Overeducation at the Start of the Career: Stepping Stone or Trap?

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ABSTRACT

Overeducation at the Start of the Career: Stepping Stone or Trap?[*]

This study investigates whether young unemployed graduates who accept a job below their level of education accelerate or delay the transition into a job that matches their level of education. We adopt the Timing of Events approach to identify this dynamic treatment effect using monthly calendar data from a representative sample of Flemish (Belgian) youth who started searching for a job right after leaving formal education. We find that overeducation is a trap. This trap is especially important early in the unemployment spell. Our results are robust across various specifications and for two overeducation measures.

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1. Introduction

Numerous studies have shown that many young workers are overeducated at the start of their careers (see, e.g., Battu *et al.*, 1999; Dolton and Vignoles, 2000). A worker is considered to be overeducated if her/his education is higher than the level that is typically required to perform adequately. This phenomenon suggests a less-than-optimal allocation of graduates over jobs and is potentially costly for society (Groot and Maassen van den Brink, 2000; McGuinness, 2006). For overeducated workers, this translates in lower earnings (Hartog, 2000) and lower job satisfaction (see, e.g., Tsang, 1987; Allen and van der Velden, 2001). Therefore, one might wonder why young job seekers actually accept jobs with requirements below their educational attainment. One potential answer is that this is the shortest pathway to a job that matches the attained educational level. This stepping stone hypothesis has been formulated most clearly by Sicherman and Galor (1990). According to their career mobility theory, overeducation is an investment in work experience which enhances promotion opportunities to higher level positions inside or outside the firm. In addition, by taking these positions, workers avoid unemployment scarring (see, e.g., Arulampalam, 2001), resulting from negative signalling, skill depreciation or psychological discouragement. However, overeducation might just as well retard the transition to an adequate job. Job specific human capital investments may lock workers into bad positions (Pissarides, 1994). Further, the sources underlying unemployment scarring may equally apply to overeducation. According to McCormick (1990), overeducation even acts as a stronger negative signal to employers than unemployment and de Grip *et al.* (2008) show that overeducation also results in cognitive decline. Moreover, Verhaest and Omey (2009) find that the negative association between overeducation and job satisfaction declines over time, suggesting some habituation. Finally, while job search models show that it may be optimal to accept a lower position and to pursue on-the-job search (Dolado *et al.*, 2009), it is doubtful whether the same search intensity can be maintained.

Several empirical studies have already provided interesting insights into this debate by investigating the mobility behaviour of overeducated workers. Sicherman (1991) and Robst (1995), for instance, find for the US that overeducated workers are more likely to move to occupations with higher human capital requirements than adequately educated workers with similar educational backgrounds. This is consistent with the career mobility thesis. In addition, Rubb (2003) reports a yearly transition rate from overeducation to adequate employment of about 20%, suggesting that overeducation is a temporary problem for most US workers. However, a number of studies for other countries challenge this conclusion. Battu *et al.* (1999) find that the match between the educational degree

and the job requirements remains fairly stable around 60% 1, 6 and 11 years after graduation for two cohorts who graduated from higher education in the UK. Dolton and Vignoles (2000) arrive at similar conclusions. Bauer (2002) finds, using the German GSOEP data from 1984 to 1998, that relatively few employees change their mismatch status. This is confirmed by Büchel and Mertens (2004) who report that overeducation results in less upward occupational mobility and less wage growth in the German labour market. This is especially for young workers with low-quality education (Pollmann-Schult and Büchel, 2004). More recently, Verhaest and van der Velden (In press) studied the persistence of overeducation in 14 countries. They find substantial heterogeneity in this persistence both across countries and within countries according to the quality and orientation of their human capital. Finally, Mavromaras and McGuinness (In press) estimate a dynamic random effects probit model allowing for correlated unobserved heterogeneity on Australian data. They find substantial state dependence in overskilling[1] for workers with a high educational degree, but none for workers with vocational education. Based on a similar model and consistent with the aforementioned findings, Mavromaras *et al.* (2010) report that neither overeducation nor overskilling has any significant effect on job mobility of female university graduates in Australia. By contrast, overeducation, especially in combination with overskilling, positively affects (voluntary) quits, but not (involuntary) layoffs of male graduates. Whether this leads to more upward occupational mobility remains an open question, however.

From this overview of the literature we conclude that evidence for the career mobility theory is mixed. Moreover, most researches just study the persistence of overeducation. However, even if overeducation is persistent, this does not reject the hypothesis that overeducation is a stepping stone to an adequate job. After all, an individual who does not accept a job for which (s)he is overeducated may remain unemployed (and therefore without adequate job) even longer than when (s)he accepts such a job. This article studies the stepping stone hypothesis. In other words, we investigate which strategy unemployed graduates should follow if they aim at speeding up the transition to a job that matches their educational qualifications. Should they, to avoid getting trapped into overeducation, (i) only accept *adequate* jobs that match their educational qualifications? Or, do they have an interest in (ii) accepting jobs for which they are *overeducated,* because these jobs are springboards that speed up the transition to an adequate job?

Our analysis also innovates in the overeducation literature from a methodological point of view. As pointed out by Leuven and Oosterbeek (2011), many studies on overeducation and its consequences

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[1] Overskilling is a situation whereby an individual has more skills and knowledge than those utilized in the job (cf. Allen and van der Velden, 2001; Green and McIntosh, 2007).

fail to account for possible non-random selection into overeducation.[2] For instance, overeducated workers may be less able than adequately educated workers. If so, the comparison of the outcomes between adequately qualified and overeducated workers may partly reflect this ability difference and is therefore not causal. To solve this selection problem, we apply the Timing of Events approach as developed by Abbring and van den Berg (2003). To identify the selection from the treatment effect, this method exploits that unobserved time-constant individual determinants of the transition to an adequate job affect this transition throughout the period that one is searching for an adequate job whereas the treatment (transition into overeducation) may only influence this transition as from the moment at which the treatment occurs. The selection effect can therefore be identified from the pre-treatment data if the treatment is not anticipated and the timing of the treatment is random, even without any exclusion restrictions.

The analysis is based on a retrospective survey of a representative sample of two birth cohorts, born in 1978 and 1980 and living in Flanders, the Dutch-speaking region in the North of Belgium. From this sample we retain male unemployed youth who started searching for a job right after graduating from formal education. An advantage of analysing data right after graduation is that there is a closer connection between the concept of overeducation and overskilling, since individuals have not yet acquired any skills through experience on-the-job. Moreover, the unusual richness of the database sustains the credibility of our findings. On the one hand, it contains detailed information on the timing of labour market transitions: starting dates of job search, transitions from unemployment to employment and even job-to-job and position changes within a same firm. This is crucial for the application of the Timing of Events method and also to capture career mobility even if it occurs within the firm, ensuring that our study cannot be criticized on the grounds of underestimating career mobility. On the other hand, both educational attainment and the job requirements are precisely registered, which allows constructing two measures of overeducation, one based on a job analysis approach and another on a modified self-assessment method. Since the educational requirement according to the latter method is nearly universally higher than the latter, the likelihood that the modified self-assessment method identifies "apparent" overschooling is reduced. This matters, since Chevalier (2003) argues that genuinely overschooled workers are more likely to move to a higher level job than those who are apparently overschooled. Consequently, since our findings are not sensitive to the choice of these measures, we are quite confident that they are not driven by incorrect measurement of the educational requirements.

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[2] The aforementioned articles of Mavromaras and McGuinness (In press) and Mavromaras *et al.* (2010) are rare exceptions with respect to the literature on the job mobility of overeducated workers.

The article is organized as follows. In the next section we describe the dataset in further detail and provide some selected descriptive statistics. *Section 3* discusses the econometric framework. *Section 4* contains and discusses the estimation results. *Section 5* concludes.

