RA on job quality. Finally, the non-random attrition that occur when individual do not fill in their monthly report is introduced as an additional dependant competing risk.

The Abbring and van den Berg (2003) model Let T_u and T_r be non-negative random variables measuring the duration until employment and the duration until the first occurrence of reduced activity, respectively. Denote by X and V two vectors of individuals characteristics, where only X is observed to the econometrician. We assume that the joint distribution of T_u, T_r may only differ between individuals through differences in X and V.

Following Abbring and van den Berg (2003), we adopt a time to event approach where the causal effect of reduced activity on unemployment duration is modeled through the effect of the realization of T_r on the distribution of T_u. These two distribution can be characterized in terms of their hazard rates $\theta_r(t|x,V)$ and $\theta_u(t|t_r,x,V)$. We further assume that the realization of t_r only affects the hazard $\theta_u(t|t_r,x,V)$ for $t > t_r$. This assumption rules out that reduced activity affects exit from unemployment before individuals actually enter reduced activity; and has therefore been named the 'no anticipation assumption'. We argue that this assumption is likely to hold in our context since it is difficult for unemployed individuals to predict at which date they will have found a job that satisfies RA requirements.[13]

We specify the hazard rates to have a Mixed Proportional Hazard (MPH) form:

$$\theta_r(t|x,V) = \lambda_r(t)\exp(x\beta_r)V_r \tag{2}$$

and

$$\theta_u(t|t_r,x,V) = \lambda_u(t)\exp(x\beta_u)\exp(\delta(t|t_r,x,V_\delta)I(t > t_r))V_u \tag{3}$$

where $\lambda_r(t)$ and $\lambda_u(t)$ are the baseline hazard rates for T_r and T_u, respectively.V_u and V_r are subsets of V affecting respectively the hazard out of unemployment and the hazard into treatment. $I()$ is an indicator function taking the value 1 if its argument is true, and zero otherwise. Due to dynamic sorting effects, the distribution of V_r among those who enter RA at t_r will differ from its population distribution. Indeed, individuals with high V_r will tend to enter RA earlier that individuals with low V_r. If V_r and V_u are dependent, then the distribution of V_u for people in RA at a given time will differ from the distribution of V_u for individuals not in RA. Therefore, one cannot infer the causal effect of RA on T_u from a comparison of the realized unemployment durations of those who entered RA at t_r from the rest of the population, because one would then mix the causal effect of RA on unemployment duration with the difference in the distribution of V_u between these individuals. In this case, $I(t > t_r)$ will be an endogenous variable, and T_u and T_r have to be modeled jointly to account for the dependance of the unobserved heterogeneity terms. The function $\delta(t|t_r,x,V_\delta)$ will capture the causal effect of reduced activity on the hazard rate out of unemployment. V_δ is an unobserved heterogeneity component that affects the way RA impacts the hazard rate out of unemployment. Allowing the

[13]Note that the non anticipation assumption does not require individuals to have no knowledge of the magnitude of the treatment effect they might face, but have no knowledge of the precise timing of entry into treatment.

treatment effect to depend on an unobserved heterogeneity term as well as on observed variables will enable us to correctly estimate the evolution of the treatment effect with respect to time since treatment. Indeed, a mover-stayer bias might occur if the variation of the distribution of V_δ (high V_δ individuals quickly leaving unemployment after RA) is confused with a decrease in the treatment effect with time (see Richardson and van den Berg, 2006). Moreover, V_δ is allowed to be correlated to the other heterogeneity components of V. The causal effect of the realization of T_r is thus allowed to depend on observed and unobserved characteristics X and V, as well as on $t - t_r$, the duration since the first occurrence of reduced activity; and, if one is ready to assume that $V_\delta \equiv 0$, on t_r, the time at which the individual enters reduced activity.

Time into treatment Unlike many labor market policies (such as employment vouchers, or tax credits) that have been evaluated in the literature, but like all training programs, reduced activity is not an instantaneous treatment as people must spend some time into RA. This may involve a lock-in effect whereby individuals reduce their search intensity during RA, but have a higher post-treatment hazard rate. Specifying $\delta(t|t_r, x, V_\delta)$ as a simple constant term will lead to an estimated treatment effect that averages over the potential lock-in period and the post-RA period. To analyse this lock-in effect, van den Berg, Holm, and van Ours (2002) and Zijl, van den Berg, and Heyma (2004) use a semi-Markov transition model and compares the transition rates from unemployment to employment and from treatment to unemployment. We take a different approach and include an indicator variable $I(t < t_r + t_{\bar{r}})$ where $t_{\bar{r}}$ is the duration of the RA spell. This indicator variable will thus equal one during an RA spell, and zero otherwise. Because the length of the RA spell is likely to be correlated with the other processes analyzed in this paper, it must be modeled alongside the latter. We specify its hazard rate as

$$\theta_{\bar{r}}(t|x, V_{\bar{r}}) = \lambda_{\bar{r}}(t) \exp(x\beta_{\bar{r}}) V_{\bar{r}} \tag{4}$$

Again, if V_u and $V_{\bar{r}}$ are dependent, then $I(t < t_r + t_{\bar{r}})$ will be endogenous and $T_{\bar{r}}$ will have to be estimated jointly with T_u and T_r.

Unemployment recurrence Our dataset allows us to observe individuals re-entering unemployment after a previous unemployment spell has ended. Because RA might affect the kind of job unemployed individuals can make a transition to, we also model unemployment recurrence as a fourth duration process denoted T_e. The corresponding hazard rate is given by:

$$\theta_e(t|x, z, V_e) = \lambda_e(t) \exp(x\beta_e + z\gamma) V_e$$

where V_e are the individuals' unobserved characteristics affecting unemployment recurrence; z contains variable summarizing the individual's situation with respect to RA during the previous unemployment spell (occurrence of an RA spell, end of the unemployment spell during or after the RA spell). γ is a conformable vector of coefficients that will measure the impact of RA on unemployment recurrence and, indirectly, on the "quality" of jobs found via Reduced Activity schemes. Again, V_e is allowed to be correlated with the other elements of V.

Non-random censoring Our dataset is an extract from administrative records. It has the advantage of being less subject to measurement errors than traditional survey data, but has the drawback of suffering from relatively large rates of attrition. To remain registered with the employment agency, individuals must send a monthly report stating their situation with respect to employment. Failure to send the report, or to show up to appointments with caseworkers lead to a de-registration of the unemployed with the employment agency, and thus to attrition in the dataset. Because this attrition is most likely non random, one cannot treat it as standard censoring. To control for its non-random nature, we chose to model it as an additional dependant competing risk. Let T_c be the random variable of time until non-random censoring. The corresponding hazard rate is:

$$\theta_c\left(t|x,V_c\right) = \lambda_c\left(t\right)\exp\left(x\beta_c\right)V_c$$

where V_c are the unobserved characteristics affecting time to non-random censoring. As before, V_c is allowed to be correlated to the other elements of V.

Let $c_h, h = u, r, \bar{r}, e, c$ equal 0 if duration T_h is censored, and 1 if it is completed. Moreover, let $o_{\bar{r}}$ equal 1 if a spell in RA is observed and 0 otherwise ($o_{\bar{r}}$ will be zero if T_r is censored and no RA spell is observed). Similarly, let o_e equal 1 if an employment spell is observed, and zero otherwise. We can write the likelihood of an individual's observed labour market history spell, conditional on X and V as:

$$l\left(t_u,t_r,t_{\bar{r}},t_e,t_c|x,V\right) = l_u l_r l_{\bar{r}}^{o_{\bar{r}}} l_e^{o_e} l_c \tag{5}$$

where

$$l_u = \theta_u\left(t|t_r,x,V_u,V_\delta\right)^{c_u}\exp\left(-\int_0^\infty \theta_u\left(t|t_r,x,V_u,V_\delta\right)dt\right)$$

$$l_r = \theta_r\left(t|x,V_r\right)^{c_r}\exp\left(-\int_0^\infty \theta_r\left(t|x,V_r\right)dt\right)$$

$$l_{\bar{r}} = \theta_{\bar{r}}\left(t|x,V_{\bar{r}}\right)^{c_{\bar{r}}}\exp\left(-\int_0^\infty \theta_{\bar{r}}\left(t|x,V_{\bar{r}}\right)dt\right)$$

$$l_e = \theta_e\left(t|x,z,V_e\right)^{c_e}\exp\left(-\int_0^\infty \theta_e\left(t|x,z,V_e\right)dt\right)$$

$$l_c = \theta_c\left(t|x,V_c\right)^{c_c} \exp\left(-\int_0^{\infty} \theta_c\left(t|x,V_c\right)dt\right)$$

Multiple spells For some individuals, we observe multiple labour market spells (here, the term "labour market spell" refers to one unemployment, including time to treatment, in treatment and to non-random censoring, and possible subsequent employment spells). In this case, we make the assumption that the individual's unobserved characteristics V remain constant across all spells. This allows us to relax some identifying assumptions of the single-spell model, in particular, identification with multiple spells does not require that V be independent of X, an hypothesis that is often hard to justify in empirical studies (van den Berg (2001)). Denoting $t_{h_1}...t_{h_S}$, $h = u, r, \bar{r}, e, c$ the S observed spells of a given individual; his (conditional) likelihood can be written as:

$$l\left(t_{u_1}\ldots t_{u_S}, t_{r_1}\ldots t_{r_S}, t_{\bar{r}_1}\ldots t_{\bar{r}_S}, t_{e_1}\ldots t_{e_S}, t_{c_1}\ldots t_{c_S}|x,V\right) = \Pi_{s=1}^{S} l_s\left(t_{u_s}, t_{r_s}, t_{\bar{r}_s}, t_{e_s}, t_{c_s}|x,V\right) \tag{6}$$

where l_s is defined as in (5).

Finally, we must integrate (6) over the distribution of the unobserved characteristics V to get the individual's unconditional (on V) likelihood :

$$l\left(t_{u_1}\ldots t_{u_S}, t_{r_1}\ldots t_{r_S}, t_{\bar{r}_1}\ldots t_{\bar{r}_S}, t_{e_1}\ldots t_{e_S}, t_{c_1}\ldots t_{c_S}|x\right) = \int l\left(t_{u_1}\ldots t_{u_S}, t_{r_1}\ldots t_{r_S}, t_{\bar{r}_1}\ldots t_{\bar{r}_S}, t_{e_1}\ldots t_{e_S}, t_{c_1}\ldots t_{c_S}|x,V\right)dG(V) \tag{7}$$

where $G(V)$ is the joint distribution of V_u, V_r, $V_{\bar{r}}$, V_e, V_c and V_δ

Interval censoring Although our dataset records the precise day in which individuals enter and leave unemployment, allowing us, in principle, to work in continuous time, RA spells are only recorded on a monthly basis. We therefore use a discrete-time (on interval-censored) approach and model the probability of each spell ending within a given time interval $[t_k, t_k+1]$. The corresponding 'hazard rate', i.e. the probability of ending a spell in a given interval, conditional on survival up to the beginning of the interval is:

$$\Pr\left(T_h \in [t_k, t_k+1] | T_h \geq t_k\right) = 1 - \exp\left(-\exp\left(X\beta_h + \gamma_{hk} + \ln\left(V_h\right)\right)\right)$$

and the corresponding survival function is:

$$\Pr\left(T_h \geq t_K\right) = \Pi_{k=0}^{K} \exp\left(-\exp\left(X\beta_h + \gamma_{hk} + \ln\left(V_h\right)\right)\right)$$

where $h \in \{u, r, \bar{r}, e\}$, and $\gamma_k = \ln\left(\int_{t_k}^{t_k+1} \lambda_{oh}(t)\,dt\right)$

5.2 Specification of the heterogeneity distribution

Allowing for a fully non-parametric distribution for V à la Heckman and Singer (1984) would be computationally challenging since the number of parameters increase sharply with the number of masspoints and of dimensions. We instead follow the literature and specify $G(V)$ as a two-factor loading distribution (see Bonnal, Fougère, and Sérandon, 1997 who use a two-factor loading specification to fit a model with six equations). More specifically, we define

$$V_u = \exp(a_u U_1 + b_u U_2)$$
$$V_r = \exp(a_r U_1 + b_r U_2)$$
$$V_{\bar{r}} = \exp(a_{\bar{r}} U_1 + b_{\bar{r}} U_2)$$
$$V_e = \exp(a_e U_1 + b_e U_2)$$

and

$$V_c = \exp(a_c U_1 + b_c U_2)$$

Here, U_1 and U_2 are the two factors that enter every duration. We impose a scale normalization by assuming that U_1 and U_2 are independently distributed on $\{-1,1\}$ with probabilities $\Pr(U_1 = 1) = p_1$ and $\Pr(U_2 = 1) = p_2$. The covariance matrix of the factors, $Var(U)$, is a the diagonal matrix where the i^{th} of the diagonal is $4\left(p_i - p_i^2\right)$. Moreover, we restrict $b_k = 0$, for some $k \in \{u, r, \bar{r}, e\}$. This specification imposes some constraints on the covariance structure of V, but nevertheless allows the correlation coefficients between V_k, and $V_{k'}$ to span the whole interval $[-1,1]$, while reducing the dimensionality of the model. The covariance matrix of V can easily be computed from the parameters of the factor loading specification. The log-transformed terms are $w = \log(V) = \Xi U'$, where Ξ is the 5×2 matrix formed by the coefficients a_k and b_k; and $U = (U_1, U_2)$. The covariance matrix of w is then $Var(w) = \Xi Var(U) \Xi'$; with $Var(U)$ is as defined above[14]. For computational tractability, V_δ, the heterogeneity parameter of the treatment effect, is specified as a linear function of V_u:

$$V_\delta = \alpha V_u$$

We thus impose that the correlation between V_δ and V_u is either null (if $\alpha = 0$)[15] or perfect (if $\alpha \neq 0$).

[14]Restricting p_1 and p_2 to equal 0.5 would not have restricted the covariance structure of the heterogeneity terms differently than when p_1 and p_2 are allowed to vary. However, the marginal distributions of the heterogeneity terms would have been constrained to be symmetric around zero, which our specification does not impose.

[15]In this case, the distribution of V_δ is degenerate at 0.