2. Data and descriptive statistics

2.1 The sample of analysis

Our analysis is based on data from a representative sample of two cohorts (birth years 1978 and 1980) of the SONAR survey conducted when respondents were 23 years old. Each cohort contains about 3000 individuals. These data are supplemented with data from two follow-up surveys, completed at age 26 for the 1978 cohort (response rate of 69%) and at age 29 for the 1980 cohort (response rate of 64%). Detailed information regarding the sampling procedures and general summary statistics can be found in SONAR (2003) and SONAR (2005).

The SONAR data contain detailed information regarding school and labour market careers, which make them very suitable for our analysis. The level of acquired educational attainment is measured at the moment that the youngster reports to have left formal education for the first time. The labour market history is registered on a monthly basis. Each month is assigned either to a working or to a non-working status, depending on the status in which one spends most of the time. Further, if employed, both job-to-job transitions and position changes within a job are recorded. Part-time jobs held during vocational education, student and vacation jobs are defined to be part of the educational career.

The analysis targets workers who are unemployed right after graduation. We therefore select individuals from the first moment that they report to have started searching for a job since graduation.[3] Furthermore, we only consider men because their labour market decisions are less affected by fertility considerations. Finally, we exclude men who did not attain a degree of lower secondary education, because below this level of education no one is overeducated by definition.

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[3] We do not retain individuals who started searching for jobs during their studies, since for these individuals we cannot identify the moment at which they found a job (if this occurs before graduation). Without information on this moment the Timing of Events approach cannot be implemented.

After eliminating 114 observations for which explanatory variables are missing, the final dataset contains 1434 individuals.

2.2 Measures of overeducation

In the main analysis we define overeducation according to a job analysis approach. Each position in the SONAR data has been coded following the Standard Occupation Classification of Statistics Netherlands (CBS, 2001). This classification groups jobs according to a set of tasks to be executed and assigns to each occupation an educational level that is the most appropriate. The following five functional levels are considered: less than lower secondary, lower secondary, higher secondary, lower tertiary and higher tertiary education. Hence, an individual is considered to be overeducated if the functional level of her/his job exceeds her/his attained educational level. Those with a functional level above their educational level, the so-called undereducated, are considered to be adequately educated in this article. Considering this - small - group as a separate category would further complicate the analysis. Moreover, undereducated individuals generally earn at least as much and are at least as satisfied with their jobs as adequately educated workers (Hartog, 2000; Verhaest and Omey, 2009). Hence, this justifies pooling them with the adequately educated.

Apart from job analysis, several other measurement approaches, for instance based on self-assessments, have been applied in the literature (see Leuven and Oosterbeek, 2011, for an overview). As any method, job analysis has some disadvantages. One often formulated criticism is that, within a particular occupation, there may be substantial heterogeneity in the tasks to be executed. However, since the SBC-classification is rather built upon tasks to be executed than on occupational titles, this problem should be less severe for our measure. Furthermore, in a number of validation studies (van der Meer, 2006; Verhaest and Omey, 2010), the CBS measure performed at least equally well as other measures. Nevertheless, we also execute a sensitivity analysis relying on a modified self-assessment approach. The SONAR survey included the following survey question regarding the first job: "What is (was), according to your own opinion, the most appropriate educational level to execute your job?" As this question was not included for subsequent jobs, we adopted the following construction procedure for our alternative measure. First, relying on this information on first jobs, we computed the median subjectively assessed required level within each

occupation.[4] Second, we assessed both for the first job *and for later jobs* whether someone was overeducated or not by comparing her/his educational level with this computed median of the subjectively required level.

According to the job analysis method within the retained sample 59% of the first jobs were filled by overeducated workers, whereas only 34% according to the modified self-assessment method.[5] These divergent figures are consistent with those of other studies that measure overeducation on the basis of both job analysis and self-assessment approaches. This may be explained by social desirability bias (Hartog, 2000), resulting in an overestimation of job requirements in the self-assessment approach. However, alternatively, occupational classifications may be relatively inflexible to upgrades in educational requirements. In this latter interpretation the modified self-assessment method discards "apparent" overeducation identified as overeducation by the job analysis method. As already mentioned, since career mobility is less likely for the "apparently overeducated" (Chevalier, 2003), more career mobility may be expected when basing the analysis on the self-assessment method.

2.3 Descriptive analysis

Based on the aforementioned information, we determine for each sampled individual the timing at which (s)he entered an adequate job or a job for which (s)he was overeducated since (s)he started searching for a job. 788 young men (55% of the retained sample) find an adequate job (as measured by job analysis) before the end of the observation period. 546 (38%) of these men directly entered an adequate job (subsample 'E', the "control" group), while 242 (17%) were temporarily overeducated before entering the adequate job (subsample 'OE', the "treatment" group). 549 young men (38%) enter a job for which they are overeducated and do *not* subsequently transit to an adequate job before they are right censored (subsample 'OC'). 97 (7%) individuals were right censored before making any transition (subsample 'C').

The right-censoring for 646 (= 549+97) of the observations occurs for one of the following reasons: (i) end of the observation period and sample attrition (69% of the 646 right censored observations); (ii)

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[4] The number of self-assessments is relatively low for some occupations at more detailed levels. Therefore, we base the computation on the most detailed occupational level for which we have at least 20 observations available in our data. For a similar procedure and discussion in the case of realized matches measures, see Verhaest and Omey (2010).

[5] This incidence using the modified self-assessment measure is very similar to the incidence using the standard subjective measure. Further, relying on this alternative procedure, we also investigated the impact of overeducation on earnings and job satisfaction. Also these outcomes were similar to those on the basis of other measures.

transition to a job for which the functional level is not registered (15%); (iii) return to full time education (7%); (iv) transition to self-employment (7%) and (v) transition to disability (2%).

Figure 1 reports non-parametric Kaplan-Meier estimates of the monthly transition into a first job (irrespectively of whether one is overeducated for it or not) and into a first adequate job (directly or indirectly, after a temporary spell of overeducation). Overeducation is measured according to the job analysis method. The corresponding figure if overeducation is measured by the self-assessment method is reported in *Appendix D*. The median duration until the transition to a first job is 1 month and 29 months until a first transition to an adequate job. This illustrates clearly that most young graduates very rapidly find a job at the start of their career, but also that these graduates are overeducated for most of these jobs, since they enter an adequate job at a much slower rate.

Figure 1: Kaplan-Meier estimates: survival in unemployment until entry in a first job (job analysis method)
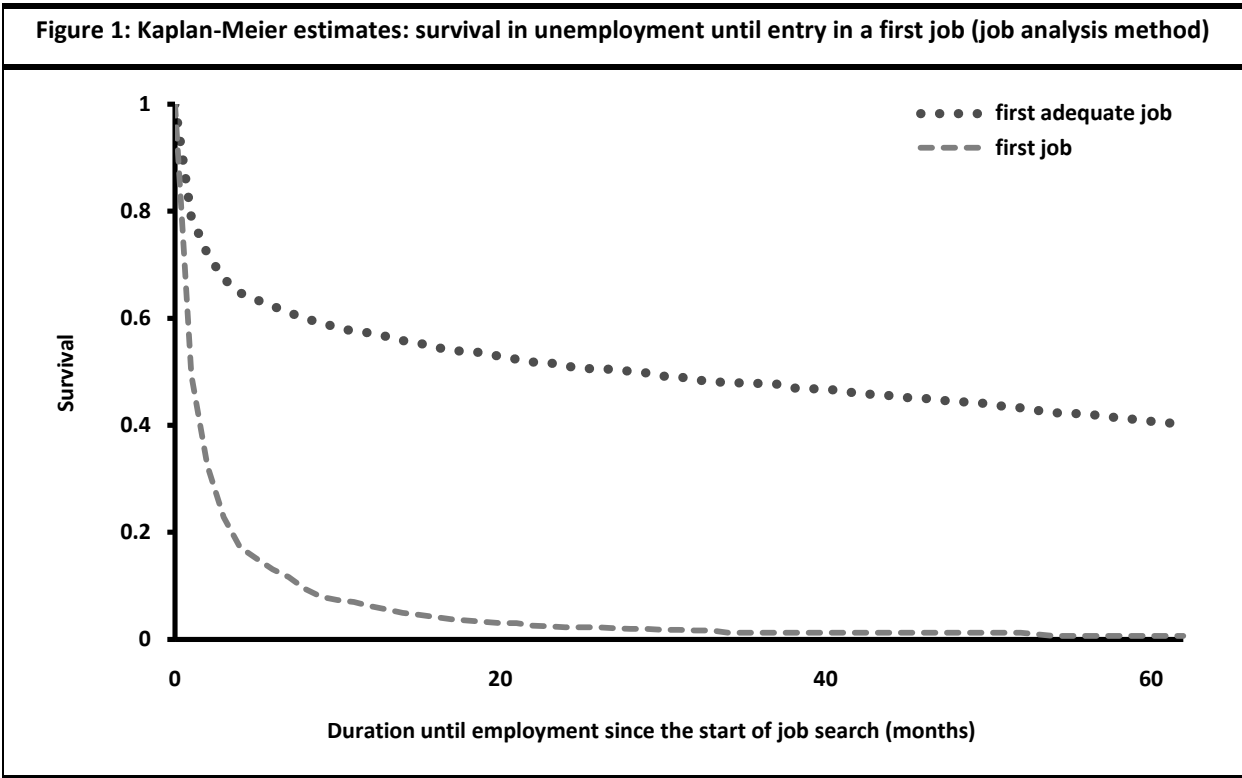
Figure 2 reports the non-parametric Kaplan-Meier estimates of the number of months that elapse after accepting a job for which one is overeducated until entry in an adequate job. The median duration is as high as 110 months. Since the median duration since the start of job search until (direct or indirect) entry into an adequate job is only 29 months, this means that most direct transitions into an adequate job occur much more rapidly than the indirect transitions. However, since this comparison does not take selection on (un)observable characteristics into account, we cannot conclude from this descriptive evidence, that accepting a job for which one is overeducated is a trap

rather than a stepping stone to an adequate job. Overeducated individuals might have very low chances to enter adequate jobs anyway, so that for these individuals it might have taken even longer before they would have found an adequate job if they would have rejected all jobs for which they were overeducated. The Timing of Events method that we apply in this research takes the selection on (un)observable characteristics into account and leads therefore to a better founded answer to our research question.

Figure 2: Kaplan-Meier estimates: survival until entry in adequate job (job analysis method)

Duration until adequate employment since the start of overeducated employment (months)
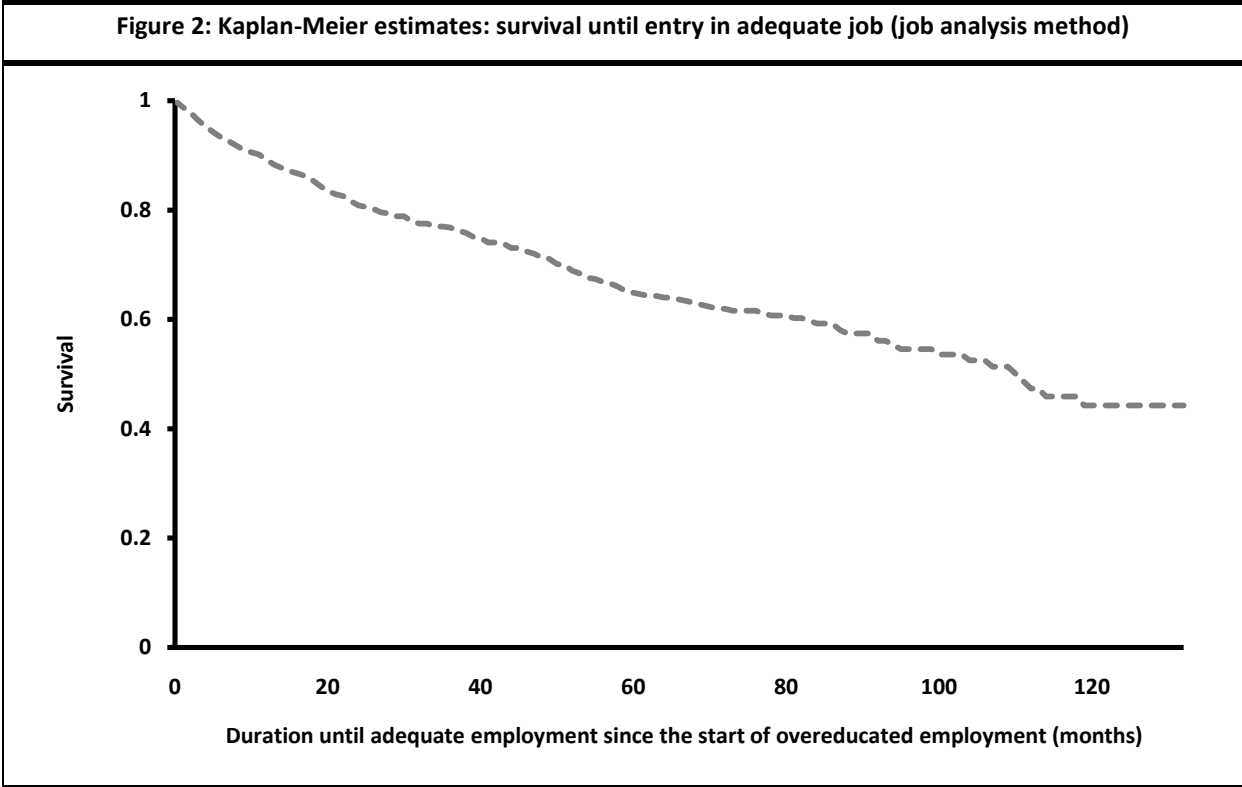
Our analysis controls for a rich set of observed characteristics. A vector of time-constant variables measured before the start of the job search spell captures the respondents' (i) level of educational attainment (highest attained level of education, number of uncertified years of schooling beyond the highest level and an indicator of whether one obtained an additional degree at the same level of education), (ii) school achievement (years of schooling delay at the age of 16 and the grade obtained in tertiary education[6]), (iii) school orientation in secondary school (general, technical, vocational or arts), (iv) social background (mother's and father's level of education and migrant status as captured by the nationality of the grandmother at mother's side), (v) birth cohort (1978 or 1980), (vi) work experience during school (internship or student job) and (vii) timing of the start of job search

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[6] This information is not available at the level of secondary education.

(quarter in the year and number of months since leaving school). In addition, the monthly Belgian youth unemployment rate (ILO definition) is included as a time varying variable as to capture seasonal and business cycle variation. Details concerning some of these variables are outlined in *Appendix A*.