6 Results

For the equations governing the transition out of unemployment, into treatment and out of employment, we specify a piecewise constant baseline hazard on the following time intervals: $[0,2]$, $[2,4[$, $[4,6[$, $[6,9[$, $[9,12[$, $[12,18[$, $[18,24[$ and $[24,36]$. Spells of reduced activity are typically short (3.2 months on average) and the majority of individuals spend only one month in RA. Therefore, we specify a constant hazard for the duration of RA spells.

We are interested in the variation of the treatment effect of reduced activity on the exit rate out of unemployment along three dimensions. First, the effect of RA might differ for individuals who are currently in reduced activity compared to those who have left RA, because of a potential lock-in effect. Second, within each of the previous cases, the effect can differ with time spent since entry into RA, or since having left RA. Finally, because RA rules lead to very different incentive structures for UI recipients compared to non recipients, treatment effects along the two previous dimensions can vary with UI recipiency. We thus define the following dummy variables to capture the heterogeneity of the treatment effect with respect to time and to UI recipiency. We separate time in treatment into two sub-periods of, respectively, less than 3 months and more than three months in RA. The post-treatment period is itself separated in three sub-periods: less than three months after the end of the RA spell, between 3 and 6 months after the end of the RA spell, and more than 6 monts after. Each variable is then interacted with UI recipiency to take into account the potentially different treatment effects of RA for the two categories of individuals. Moreover, in a model where V_δ is set to zero, we allow the treatment effect to depend on the length of time before entry into RA With respect to the length of the unemployment spell, the treatment effect is thus modeled through $5 \times 2 = 10$ dummy variables and one continuous variable.

The treatment effect of reduced activity on the exit rate out of employment is modeled through a dummy variable taking the value 1 if the individual has had an RA spell in his previous unemployment spell, and zero otherwise. To allow for a different effect of RA on the length of the employment spell if the individual was benefiting from UI benefits during his RA spell, we also include a dummy variable indicating that the RA spell was concomitant with UI receipt. Finally, we include an additional dummy variable indicating if the individual exited unemployment while in RA.

Control variables include the usual socio-economic characteristics such as sex, age, education, nationality, household structure and the cumulative unemployment during the last five years. We also control for the reason of entry into unemployment and for receipt of unemployment benefit and a French guaranteed minimum income benefit, the RMI. Local macroeconomic conditions are controlled for *via* the local unemployment rate. All variables are (potentially) time-varying.

We estimates four versions of the model. In Model (1), the timing of entry into treatment and the length of the RA spell are assumed exogenous. Moreover, the employment spell is not included in the model. In other words, the elements l_r, $l_{\bar{r}}$ and l_e are dropped from equations (5) and (7). Model (2) introduces the time to treatment.[16] Model (3) further introduces the length of the RA spell.[17] Finally, Model (4) is the full model described in equations (5) and (7). The correction for non-random censoring is included in all models.

We first present the results without unobserved heterogeneity on the treatment effect, and then turn to a version where treatment effects are allowed to depend on unobserved characteristics V_δ.

6.1 Homogenous treatment effects

In this section, we present results from the model where α is set to zero, i.e. where $V_\delta = 0$ and the treatment effect does not depend on an unobserved heterogeneity term. We therefore allow the treatment effect to depend on the time to entry into RA. Such dependance to time-to-entry is not identified when $V_\delta \neq 0$ (see Richardson and van den Berg, 2006).

Before turning to the interpretation of the results from the models where the treatment effects vary with observed characteristics, we first present a benchmark model similar to Model(2) described above, and where the treatment effect is constant over time, and across characteristics. As noted in Section 5.1, such a specification leads to an estimate of the treatment effect that averages over the in-treatment and post-treatment period. Nonetheless, it gives a rough idea of the overall effect of reduced activity on the exit rate from unemployment. Table 2 present the estimated parameter from this benchmark model. Results show that reduced activity has a negative impact of the transition rates to employment[18], reducing it by 23% $(1-\exp(-0.265))$. This average negative impact can be misleading as it provides no information on the variation with time and across characteristics of the treatment effect, and thus gives no insight into the possible policy changes that might allow to improve the efficiency of RA rules. To gain more insight on the effects of reduced activity, we now turn to the estimation of more complete models.

Table 4 gives the estimated parameters of the baseline hazard and control variables for the four equation of the full model. Estimates of the control variables are very similar across models, and we only present the results from model (4) to gain space. Table 3 shows the estimated treatment effects on the hazard rate out of unemployment, and on the hazard rate out of employment, separately for the four versions of the model. Table

[16] The elements $l_{\bar{r}}$ and l_e are dropped from equations (5) and (7).

[17] l_e is dropped from equations (5) and (7).

[18] A "naïve" estimation using Model (1) and a simple dummy for treatment lead to an estimated positive and significant impact of RA on the hazard to employment of roughly +16%. Correcting for the endogeneity of time to treatment thus inverts the conclusions that can be drawn from the analysis of the impact of RA on the duration of unemployment spells.

5 gives the estimated factor loadings for the unobserved heterogeneity distribution for all models. Figure 1 plots the estimated baseline hazards[19] for the unemployment duration, the pre-treatment duration, and the employment duration.

Results from Table 3[20] indicate the presence of a significant lock-in effect in the periods of reduced activity: during the first three months of RA, individuals who do not receive UI benefits have their hazard rate reduced by 55% $(1-\exp(-0.805))$; and the drop reaches 78% after three months of RA. Individuals receiving UI benefits experience a lower decrease of their transition rate into employment during their RA spell: by 36.8% $(1-\exp(-0.805+0.346))$ during the first three months, by and 74.6% afterwards. The difference between UI and non UI recipients is only significant during the first three months of reduced activity. We conjecture that the substantial overall decrease of the hazard rate during reduced activity stems from a decrease in the job search intensity occurring when individuals are employed. It is important to note that these estimates of the treatment effects are, in this model, conditional on the duration before entry into RA. Each month before treatment raises the hazard rate after entry by 5.9% $(\exp(0.057))$. The mean duration before entry into RA is 4.34 month (for those with a known RA spell). Therefore, the treatment effects of RA for an individual with the mean duration before treatment should be offset by 0.249 (4.34×0.057). Taking this mean duration before entry in RA into account, one can calculate that the post-treatment effect for non UI recipients is first strongly positive, increasing the hazard rate by 108% during the first 3 months, then by 11.3% during the 3 following months, before dropping to a 5.8% decrease after 6 months. The gain in human capital and employability that stems from a recent work experience, while quickly decreasing, is noticeable and has a large effect. Likewise, the lock-in effect, while still significant, is substantially reduced when time to treatment is accounted for: -42.6% in the first three months, and -72% thereafter. For UI recipients, the lock-in effects are -18% and -67.3% during and after the first three months. The post-treatment effect for UI recipients is almost null for the first three months, the declines rapidly to -55% after 6 months.

Turning now to the estimates of the treatment effect of reduced activity on the duration of the subsequent employment spell, results presented in the last column of Table 3 indicate that reduced activity tends to increase the subsequent employment duration for those who experienced a reduced activity spell without receiving UI benefits, while no significant differences in employment duration appears to result from an RA spell concomitant with UI receipt. Finally, exiting from unemployment to employment while in RA does not seem to improve employment duration.