Table 1: Summary statistics					
Sample:	**Total**	**C**	**E** **(controls)**	**OC**	**OE** **(treated)**
(Number of individuals):	(1434)	(97)	(546)	(549)	(242)
Highest level of educational attainment					
Highest attained level of education					
Lower secondary education	0.24 (0.43)	0.14 (0.35)	0.27 (0.44)	0.24 (0.43)	0.21 (0.41)
Secondary education	0.43 (0.50)	0.30 (0.46)	0.44 (0.50)	0.41 (0.49)	0.52 (0.50)
Lower tertiary education	0.17 (0.38)	0.22 (0.41)	0.19 (0.39)	0.14 (0.35)	0.17 (0.38)
Higher tertiary education	0.16 (0.37)	0.34 (0.48)	0.10 (0.31)	0.21 (0.41)	0.10 (0.30)
Additional successful years of education after highest attained level of education	0.40 (0.73)	0.32 (0.65)	0.37 (0.67)	0.48 (0.81)	0.36 (0.69)
Additional degree at highest attained level of education	0.06 (0.23)	0.11 (0.32)	0.04 (0.19)	0.07 (0.25)	0.05 (0.23)
Schooling achievement					
Tertiary education: grade					
No grade	0.85 (0.36)	0.77 (0.42)	0.85 (0.36)	0.86 (0.35)	0.87 (0.34)
With honours (cum laude)	0.13 (0.34)	0.21 (0.41)	0.13 (0.34)	0.12 (0.33)	0.12 (0.32)
With great/highest honours (cum magna/maxima laude)	0.02 (0.14)	0.02 (0.14)	0.02 (0.14)	0.02 (0.14)	0.02 (0.14)
Years of schooling delay (at age of 16)	0.43 (0.60)	0.40 (0.64)	0.47 (0.65)	0.42 (0.57)	0.38 (0.54)
School orientation at age of 16 in secondary school					
General secondary education	0.35 (0.48)	0.57 (0.50)	0.33 (0.47)	0.35 (0.48)	0.30 (0.46)
Technical secondary education	0.37 (0.48)	0.27 (0.45)	0.40 (0.49)	0.34 (0.47)	0.43 (0.50)
Arts secondary education	0.01 (0.11)	0.02 (0.14)	0.01 (0.10)	0.01 (0.10)	0.02 (0.13)
Vocational secondary education	0.27 (0.44)	0.14 (0.35)	0.26 (0.44)	0.30 (0.46)	0.25 (0.43)
Social background					
Mother's educational level	5.33 (3.25)	5.86 (3.40)	5.47 (3.16)	5.13 (3.32)	5.24 (3.20)
Father's educational level	5.72 (3.41)	6.47 (3.60)	5.86 (3.25)	5.57 (3.50)	5.47 (3.42)
Grandmother (mother's side) foreign	0.06 (0.24)	0.13 (0.34)	0.07 (0.25)	0.04 (0.20)	0.06 (0.24)
Birth cohort *(birth year)*					
1978	0.48 (0.50)	0.42 (0.50)	0.49 (0.50)	0.50 (0.50)	0.41 (0.49)
1980	0.52 (0.50)	0.58 (0.50)	0.51 (0.50)	0.50 (0.50)	0.59 (0.49)

Work experience during education					
Any internship during education	0.59 (0.49)	0.51 (0.50)	0.55 (0.50)	0.63 (0.48)	0.61 (0.49)
Any student job during education	0.81 (0.40)	0.72 (0.45)	0.81 (0.39)	0.79 (0.41)	0.86 (0.34)
Timing of the start of job search					
Start of job search: quarter in the year					
First quarter	0.09 (0.28)	0.13 (0.34)	0.10 (0.30)	0.07 (0.25)	0.10 (0.29)
Second quarter	0.17 (0.37)	0.10 (0.31)	0.18 (0.39)	0.16 (0.36)	0.17 (0.37)
Third quarter	0.66 (0.47)	0.70 (0.46)	0.63 (0.48)	0.67 (0.47)	0.68 (0.47)
Fourth quarter	0.09 (0.28)	0.06 (0.24)	0.09 (0.28)	0.10 (0.31)	0.06 (0.24)
Months between leaving school and starting job search	2.04 (4.03)	2.61 (4.68)	2.12 (4.76)	2.03 (3.57)	1.67 (2.68)
Seasonal and business variation					
Youth unemployment rate at start date of job search	18.79 (2.69)	19.21 (3.12)	18.36 (2.75)	19.05 (2.54)	18.98 (2.59)

Reported figures are means and standard deviations in parentheses. Subsample 'C' contains men who are right censored before making any transition during the observation period; subsample 'E' contains men who directly transit to an adequate job; subsample 'OC' contains men who enter a job for which they are overeducated and who are subsequently right censored before making any transition to an adequate job; subsample 'OE' contains men who are temporarily overeducated before entering an adequate job. Details regarding some of the explanatory variables are outlined in *Appendix A*.

In *Table 1* we report descriptive statistics for these explanatory variables used in the econometric analysis below. We separately report statistics on the four subsamples identified in the beginning of this Subsection: 'E', 'OE', 'OC' and 'C'. Subsample C is relatively small and contains the most educated graduates, since, as this group studies longer, the observation period is systematically shorter for this group. On the other hand, it comprises more foreign youth, which squares with the well documented negative correlation between foreign ethnicity and labour market success. There are also fewer individuals in this subsample with any internship or student work experience during their educational careers.

There is no clear pattern in the differences observed between the other three subsamples except that in subsample E (the "controls"), which is restricted to youth with a direct transition to adequate employment, the parent's level of education and the number of years of schooling delay at the age of 16 is on average higher, and the youth unemployment rate is lower than in the two other subsamples (OC and OE, the "treated"), containing youth who are (first) overeducated. It is a priori unclear in which direction this could have biased the aforementioned descriptive evidence on our research question.

3. Econometric model

3.1 The selection problem

We aim at identifying whether an unemployed graduate can accelerate the transition to an adequate job by temporarily accepting a job for which (s)he is overeducated ("the treatment") rather than only accepting adequate jobs, or whether instead (s)he might get trapped in overeducation by following such a strategy. To answer this question, we face a double selection problem. First, young men who are more likely to accept a job for which they are overeducated may have a systematically lower (or higher) likelihood of finding an adequate job than those who are less likely to be overeducated. If we ignore this 'classic selection problem', then a simple comparison of the speed of transition to an adequate job between those who directly enter an adequate and those who do so only after an intermediate period of employment as overeducated worker, will underestimate (overestimate) the treatment effect on this speed. Second, even if there is no systematic relationship between the unobserved determinants of treatment and entry in an adequate job, then we are still confronted with a "dynamic selection problem". Since the treatment does not occur at the start of the unemployment spell, treatment can only occur for youth who did not find an adequate job beforehand. Consequently, the treatment effect is measured for a population that has less chances of finding an adequate job than if it was measured at the start of the unemployment spell. This biases the treatment effect towards zero because the treatment effect is confounded with the unobserved lower chances of finding adequate employment in this population (see e.g. Lancaster, 1990, p. 65). The Timing of Events method proposed by Abbring and van den Berg (2003) takes this double selection problem into account and identifies therefore the true causal impact of a transition to overeducation on the speed of transition to an adequate job. We first write down the econometric model and then discuss why we believe that the main identifying assumptions of the Timing of Events method are satisfied.

3.2 The econometric model

In the following, the index o indicates overeducation and the index e refers to adequate employment. The transitions of interest into overeducation and adequate employment are represented by two random latent durations: T_o and T_e, with t_o and t_e denoting their realizations. We assume that all individual differences in the joint distribution of both durations can be characterized

by explanatory variables *X* and *V*. *X* denotes the observed variables as described in *Section 2.3* with realization *x.*[7] *V*, on the other hand, is unobservable to the researcher and transition-specific. More concretely, *V* is a vector *(Ve,Vo)* with realization *(ve,vo)*. *X* and *V* are assumed to be independently distributed (see *Section 3.3* for further discussion).

Abbring and van den Berg (2003) assume that T_e and T_o are independent conditionally on *X* and *V,* so that the joint distribution of *(To,Te)|(X,V)* can be written as the product of the distributions of *Te|(X,Ve)* and *To|(X,Vo)* which are in turn completely determined by their hazard rates $\vartheta_e\left(t|t_o,x,V_e\right)$ and $\vartheta_o\left(t|x,V_o\right)$, where *t* is the elapsed job search duration. These hazard rates are then specified according to the following Mixed Proportional Hazard (MPH) form:

$$\begin{cases} \ln\vartheta_o\left(t|x,V_o\right) = \ln\lambda_o(t) + x'\beta_o + V_o \\ \ln\vartheta_e\left(t|t_o,x,V_e\right) = \ln\lambda_e(t) + x'\beta_e + \delta\left(t|t_o,x\right)\!1(t > t_o) + V_e \end{cases} , \tag{3-1}$$

where *1(.)* is an indicator function, which is 1 if the argument is true and 0 otherwise, and *δ(t|to,x)* is the treatment effect of overeducation on the speed of transition to an adequate job. Observe that it can be any function of *t, to* and *x,* but cannot depend on any unobserved factor.

First, in a benchmark specification, we assume that the treatment effect is constant:

Constant treatment effect model

$$\delta\left(t|t_o,x\right) = \delta\left(t|t_o\right) = \delta_o . \tag{3-2}$$

Clearly, overeducation is a stepping stone (trap) if and only if this constant is significantly positive (negative): the transition to an adequate job increases (decreases) proportionally with this treatment effect.

In the benchmark model we allow for an extension in which the treatment effect depends on both the duration since entry in overeducation (*t-t0*) and on the elapsed unemployment duration until entry in overeducated employment *t0*. The first factor (*t-t0*) aims at capturing a gradually decreasing *locking-in* effect and/or steadily growing *investment* effect. Locking-in may reflect investment in specific human capital (Pissarides, 1994), cognitive decline (Grip *et al.,* 2008), habituation (Verhaest and Omey, 2009) or reduced job-search effort on-the-job. The investment effect reflects the gradually increasing promotion opportunities with work experience, as described in the career mobility theory (Sicherman and Galor, 1990). The dependence on the elapsed unemployment

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[7] To avoid cumbersome notation, we ignore the presence of the youth unemployment rate as a time-varying covariate.

duration, on the other hand, aims at testing whether long-term unemployed benefit more from a stepping stone effect (if any) than short-term unemployed, since accepting any job might reduce the *scarring* effects of long-term unemployment. We include quadratic terms to allow for nonlinearity of these effects over time.

Extended model

$$\delta\left(t|t_o\right)= \delta_0 + \delta_1 \cdot (t-t_o) + \delta_2 \cdot (t-t_o)^2 + \delta_3 \cdot (t_o) + \delta_4 \cdot (t_o)^2. \tag{3-3}$$

In *Section 4.2,* in which we report a number of sensitivity analyses, we discuss some further extensions in which the treatment effect depends on some other explanatory variables.

$\lambda_o(t)$ and $\lambda_e(t)$ represent the baseline hazard functions for transitions into overeducation and adequate employment. The hazard rate is said to be duration dependent if these functions are time-variant. Positive (negative) duration dependence in the transition into overeducation, respectively adequate employment, means that $\lambda_o(t)$, respectively $\lambda_e(t)$, are increasing (decreasing) in t. We follow the literature by specifying these baseline hazards as piecewise constant:

$$\begin{cases} \ln \lambda_o(t) = \alpha_m^o \\ \ln \lambda_e(t) = \alpha_m^e \end{cases} \text{for } t \in \left[t_{m-1}, t_m\right), \tag{3-4}$$

where *m* is an indicator of the time interval and where in the application m ≤ 8 and $t_0 = 0$, $t_1 = 1$, $t_2 = 2$, $t_3 = 3$, $t_4 = 4$, $t_5 = 6$, $t_6 = 9$, $t_7 = 18$ and $t_8 = +\infty$.

We estimate the constant treatment and extended model by Maximum Likelihood. We distinguish between four types of likelihood contributions, conditional on the unobserved heterogeneity distribution, depending on the labour market history of the youth described in *Section 2.3*; $l_c(V)$, $l_e(V)$, $l_{oc}(V)$ and $l_{oe}(V)$. In *Appendix B* we derive these conditional contributions taking the time-grouped nature of the data into account.

To obtain the unconditional likelihood contributions, we integrate the four conditional contributions over the unobserved heterogeneity distribution. We follow Heckman and Singer (1984) and assume that (v_e, v_o) is randomly drawn from a discrete distribution with a finite and *a priori* unknown number *K* of points of support. Since we include a constant term in *X*, v_{e1} and v_{o1} are normalized to *0*. The probabilities associated to these points of support are specified as logistic transforms:

$$p_k = \frac{\exp(\gamma_k)}{\sum_{j=1}^{K} \exp(\gamma_j)} \text{, with } k = 1, 2, \ldots, K \text{ and } \gamma_1 = 0. \tag{3-5}$$

Hence, the likelihood contribution for individual i in subsample $n \in \{c, e, oc, oe\}$ unconditional on unobserved heterogeneity is:

$$l_{ni} = \sum_{k=1}^{K} p_k \cdot l_n(v_{ek}, v_{ok}), \text{ with } n \in \{c, e, oc, oe\}. \tag{3-6}$$

We can then write the unconditional log-likelihood as the sum of the unconditional individual log-likelihood contributions:

$$L = \sum_{i=1}^{N} \left[J_{ci} \ln(l_{ci}) + J_{ei} \ln(l_{ei}) + J_{oci} \ln(l_{oci}) + J_{oei} \ln(l_{oei}) \right], \tag{3-7}$$

where J_{ni} equals 1 if l_{ni} is the contribution of individual i to the likelihood and J_{ni} equals 0 otherwise. We maximize this log-likelihood according to the procedure described in Gaure *et al.* (2007). In particular, we increase the number of points of support until the likelihood function does not show any improvement and subsequently select the model that minimizes the Akaike Information Criterion (AIC) to reduce the risk of bias induced by an over-parameterized model.

3.3 Identification

Unlike some other methods that aim at resolving the selection problem, the Timing of Events method does not require any exclusion restrictions. All observed determinants may affect both the transition to overeducation (the treatment) and the transition to an adequate job (the outcome of interest). However, the method requires another set of identifying assumptions (Abbring and van den Berg, 2003) of which we discuss the credibility now.

1. The method assumes that events do *not* realize *instantaneously*, since it exploits the timing of events to identify the true causal effect. In the retained sample individuals *gradually* enter overeducation or adequate employment over time, so that this first condition is satisfied.

2. Even if the aforementioned events realize gradually over the course of the job search period, the method requires that the *timing* of these events is known with sufficient precision. The data record transitions with a monthly precision. This time grouping is not problematic to the extent that it is unlikely that two transitions take place within the same month (see Cockx *et al.,* In press, for a discussion). In our data at most one transition can take place within a given month by definition: each month is assigned either to a working or non-working status, depending on the status in which one spends most of the time (see *Section 2.1*). This does not mean that in reality

not more than one transition may occur within a month (e.g. short-term employment through temporary work agencies). However, they are regarded unimportant for the job transition process we study.

Even if the time grouping of the data is not problematic, Monte Carlo analysis of Gaure *et al.* (2007) has shown that that it is important to take, as we do (see *Appendix B*), this time grouping explicitly into account. However, if one follows this advice the aforementioned Monte Carlo analysis has shown that Abbring and van den Berg (2003)'s method is extremely reliable.

3. The moment at which employment is entered may not be *anticipated*. Since neither the employer nor the job searcher has in general an interest to postpone hiring once the hiring decision is taken, we believe that the time lag between the moment at which the job was found and the moment at which the job is entered, is relatively short, so that the no-anticipation assumption is approximately satisfied.