It is also interesting to note that UI recipients have a lower exit rate to reduced

[19] All covariates are set to zero

[20] We interpret the estimated coefficients of Model (4) only, as it is the most complete, and the most likely to control for all potential endogeneity biases.

activity, which is consistent with the fact that, since the implicit marginal tax rate on wage income from RA is equal to the replacement rate; UI recipients thus have less to gain from a spell of reduced activity.

Table 2: Benchmark model

Variable	U.→E. **Coefficient** (Std. Err.)	U.→C. **Coefficient** (Std. Err.)	To RA **Coefficient** (Std. Err.)
Baseline months 2-4	0.599** (0.047)	−0.103** (0.032)	−0.289** (0.034)
Baseline months 4-6	0.646** (0.054)	−0.203** (0.039)	−0.445** (0.046)
Baseline months 6-9	0.629** (0.056)	−0.108** (0.039)	−0.545** (0.052)
Baseline months 9-12	0.242** (0.071)	−0.245** (0.048)	−0.563** (0.067)
Baseline months 12-18	0.105 (0.072)	−0.284** (0.049)	−0.559** (0.069)
Baseline months 18-24	0.000 (0.090)	−0.315** (0.063)	−0.852** (0.109)
Baseline after 24 months	−0.034 (0.093)	−0.316** (0.068)	−0.731** (0.116)
Treatment effect	−0.265** (0.048)	−0.007 (0.037)	
Characteristics			
Woman	−0.095* (0.039)	−0.367** (0.028)	0.030 (0.031)
Age	−0.006** (0.002)	−0.036** (0.002)	−0.017** (0.002)
French national	0.525** (0.072)	−0.233** (0.042)	0.257** (0.053)
Couple	0.107* (0.048)	−0.214** (0.034)	0.049 (0.038)
Has children	−0.033 (0.048)	0.155** (0.035)	−0.054 (0.038)
Local unemp. rate	−0.078** (0.008)	−0.005 (0.006)	− 0.07 ** (0.006)
Cum. unemp. in the 5 preceding years	−0.064** (0.013)	−0.027** (0.009)	0.08 ** (0.009)
Education (none, or primary)			
Secondary education	0.113† (0.059)	−0.483** (0.037)	0.150** (0.046)
Tertiary education	0.470** (0.067)	−0.885** (0.047)	0.107* (0.054)
Social transfers (none)			
UI receipt	−1.119** (0.037)	−1.366** (0.028)	−0.181** (0.031)
RMI	−0.761** (0.075)	0.099** (0.037)	−0.467** (0.056)
Reason for unemployment (first entry)			
Fired	0.724** (0.104)	−0.116† (0.066)	−0.172* (0.084)
Demission	0.598** (0.114)	0.348** (0.069)	0.377** (0.090)
End of fixed-term contract	1.105** (0.094)	0.093† (0.056)	0.476** (0.075)
Other	0.193* (0.097)	0.063 (0.055)	0.052 (0.076)
Intercept	−3.576** (0.167)	−0.557** (0.115)	−2.298** (0.129)
a_u	−0.504** (0.097)	a_c	−0.981** (0.057)
b_u	0.753** (0.054)	b_c	−1.495** (0.050)
a_r	0.099* (0.042)		
$\Pr(U_1 = 1)$	0.574** (0.031)	$\Pr(U_2 = 1)$	0.456** (0.025)
N		18100 spells	
Log-likelihood		-74990.927	
$\chi^2_{(68)}$		8748.32	

Sig. levels : † : 10% ∗ : 5% ∗∗ : 1%

Table 3: Homogenous treatment effects

	Model (1)	Model (2)	Model (3)	Model (4)	
	U.→E.	U.→E.	U.→E.	U.→E.	E.→U.
	Coefficient (Std. Err.)	**Coefficient** (Std. Err.)	**Coefficient** (Std. Err.)	**Coefficient** (Std. Err.)	**Coefficient** (Std. Err.)
In RA for less than 3 months	-0.685^{**} (0.093)	-1.189^{**} (0.094)	-0.816^{**} (0.093)	-0.805^{**} (0.093)	
In RA for more than 3 months	-1.602^{**} (0.173)	-2.178^{**} (0.172)	-1.534^{**} (0.173)	-1.519^{**} (0.173)	
In RA for less than 3 months * UI	0.325^{**} (0.114)	0.313^{**} (0.112)	0.329^{**} (0.112)	0.346^{**} (0.112)	
In RA for more than 3 months * UI	0.120 (0.215)	0.088 (0.211)	0.135 (0.208)	0.149 (0.208)	
First 3 months after RA	0.828^{**} (0.064)	0.200^{**} (0.065)	0.493^{**} (0.064)	0.482^{**} (0.064)	
From 3 to 6 months after RA	0.426^{**} (0.103)	-0.423^{**} (0.101)	-0.123 (0.101)	-0.143 (0.101)	
More than 6 months after RA	0.517^{**} (0.098)	-0.558^{**} (0.094)	-0.281^{**} (0.092)	-0.310^{**} (0.093)	
First 3 months after RA * UI	-0.782^{**} (0.085)	-0.754^{**} (0.083)	-0.755^{**} (0.083)	-0.724^{**} (0.082)	
From 3 to 6 months after RA * UI	-0.599^{**} (0.137)	-0.474^{**} (0.134)	-0.455^{**} (0.134)	-0.420^{**} (0.134)	
More than 6 months after RA * UI	-1.004^{**} (0.125)	-0.794^{**} (0.117)	-0.754^{**} (0.118)	-0.730^{**} (0.118)	
Months before RA	0.068^{**} (0.006)	0.085^{**} (0.006)	0.060^{**} (0.006)	0.057^{**} (0.006)	
Was in RA when exited from unemp.					0.133^{*} (0.068)
Had an RA spell					-0.439^{**} (0.083)
Had an RA spell with UI					0.540^{**} (0.082)

Significance levels : †: 10% $*$: 5% $**$: 1%

Table 4: Control variables, Model (4)