4. Observed and unobserved determinants affect the transition rates to overeducation and adequate employment of the *un*treated individuals *proportionally*.[8] This is the so called Mixed Proportional Hazard (MPH) assumption. The aforementioned Monte Carlo analysis of Gaure *et al.* (2007) has shown that this assumption is crucial, at least if only time constant explanatory variables are available.[9] We are particularly concerned that the MPH assumption is not satisfied across levels of educational attainment and that this therefore may be a source of bias. The reason for this concern is that the highest educated individuals have more opportunities to be overeducated, simply because accepting any job with requirements below the highest level of educational attainment leads to overeducation. By contrast, individuals with a lower secondary degree are only overeducated if they accept a job that does not require any educational attainment. We therefore perform a sensitivity analysis in which we estimate the treatment effects separately for each level of educational attainment, relaxing thereby the proportionality assumption in this dimension.

5. There should be at least two *continuous* explanatory variables that are not linearly dependent. This condition is not strictly satisfied, since variables such as parent's education, number of years of schooling delay, additional years of education beyond the highest degree, the elapsed number of months between school-leaving and the start of job search are multivalued, but not

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[8] Observable factors may affect the treatment effect non-proportionally. The treatment effect may, however, not depend on unobservables unless additional assumptions are imposed (see, e.g., Richardson and van den Berg, 2008).

[9] Note that despite the youth unemployment rate is a time-varying explanatory variable, it is of no use for identification, since its variation is the same across all observations in the sample.

continuous. By contrast, the (time-varying) youth unemployment rate can be regarded as a continuous covariate. Moreover, Gaure *et al.* (2007, p. 1186) conclude on the basis of their extensive Monte Carlo analysis that, with "some exogenous variation in hazard rates over calendar time, no subject-specific covariates are required in order to identify treatment and spell-duration effects".

6. *X* and *V* should be independently distributed. This is a strong assumption, but it can be relaxed if one is willing to assume that the unobserved heterogeneity conditional on *x* can be written as $v_k exp(x\mu_k)$ (for *k = e, o*), where V_k is then independently distributed from *X* and where μ_k is some unknown parameter vector. In this case it is not difficult to see that the treatment effect below is still consistently estimated, but that the parameters associated to the covariates of *x* can no longer be given a structural interpretation. This is very similar to Chamberlain's (1980) widely used extension of the random effect probit model (see Cockx *et al.*, In press, for further discussion).

7. Finally, T_e and T_o are independent conditionally on *X* and *V.* This means that the hazard rates to adequate employment and overeducation may not depend on unobserved time-varying shocks. Even if we cannot exclude bias induced by such shocks at the individual level, the inclusion of the time-varying youth unemployment rate aims at capturing seasonal and business cycle shocks at the aggregate level.

4. Results

4.1 Main results

In this subsection we first discuss the main results. In a subsequent subsection we report a number of sensitivity analyses. In the main text we focus on the treatment effects. The complete estimation results can be found in *Appendix C.*

On the basis of the AIC we retain for both outlined specifications of the treatment effect (constant and extended) the model with three heterogeneity types. However, the probability assigned to one of the points of support is small (4%), so that the estimates are not very different from a model with two points of support. This may also explain why the correlation between V_e and V_o is so close to 1

(cf. *Appendix C*): the model with two points of support is equivalent to a model with a one-factor specification for which the correlation can only be 0, 1 or -1. A positive correlation means that the model identifies a positive selection on unobservables. Hence, the model that does not correct for unobserved heterogeneity overestimates the treatment effect. This can be verified by comparing the treatment effects of the benchmark models that ignore unobserved heterogeneity as reported in *Table C-2* (*Appendix C*) to the treatment effects reported in *Table 2* below.

The main estimation results of the benchmark model are summarized in *Table 2.* A more comprehensive presentation is reported in *Table C-1*. As shown by panel A, the point estimate of the treatment effect in our benchmark model is very negative and highly significant. In the full sample the monthly transition rate into adequate employment drops by about 96%[10] in the subsequent months after entering overeducated employment. This supports the hypothesis of the descriptive analysis in *Section 2.3* that overeducation is a trap and *not* a stepping stone to adequate employment.

Table 2: Main results - estimates for the selected models		
	A. Constant treatment effect model	**B. Extended model**
Treatment effect		
Constant: δ_0	-3.171***	-4.080***
	(0.287)	(0.354)
Interaction with $(t - t_0)$: δ_1		-0.014
		(0.012)
Interaction with $(t - t_0)^2$: δ_2*100		0.011
		(0.011)
Interaction with t_0: δ_3		0.232***
		(0.088)
Interaction with $(t_0)^2$: δ_4		-0.004
		(0.004)
Log-likelihood	-4606.553	-4594.661
AIC	9347.107	9331.321
Parameters	67	71
Observations	1434	1434
Standard errors in parentheses. *** indicates significance at the 1% level, ** significance at the 5% level and * significance at the 10% level.		

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[10] $0.96 = 1 - exp(-3.171)$.

Panel B summarizes the estimation results for the extended model. First, the point estimates for δ_1 and δ_2, capturing the effect heterogeneity in the elapsed duration since inflow into a job for which one is overeducated, are not statistically significant. Neither the *locking-in* nor the *investment effects* seem to matter much therefore, or both effects might counteract. Second, by contrast, δ_3 is highly significant. This means that young men delay the transition to an adequate job by accepting jobs for which they are overeducated more at the start of the unemployment spell rather than later on. The magnitude of this adverse effect declines with unemployment duration and, if we ignore the insignificant second order term (δ_4), it becomes even positive beyond an unemployment duration of 17.6 months.[11] This would be an important finding, since it would mean that only short-term unemployed graduates get trapped in overeducation. Long-term unemployed would accelerate the transition to an adequate job by temporarily accepting a job for which they are overeducated. However, this conclusion crucially hinges on ignoring the insignificant second order term δ_4. If we take it into account, the treatment effect attains a maximum at 29 months[12] and decreases again thereafter. At this maximum the transition rate to an adequate job after entry in overeducated overeducated is still 51%[13] below what it would have been if one would have only accepted adequate jobs. In the sensitivity analysis below, we will argue that this is the correct interpretation of our findings. The transition to overeducation is thus never a stepping stone, but always a trap, even if the findings are consistent with the hypothesis that one can reduce the negative scarring effect of unemployment duration by accepting a job for which one is overeducated. Note that the transition rate to adequate jobs exhibits clear negative duration dependence while that to jobs for which one is overeducated increases with unemployment duration (cf. *Table C-1* in *Appendix C*).

We briefly discuss some secondary results reported for the extended model. Note that a structural interpretation of the coefficients for the observed covariates is hazardous given the potential dependence between X and V.[14] We find that the employment gap between foreign and native youth is significantly larger for the transition into jobs for which one is overeducated than for the transition into adequate jobs. In addition we get a stable positive effect of an honours degree in tertiary education on the transition to adequate employment. Conducting any student work during education affects the transition to overeducated and adequate employment with a similar magnitude.

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[11] *17.6 = 4.08/0.232.*

[12] *29 = 0.232/(2*0.004).*

[13] *-4.08 + 0.232*29 - 0.004*29^2 = -0.716 and 1 - exp(-0.716) = 0.51.*

[14] See the discussion of the identifying assumption 6 in *Section 3.3*.

The fact that the higher educated are *ceteris paribus* less likely to leave unemployment is most probably a consequence of only retaining young men in the sample who started job search after leaving school: this group is a negatively selected subsample of the higher educated. One might argue that this might cause non-proportionality of the unobserved determinants of the transitions from unemployment, since for lower levels of education this negative selection is less an issue because they are less likely to find a job immediately after leaving school. Conditional on the level of educational attainment, one might therefore expect higher V's for the lower educated than for the higher educated. We will try to address this issue in the first part of the sensitivity analysis reported in the next subsection.