Variable	U.→E. Coefficient (Std. Err.)	U.→C. Coefficient (Std. Err.)	To RA Coefficient (Std. Err.)	From RA Coefficient (Std. Err.)	E.→U.
Baseline months 2-4	0.508** (0.047)	−0.172** (0.033)	−0.394** (0.032)		1.431** (0.088)
Baseline months 4-6	0.54 ** (0.054)	−0.383** (0.039)	−0.618** (0.043)		1.464** (0.089)
Baseline months 6-9	0.541** (0.057)	−0.400** (0.039)	−0.775** (0.049)		1.342** (0.089)
Baseline months 9-12	0.227** (0.073)	−0.633** (0.048)	−0.848** (0.064)		0.900** (0.098)
Baseline months 12-18	0.087 (0.078)	−0.797** (0.048)	−0.888** (0.065)		0.305** (0.101)
Baseline months 18-24	−0.016 (0.101)	−0.946** (0.062)	−1.235** (0.106)		−0.215† (0.121)
Baseline after 24 months	−0.101 (0.111)	−1.026** (0.064)	−1.142** (0.113)		−0.390** (0.119)
Characteristics					
Woman	−0.113** (0.037)	−0.305** (0.027)	−0.009 (0.028)	−0.318** (0.041)	−0.004 (0.041)
Age	−0.005* (0.002)	−0.032** (0.002)	−0.014** (0.002)	−0.028** (0.002)	−0.001 (0.003)
French national	0.541** (0.072)	− 0.21 ** (0.040)	0.239** (0.048)	−0.206** (0.075)	−0.316** (0.076)
Couple	0.118* (0.046)	−0.207** (0.033)	0.035 (0.034)	−0.139** (0.053)	−0.188** (0.054)
Has children	−0.066 (0.047)	0.172** (0.034)	−0.055 (0.034)	0.102† (0.054)	−0.077 (0.054)
Local unemp. rate	−0.076** (0.008)	−0.002 (0.005)	−0.061** (0.006)	−0.021* (0.009)	0.011 (0.009)
Cum. unemp. in the 5 preceding years	−0.060** (0.013)	−0.027** (0.008)	0.066** (0.009)	−0.020 (0.013)	0.077** (0.014)
Education (none, or primary)					
Secondary education	0.065 (0.059)	−0.439** (0.036)	0.199** (0.042)	−0.326** (0.065)	−0.008 (0.063)
Tertiary education	0.392** (0.066)	−0.779** (0.045)	0.148** (0.049)	−0.222** (0.077)	−0.395** (0.073)
Social transfers (none)					
UI receipt	−0.888** (0.047)	−1.714** (0.036)	−0.109** (0.029)	−0.221** (0.039)	
RMI	−0.804** (0.075)	0.069† (0.038)	−0.444** (0.052)	0.22 ** (0.079)	
Reason for unemployment (first entry)					
Fired	0.545** (0.103)	0.018 (0.063)	−0.162* (0.080)	0.023 (0.111)	−0.442** (0.124)
Demission	0.521** (0.113)	0.371** (0.065)	0.368** (0.085)	0.033 (0.117)	−0.067 (0.135)
End of fixed-term contract	0.949** (0.093)	0.168** (0.052)	0.472** (0.071)	−0.098 (0.099)	0.113 (0.110)
Other	0.081 (0.096)	0.082 (0.052)	0.042 (0.073)	−0.053 (0.102)	−0.146 (0.116)
In RA		−2.072** (0.102)			
In RA*UI		1.456** (0.135)			
Post RA		0.640** (0.041)			
Post RA*UI		0.875** (0.053)			
Intercept	−4.121** (0.158)	0.053 (0.095)	−2.352** (0.113)	1.806** (0.199)	−3.641** (0.195)

N	8324 individuals, 18100 spells
Log-likelihood	-95566.937
$\chi^2_{(118)}$	13401.488

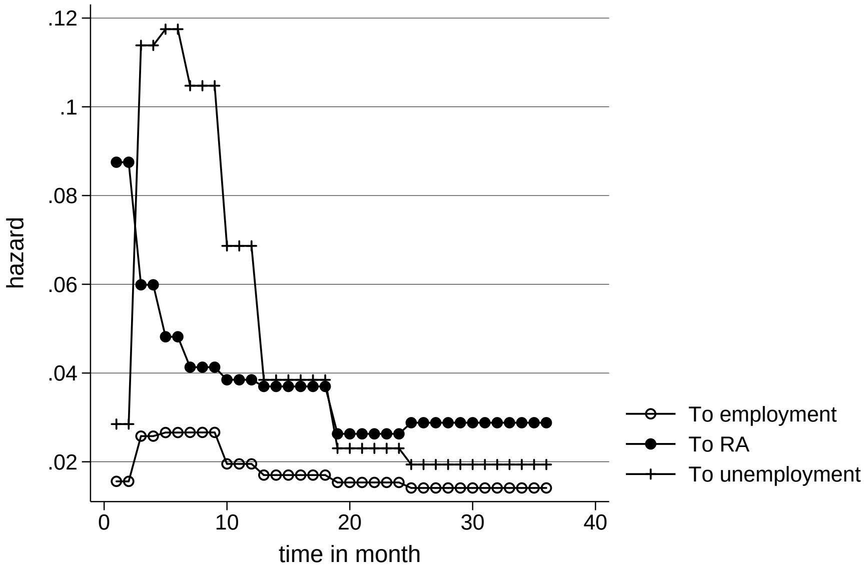
Significance levels : †: 10% $*$: 5% $**$: 1%

Table 5: Factor loadings

Parameter	Model (1) Coefficient (Std. Err.)	Model (2) Coefficient (Std. Err.)	Model (3) Coefficient (Std. Err.)	Model (4) Coefficient (Std. Err.)
a_u	-0.808^{**} (0.042)	-0.900^{**} (0.087)	-0.552^{**} (0.061)	-1.102^{**} (0.059)
b_u	-1.520^{**} (0.154)	0.537^{**} (0.056)	0.684^{**} (0.036)	-0.629^{**} (0.041)
a_r		-0.055 (0.041)	-1.189^{**} (0.045)	-1.113^{**} (0.051)
b_r		0	0	0
$a_{\bar{r}}$			1.034^{**} (0.036)	0.547^{**} (0.120)
$b_{\bar{r}}$			1.042^{**} (0.030)	$-\ 1.05\ ^{**}$ (0.028)
a_e				0.108 (0.074)
b_e				-0.052 (0.037)
a_c	1.013^{**} (0.064)	-1.135^{**} (0.041)	0.434^{**} (0.029)	0.892^{**} (0.042)
b_c	0	-1.475^{**} (0.049)	-0.596^{**} (0.048)	0.363^{**} (0.044)
$\Pr(U_1 = 1)$	0.625^{**} (0.036)	0.618^{**} (0.023)	0.528^{**} (0.015)	0.465^{**} (0.016)
$\Pr(U_2 = 1)$	0.321^{**} (0.036)	0.604^{**} (0.021)	0.376^{**} (0.015)	0.588^{**} (0.018)

Significance levels : †: 10% $*$: 5% $**$: 1%

Figure 1: Estimated baseline hazards



6.2 Heterogenous treatment effects

We now turn to the results of the models allowing the treatment effects to depend on unobserved characteristics. In other words the parameter α is not constrained to be zero. Introducing an unobserved heterogeneity component into the treatment effect will, as explained in Section 5.1, correct for a mover-stayer bias in the estimation of the time-dependant treatment effect. We thus expect the estimates of the impact of RA to become less decreasing with time compared to the results of the previous sub-section.

Table 6 shows the estimated parameters of the treatment effects for models (2h), (3h) and (4h)[21]. Substantial unobserved heterogeneity is present in the treatment effect. $\hat{\alpha}$, the estimated parameter of treatment effect heterogeneity ranges between -0.48 and -0.6, meaning that the size of the treatment effect is negatively correlated with the heterogeneity term affecting exits from unemployment: the gain from reduced activity is greater for individuals with unfavorable unobserved characteristics. One implication is that employment agencies should target the latter type of individuals and encourage them to enter reduced activity. As expected, the time-profile of the treatment effects become less decreasing when heterogeneity is introduced in the model. Using coefficients from Model (4h), we find that the lock-in effect is negligible in the first three months for non UI recipients, then increases to -60% after three months (versus -72% in the

[21] Where "h" stands for "heterogenous"

homogeneous model). For UI recipients, the initial lock-in effect is actually negative since the estimated variation in the hazard rate is +48%, and then goes to -52% (versus -67.3% in the homogenous model). The same pattern can be found in the post-RA effects. For non UI recipients, the hazard rate is multiplied by 3 in the first three months after RA, then increases by 65% in the three following months, before settling at +21% afterwards. For UI recipients, the initial increase is by 75%, then by 18% and finally -36% (versus -55% in the homogenous model).