4.2 Sensitivity analysis

In *Table 3* we report some robustness checks of our main result that young men get trapped in jobs for which they are overeducated. First, we re-estimate our model separately on the four subsamples defined according to their highest attained level of education.[15] We do so because we are particularly concerned with the failure of the MPH assumption across levels of educational attainment (see our discussion of identifying assumption 4 in *Section 3.3* as well as our discussion at the end of the previous subsection). However, panels A1 until A4 indicate that the estimates of the treatment effects are not different across these subgroups. For all educational levels, accepting a job for which one is overeducated prolongs the transition to an adequate job. Moreover, δ_1 and δ_2 are insignificant for all subsamples. As in the pooled analysis, δ_3 is large and positive, but only significantly so for the two lowest levels of education. Finally, δ_4 is systematically negative and even significantly so (at the 10% level) for graduates with a secondary education. Moreover, if this quadratic term is taken into account, the treatment effect remains negative for all possible unemployment durations. These findings are therefore reassuring and consistent with the main findings reported in *Section 4.1*.

In a second sensitivity test we introduce more heterogeneity in the treatment effect. On the one hand it could be argued that in a booming economy it would be easier to promote from overeducation to an adequate job. On the other hand we want to capture the difference in treatment effects according to differences in skills, since one may argue that, within each educational

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[15] For the models reported in panels A and C the lowest AIC was obtained with two points of support, while for the model reported in panel B 3 points of support were required. For the model reported in panel D one point of support was optimal. This is probably due to the relatively small number of observations in this sample. Since the findings of this model are quite different from the models accounting for heterogeneity and since among the models that account for heterogeneity the one with 3 points of support yields the lowest AIC, we choose to report the parameter estimates of the latter model rather than those of the model that disregards unobserved heterogeneity.

level, the higher skilled transit faster to an adequate job. This would be evidence of promotion induced by genuine overeducation, since the more skilled are more likely to be genuinely overeducated and the latter are more likely to promote (cf. the discussion in *Section 1*). To this end, we further include interactions with the unemployment rate and the years of schooling delay at the age of 16. Panel B indicates that neither of the two additional interaction effects are significant.

Extended model (sensitivity analysis 2)

$$\delta(t|t_o) = \delta_0 + \delta_1 \cdot (t - t_o) + \delta_2 \cdot (t - t_o)^2 + \delta_3 \cdot (t_o) + \delta_4 \cdot (t_o)^2 + \delta_5 \cdot ur_t + \delta_6 \cdot delay16$$

(4-1)

Thirdly, we test the robustness of our results to the alternative measure of overeducation as defined in *Section 2.2*. This alternative measure results in a rearrangement of the sample of graduates over the four subsamples: subsamples 'C', 'E', 'OC' and 'OE' comprise 97, 886, 267 and 184 individuals respectively. As explained in *Section 2.2*, according to this alternative measure the degree of overeducation is much lower and therefore it is more likely that *genuine* overeducation is captured. If so, the likelihood of promotion should increase. However, the estimated treatment effects are very comparable to those of the benchmark model. A first main difference is that the quadratic interaction term with unemployment duration (δ_4) is now very significantly different from zero. This provides further confirmation that we should take this interaction term into account when interpreting the results. A second main difference is the significance of δ_1 and δ_2, the interactions with the time since entry in a job for which one is overeducated (t-t_0): the entrapment effect is (slightly) more pronounced during the first 70 months.

	A1. Sensitivity analysis 1 Subpopulation "Lower secondary education"	A2. Sensitivity analysis 1 Subpopulation "Higher secondary education"	A3. Sensitivity analysis 1 Subpopulation "Lower tertiary education"	A4. Sensitivity analysis 1 Subpopulation "Higher tertiary education"	B. Sensitivity analysis 2 Additional treatment interactions	C. Sensitivity analysis 3 Modified subjective overeducation Measure
Table 3: Sensitivity analysis - estimates for the selected models						
Treatment effect						
Constant: δ_0	-4.322*** (0.618)	-4.893*** (0.689)	-4.149*** (0.606)	-4.044 (2.906)	-4.216*** (0.605)	-4.103*** (0.267)
Interaction with (t - t₀): δ_1	-0.006 (0.022)	-0.006 (0.017)	0.015 (0.042)	0.081 (0.088)	-0.015 (0.012)	-0.045*** (0.016)

Interaction with $(t - t_0)^2$: δ_2*100	0.005 (0.018)	0.011 (0.015)	-0.020 (0.053)	-0.143 (0.125)	0.012 (0.010)	0.032** (0.015)
Interaction with t_0: δ_3	0.357*** (0.121)	0.421*** (0.152)	0.219 (0.214)	0.200 (0.350)	0.229** (0.090)	0.320*** (0.072)
Interaction with $(t_0)^2$: δ_4	-0.008 (0.005)	-0.011* (0.006)	-0.009 (0.013)	-0.003 (0.012)	-0.004 (0.004)	-0.009** (0.003)
Interaction with unemployment rate: δ_5					0.012 (0.028)	
Interaction with years of schooling delay (age of 16): δ_6					-0.222 (0.153)	
Log-likelihood	-1024.419	-1978.052	-765.183	-670.047	-4593.340	-4058.329
AIC	2156.839	4078.103	1648.365	1466.093	9332.680	8258.657
Parameters	54	61	59	63	73	71
Observations	338[16]	620	244[17]	230	1434	1434

Standard errors in parentheses. *** indicates significance at the 1% level, ** significance at the 5% level and * significance at the 10% level.

In a final sensitivity analysis we also included the field of tertiary education as main explanatory variables. However, these variables were hardly significant in neither of the hazard rates and influenced the findings only negligibly.[18]

5. Discussion

The finding that overeducation strongly retards the transition to adequate employment clearly challenges Sicherman and Galors' (1990) career mobility thesis. This adds to the more indirect evidence provided by other researchers who studied upward mobility of overeducated individuals, and who concluded that many individuals remain overeducated for very long periods (cf. *Section 1*). It also confirms the conclusions of studies that test this theory in an indirect way by investigating the relationship between overeducation and training participation or skill acquisition. These studies in general find that overeducated workers participate less often in training and acquire less additional

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[16] 1 individual is dropped since (s)he was the only one with arts secondary education at the age of 16 causing optimization problems.

[17] 1 individual is dropped since (s)he was the only one with vocational secondary education at the age of 16 causing optimization problems.

[18] These results are not reported, but are available upon request.

skills than adequately educated workers with a similar educational background (Robst, 1995; van Smoorenburg and van der Velden, 2000; Büchel and Mertens, 2004; Verhaest and Omey, In press).

An often-formulated criticism on the literature of overeducation is that many workers are only "apparently overeducated" (Chevalier, 2003; Green and McIntosh, 2007), i.e. because of occupational upgrading and/or lower quality of human capital, they are formally overeducated but not overskilled. Hence, for these individuals, making a transition to a job for which they are formally adequately educated may simply be not an option. While this might be true for some of the individuals, we have no indications that this is the main driver of our results. First, by focusing our analysis on graduates we do not face the problem that work experience confounds the measure of overeducation. This reduces the likelihood of mismeasuring overeducation. Second, we accounted for selection on unobservables, implying that our basic estimates are likely reflecting the true causal effect of overeducation and not just unobserved ability (Leuven and Oosterbeek, 2011). Thirdly, additional estimates did not deliver indications of heterogeneous effects depending on skill level as measured by the years of schooling delay. Finally, our results were largely similar if based on an adapted subjective overeducation measure which is arguably a better measure of genuine overeducation.