Table 6: Heterogenous treatment effects

	Model (2h)	Model (3h)	Model (4h)	
	U.→E.	U.→E.	U.→E.	E.→U.
	Coefficient (Std. Err.)	**Coefficient** (Std. Err.)	**Coefficient** (Std. Err.)	**Coefficient** (Std. Err.)
In RA for less than 3 months	-0.401^{**} (0.097)	-0.055 (0.101)	-0.057 (0.101)	
In RA for more than 3 months	-1.486^{**} (0.171)	-0.924^{**} (0.172)	-0.926^{**} (0.172)	
In RA for less than 3 months * UI	0.412^{**} (0.112)	0.450^{**} (0.112)	0.45^{**} (0.112)	
In RA for more than 3 months * UI	0.128 (0.209)	0.181 (0.208)	0.184 (0.208)	
First 3 months after RA	0.910^{**} (0.067)	1.194^{**} (0.075)	1.190^{**} (0.076)	
From 3 to 6 months after RA	0.208^{*} (0.102)	0.500^{**} (0.108)	0.495^{**} (0.108)	
More than 6 months after RA	-0.082 (0.095)	$0.192^{\dagger}$ (0.102)	$0.184^{\dagger}$ (0.103)	
First 3 months after RA * UI	-0.671^{**} (0.082)	-0.634^{**} (0.082)	-0.634^{**} (0.082)	
From 3 to 6 months after RA * UI	-0.376^{**} (0.132)	-0.329^{*} (0.132)	-0.329^{*} (0.133)	
More than 6 months after RA * UI	-0.702^{**} (0.116)	-0.646^{**} (0.116)	-0.645^{**} (0.116)	
Was in RA when exited from unemp.				0.097 (0.068)
Had an RA spell				-0.471^{**} (0.082)
Had an RA spell with UI				0.630^{**} (0.084)
α	-0.604^{**} (0.055)	-0.485^{**} (0.049)	-0.477^{**} (0.049)	

Significance levels : †: 10% $*$: 5% $**$: 1%

Table 7: Control variables, Model (4h)

Variable	U.→E. Coefficient (Std. Err.)	U.→C. Coefficient (Std. Err.)	To RA Coefficient (Std. Err.)	From RA Coefficient (Std. Err.)	E.→U. Coefficient (Std. Err.)
Baseline months 2-4	0.513** (0.048)	− 0.18 ** (0.033)	−0.393** (0.032)		1.402** (0.088)
Baseline months 4-6	0.569** (0.055)	−0.394** (0.040)	−0.615** (0.043)		1.396** (0.090)
Baseline months 6-9	0.609** (0.058)	−0.411** (0.039)	−0.771** (0.049)		1.228** (0.091)
Baseline months 9-12	0.345** (0.073)	−0.644** (0.048)	−0.842** (0.064)		0.761** (0.101)
Baseline months 12-18	0.28 ** (0.075)	−0.807** (0.048)	− 0.88 ** (0.065)		0.143 (0.104)
Baseline months 18-24	0.261** (0.095)	−0.951** (0.062)	−1.225** (0.107)		− 0.4 ** (0.125)
Baseline after 24 months	0.26 ** (0.100)	−1.020** (0.064)	−1.132** (0.113)		−0.574** (0.122)
Characteristics					
Woman	−0.105** (0.036)	−0.302** (0.027)	−0.006 (0.028)	−0.314** (0.041)	−0.002 (0.041)
Age	−0.005* (0.002)	−0.032** (0.002)	−0.013** (0.002)	−0.028** (0.002)	0 (0.003)
French national	0.517** (0.071)	−0.198** (0.040)	0.234** (0.048)	−0.215** (0.075)	−0.314** (0.076)
Couple	0.115* (0.045)	−0.206** (0.033)	0.036 (0.034)	− 0.15 ** (0.052)	−0.183** (0.054)
Has children	−0.057 (0.046)	0.167** (0.034)	−0.054 (0.035)	0.11 * (0.053)	−0.079 (0.054)
Local unemp. rate	−0.071** (0.008)	−0.003 (0.005)	− 0.06 ** (0.006)	−0.019* (0.009)	0.012 (0.009)
Cum. unemp. in the 5 preceding years	−0.057** (0.012)	−0.031** (0.008)	0.067** (0.009)	−0.019 (0.013)	0.079** (0.014)
Education (none, or primary)					
Secondary education	0.052 (0.058)	−0.435** (0.036)	0.201** (0.042)	−0.316** (0.065)	0.011 (0.063)
Tertiary education	0.38 ** (0.064)	−0.783** (0.045)	0.155** (0.049)	−0.194* (0.076)	−0.378** (0.073)
Social transfers (none)					
UI receipt	−0.899** (0.048)	−1.710** (0.036)	−0.102** (0.029)	−0.211** (0.039)	
RMI	−0.805** (0.075)	0.068† (0.036)	−0.454** (0.053)	0.221** (0.080)	
Reason for unemployment (first entry)					
Fired	0.563** (0.101)	0.013 (0.063)	−0.152† (0.080)	0.033 (0.112)	−0.362** (0.124)
Demission	0.508** (0.110)	0.372** (0.065)	0.37 ** (0.085)	0.031 (0.117)	− 0.04 (0.135)
End of fixed-term contract	0.893** (0.090)	0.179** (0.052)	0.467** (0.071)	−0.088 (0.099)	0.172 (0.110)
Other	0.082 (0.094)	0.079 (0.051)	0.042 (0.073)	−0.049 (0.102)	−0.098 (0.116)
In RA		−2.072** (0.102)			
In RA*UI		1.444** (0.135)			
Post RA		0.704** (0.040)			
Post RA*UI		0.843** (0.053)			
Intercept	−4.267** (0.156)	0.066 (0.094)	−2.394** (0.115)	1.859** (0.205)	−3.602** (0.195)

N	8324 individuals, 18100 spells
Log-likelihood	-95559.153
$\chi^2_{(118)}$	13455.77

Significance levels : †: 10% $*$: 5% $**$: 1%

Table 8: Factor loadings, heterogenous models

	Model (2h)	Model (3h)	Model (4h)
Parameter	**Coefficient** (Std. Err.)	**Coefficient** (Std. Err.)	**Coefficient** (Std. Err.)
a_u	-0.685^{**} (0.127)	-1.098^{**} (0.057)	-1.112^{**} (0.059)
b_u	0.863^{**} (0.100)	-0.876^{**} (0.052)	-0.873^{**} (0.053)
a_r	-0.044 (0.041)	-1.143^{**} (0.051)	-1.138^{**} (0.052)
b_r	0	0	0
$a_{\bar{r}}$		0.668^{**} (0.139)	0.651^{**} (0.140)
$b_{\bar{r}}$		-1.035^{**} (0.029)	-1.037^{**} (0.029)
a_c	-1.120^{**} (0.044)	0.929^{**} (0.041)	0.932^{**} (0.041)
b_c	-1.553^{**} (0.048)	0.432^{**} (0.041)	0.432^{**} (0.041)
a_e			0.074 (0.067)
b_e			0.011 (0.038)
$\Pr(U_1 = 1)$	0.629^{**} (0.029)	0.466^{**} (0.016)	0.463^{**} (0.016)
$\Pr(U_2 = 1)$	0.606^{**} (0.021)	0.582^{**} (0.017)	0.578^{**} (0.017)

Sig. levels : †: 10% $*$: 5% $**$: 1%

7 Simulations

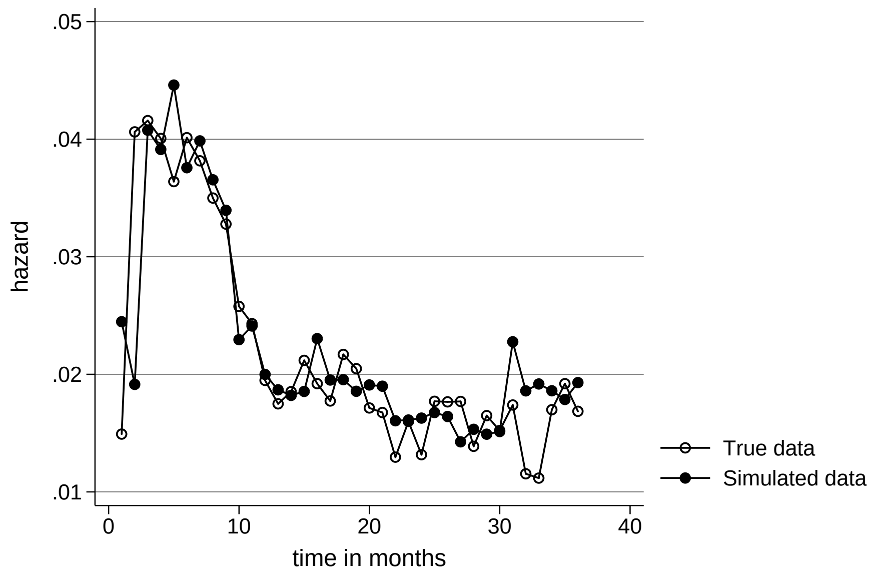
Because the overall effect of reduced activity depend in a complex way on not only on the estimated treatment effects, but also on their interaction with the baseline hasard and the evolution of the distribution of observed and unobserved characteristics among the survivors at each point in time, we turn to simulations to assess more precisely the efficiency of reduced activity on the proportion of unemployed having exited to employment at every point in time.

To run our simulations, we draw from the empirical distribution function of the observed exogenous covariates in our estimation sample at time $t = 1$. We then compute the evolution of these covariates for 36 months in the following way: Characteristics such as sex, education, household structure, nationality, RMI receipt, local unemployment rate, cumulative unemployment and reason for entry into unemployment are assumed to be time constant. Age at each month is trivially computed from age at $t = 1$. For UI benefit, we use information on the number of months the individual is entitled to, and assume he receives it for as long as his entitlement period runs. We further draw from the estimated joint distribution of the heterogeneity terms from Model (4h). We then use the estimated coefficients of Model (4h) to simulate the duration processes to reduced activity, in reduced activity (thus constructing the endogenous explanatory variables of our model), and in unemployment. Figure 2 compares the estimated Nelson-Aalen unemployment hazard estimates from the true and the simulated data, and shows that our model is able to closely replicate the unemployment duration process into study. Here, the simulated data comes from a simulation that also includes time to attrition, as we want to replicate the observed data generating process. In the following simulations, however, we wish to simulate the data generating process of time to employment (and of the endogenous explanatory variables), which is the economist's primary concern, and not the observed one. We thus exclude the time to attrition process from the following simulations.

We compute the proportion of the simulated population having left unemployment from $t = 1$ to $t = 36$ under two scenarios: one where RA is an option available to the unemployed, and one where it is not. In the latter case, we set all parameters of the treatment effects to zero. We then compute the difference between these two proportion at each point in time[22]. A positive difference indicate that reduced activity improves the proportion of individuals having left unemployment, and a negative difference indicates that RA has a negative impact. Figure 3 plots these differences using all individuals in our sample. It shows that the lock-in effect induces a negative impact of RA in the first nine months after the start of the unemployment spell, and a positive effect afterwards. Both the positive an d negative effects are rather small, ranging from -0.75 percentage

[22]In future versions, bounds for the 95% confidence interval will be computed using repeated draws from the joint distribution of the estimated coefficients.

Figure 2: Nelson-Aalen hazards, true and simulated data



points to +1 percentage point. We next run the same simulations for two sub samples: individuals receiving UI benefits in the first month of unemployment, and those who do not. Figures 4 and 5 plot the gain from RA for the two populations. As can be seen from these Figures, the pattern are markedly different for the two sub populations. While UI recipients experience a negative effect of reduced activity for virtually all 36 months, the lock-in effect for non UI recipients disappears after 7 months, and the positive effect of reduced activity steadily increases afterwards, reaching +2 percentage points after 36 months.

Figure 3: Simulated gains from RA, all individuals

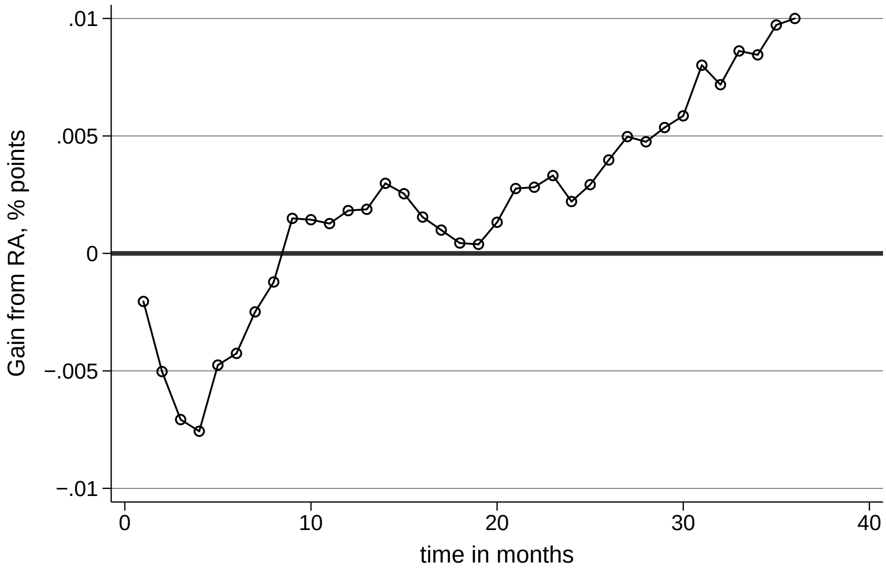


Figure 4: Simulated gains from RA, UI recipients

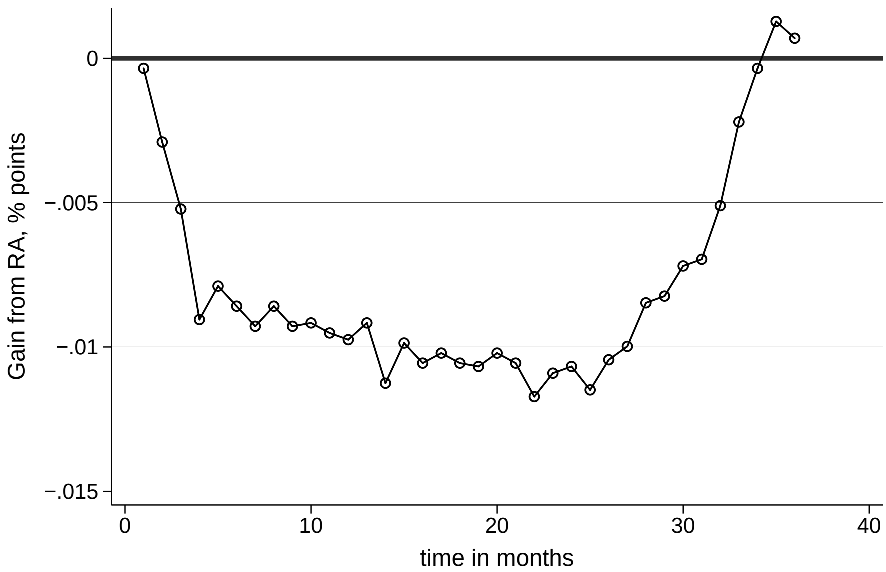
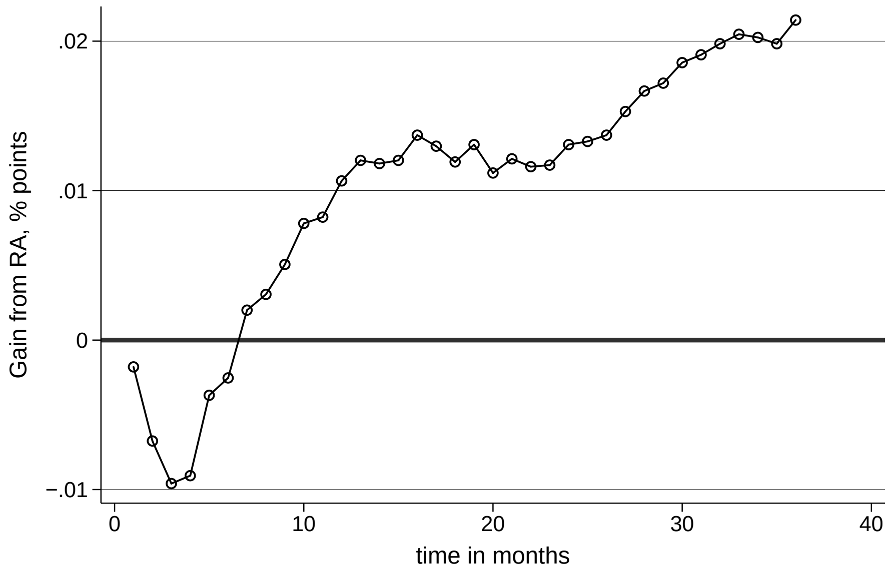


Figure 5: Simulated gains from RA, non UI recipients



TO BE COMPLETED

8 Conclusion

TO BE COMPLETED

References

ABBRING, J. H., AND G. J. VAN DEN BERG (2003): "The nonparametric identification of treatment effects in duration models," *Econometrica*, 71(5), 1491–1517.

ALGAN, Y., AND A. TERRACOL (2002): "L'influence de l'épargne de précaution sur la recherche d'emploi," *Économie et Statistiques*, (349-350), 63–76.

BLOEMEN, H. G. (2002): "The relation between wealth and labour market transitions: an empirical study for the Netherlands," *Journal of Applied Econometrics*, 17(3), 249–268.

BLOEMEN, H. G., AND E. G. F. STANCANELLI (2001): "Individual Wealth, Reservation Wages, and Transitions into Employment," *Journal of Labor Economics*, 19(2), 400–439.

BONNAL, L., D. FOUGÈRE, AND A. SÉRANDON (1997): "Evaluating the Impact of French Employment Policies on Individual Labour Market Histories," *The Review of Economics and Statistics*, 64(4), 683–713.

COCKX, B., S. ROBIN, AND C. GOEBEL (2006): "Income Support Policies for Part-Time Workers: A Stepping-Stone to Regular Jobs? An Application to Young Long-Term Unemployed Women in Belgium," CESifo Working Paper Series 1863, CESifo GmbH.

CRÉPON, B., M. DEJEMEPPE, AND M. GURGAND (2005): "Counseling the Unemployed: Does It Lower Unemployment Duration and Recurrence?," IZA Discussion Papers 1796, IZA.

CRÉPON, B., M. FERRACCI, AND D. FOUGÈRE (2007): "Training the Unemployed in France: How Does It Affect Unemployment Duration and Recurrence?," IZA Discussion Papers 3215, IZA.

GRANIER, P., AND X. JOUTARD (1999): "L'activité réduite favorise-t-elle la sortie du chômage ?," *Économie et Statistiques*, (321-322), 133–148.

GURGAND, M. (2002): "Activité réduite: le dispositif d'incitation de l'Unedic est-il incitatif ?," *Travail et emploi*, (89), 81–93.

GURGAND, M., AND M.-T. LETABLIER (1999): "Travailler et être inscrit au chômage : emploi d'attente ou statut intermédiaire?," 4 Pages 33, Centre d'études de l'emploi.

HECKMAN, J. J., AND S. NAVARRO (2005): "Dynamic Discrete Choice and Dynamic Treatment Effects," NBER Technical Working Papers 0316, National Bureau of Economic Research.

HECKMAN, J. J., AND B. SINGER (1984): "A method for minimizing the impact of distributional assumptions in econometric models for duration data," *Econometrica*, 52(2), 271–320.

HUJER, R., S. THOMSEN, AND C. ZEISS (2006): "The effects of vocational training programmes on the duration of unemployment in Eastern Germany," *ASTA Advances in Statistical Analysis*, 90(2), 299–321.

KLUVE, J. (ed.) (2007): *Active Labor Market Policies in Europe: Performance and Perspectives*. Springer, Ney York.

LENTZ, R., AND T. TRANAES (2001): "Job Search and Savings: Wealth Effects and Duration Dependence," Working Paper 461, CESifo.

MCCALL, B. P. (1996): "Unemployment Insurance Rules, Joblessness, and Part-Time Work," *Econometrica*, 64(3), 647–682.

RICHARDSON, K., AND G. J. VAN DEN BERG (2006): "Swedish Labor Market Training and the Duration of Unemployment," Discussion Papers 2314, IZA.

VAN DEN BERG, G. J. (2001): "Duration Models: Specification, Identification, and Multiple Durations," in *Handbook of Econometrics*, ed. by J. J. Heckman, and E. Leamer, vol. 5, chap. 55, pp. 3381–3460. Elsevier.

VAN DEN BERG, G. J., A. HOLM, AND J. C. VAN OURS (2002): "Do stepping-stone jobs exist? Early career paths in the medical profession," *Journal of Population Economics*, 15(4), 647–665.

ZIJL, M., G. J. VAN DEN BERG, AND A. HEYMA (2004): "Stepping-stones for the unemployed: the effect of temporary jobs on the duration until regular work," Discussion Paper 1241, IZA.