If overeducation is not a stepping stone to an adequate job, one may wonder why? What explains the strong entrapment effect immediately after entrance into overeducation? And why does this entrapment effect not decrease later on? An explanation for the strong initial entrapment effect may be that, by accepting a position that does not match with one's level of educational attainment, the worker may transmit a negative signal to prospective employers (McCormick, 1990). Furthermore, it may be difficult to maintain the same job search intensity on-the-job than when one is unemployed. If so, this may also reduce the incentive for employers to create vacancies for adequately matched jobs and thereby reinforce the low transition rate to an adequate job (see Dolado *et al.*, 2009).[19] The entrapment effect might not decrease over time as a consequence of investments in specific human capital (Pissarides, 1994), cognitive decline (de Grip *et al.,* 2008), or habituation (Verhaest and Omey, 2009).

Given the strong entrapment effect of overeducation, we need to understand why individuals are prepared to accept such jobs. One explanation is that individuals are credit constrained. Since school-leavers are only entitled to unemployment benefits after nine months of registered unemployment, this is a natural explanation, especially so if they are no longer financially dependent on their parents income. 15% of the individuals in the sample retained for the analysis left the parental home at the

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[19] The low likelihood of finding an adequate position may also be explained by an efficiency wage type of argument (Skott, 2006).

moment at which they started job search. Furthermore, after expiration of this waiting period, the benefit level is low. For singles and cohabiting individuals it is not very different from the means-tested social assistance benefit level.[20]

But even without credit constraints, it may be optimal to accept such jobs. First, the financial and psychological costs of overeducation are, although significant, still relatively modest in comparison to those of being unemployed (Verhaest and Omey, 2009). Albrecht and Vroman (2002) developed a matching model in which they show that it may be optimal for skilled workers to accept unskilled jobs as long as the productivity differences between skilled and unskilled jobs are not too large. In that case, the expected surplus of earnings resulting from future adequate employment no longer outweighs the income loss resulting from unemployment. Note that the argument applies even if the model did not allow the high skilled workers to continue search on the job for which they are overeducated. This feature is consistent with strong entrapment. Second, the likelihood of finding an adequate job may be rather low anyway due to scarring effects of unemployment duration. By accepting a job for which one is overeducated, these scarring effects may be reduced. This is consistent with our findings that the transition rate to adequate jobs exhibits negative duration dependence[21] and that entrapment in overeducation decreases with unemployment duration.

6. Conclusion

In this research project we investigated whether overeducation at the start of the career speeds up the transition to adequate employment. Contrary to many other contributions in this research area, we handled selection on both observables and unobservables. For this, we applied the Timing of Events approach. Our findings indicate that, even for long-term unemployed young people, accepting a job for which one is overeducated strongly retards the transition to an adequate job. This result

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[20] Depending on factors such as cohabitation status and number of children, the unemployment benefit is only 4 - 24% higher than the social assistance benefit level (source: National Employment Office (NEO) and Federal Public Service for Social Integration (FPS SI) of the Belgian government). In addition, in contrast to beneficiaries of social assistance, the unemployed are usually not entitled to reduced rates of telecommunication, electricity, heating and public transport.

[21] Note that this is only the case if we measure overeducation according to the job analysis method. If we measure it by the modified subjective method, the duration dependence of the transition rate to both adequate jobs and jobs for which one is overeducated is positive (cf. *Table C-3*, panel C in *Appendix C*). We have no clear explanation for this finding.

was found to be robust against various sensitivity checks. We advanced some explanations of why unemployed graduates may nevertheless choose for such jobs and why they do not quickly transit to a job that matches with their level of educational attainment.

From a policy point of view, it is important to stress that one cannot conclude from this study that a worker should rather continue searching for an adequate job than accepting a job for which one is overeducated. Individuals who choose for this strategy will definitely remain longer unemployed, which can be socially less desirable than being employed in a job that does not match the acquired educational attainment. However, if a policy maker aims at matching unemployed graduates to an adequate job as soon as possible, (s)he better does not force them to accept jobs for which they are overeducated, since these jobs certainly do not act as a stepping stones.

Appendix A: Additional information about some explanatory variables

Table A-1: Additional information about some explanatory variables	
Variable name	**Variable details**
Grandmother (mother's side) foreign	Dummy = 1 if the respondent's grandmother on mother's side has not the Belgian nor a North American, British, Scandinavian, Western European or Australian nationality.
Highest attained level of education	Unless otherwise stated, variables reflecting the educational career of the respondent are measured at the moment the youngster stops schooling (for the first time).
Father's (mother's) educational level	This variable measures for the parent the number of successful schooling years beyond primary school. E.g. it is equal to 6 if the parent has successfully completed general or technical secondary education, but did not successfully complete any year of higher education.
Youth unemployment rate	This is the seasonally unadjusted monthly Belgian unemployment rate for males aged less than 25 years following the ILO definition (source: Eurostat).

Appendix B: The likelihood contributions[22]

The first conditional contribution concerns individuals without any transition into (overeducated or adequate) employment before the end of month m_c after which they are right censored due to one of the reasons described in *Section 2.1*.

$$I_c(V) = exp\left[-\sum_{i=1}^{m_c} \vartheta_e^A\left(t_i|t_o,x,V_e\right) + \vartheta_o\left(t_i|x,V_o\right) \right]$$

(B-1)

In the above expression subscript *A* ("ante") refers to no prior experience in overeducated employment (subscript *P* ("post") in other expressions will label hazard rates into adequate employment after some prior experience in overeducation).

The second contribution pertains to individuals who find an adequate job in month m_e without any prior experience in overeducation.

$$I_e(V) = \frac{\vartheta_e^A\left(t_{m_e}|t_o,x,V_e\right)}{\vartheta_e^A\left(t_{m_e}|t_o,x,V_e\right) + \vartheta_o\left(t_{m_e}|x,V_o\right)} \times$$

$$exp\left[-\sum_{i=1}^{m_e-1} \vartheta_e^A\left(t_i|t_o,x,V_e\right) + \vartheta_o\left(t_i|x,V_o\right) \right] \times \left[1 - exp\left[- \vartheta_e^A\left(t_{m_e}|t_o,x,V_e\right) - \vartheta_o\left(t_{m_e}|x,V_o\right)\right]\right]$$

(B-2)

Expression *(B-2)* can be interpreted as a competing risk model in which the first factor is the probability of leaving unemployment for adequate employment given that one leaves unemployment in month m_e and in which the subsequent factors express the chance on leaving unemployment in month m_e (third factor) after staying unemployed until month m_e-1 (second factor).

The third contribution concerns individuals who find a job for which one is overeducated in month m_o without any subsequent transition into adequate employment before the end of month m_c after which they are right censored.

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[22] See Cockx *et al.* (2010) for a detailed derivation.

$$I_{oc}(V) = \frac{\vartheta_o\left(t_{m_o}|x,V_o\right)}{\vartheta_e^A\left(t_{m_o}|t_o,x,V_e\right)+\vartheta_o\left(t_{m_o}|x,V_o\right)-\vartheta_e^P\left(t_{m_o}|t_o,x,V_e\right)}$$

$$\times exp\left[-\sum_{i=1}^{m_o-1}\vartheta_e^A\left(t_i|t_o,x,V_e\right)+\vartheta_o\left(t_i|x,V_o\right)\right]$$

$$\times\left[exp\left[-\vartheta_e^P\left(t_{m_o}|t_o,x,V_e\right)\right]-exp\left[-\vartheta_e^A\left(t_{m_o}|t_o,x,V_e\right)-\vartheta_o\left(t_{m_o}|x,V_o\right)\right]\right]$$

$$\times exp\left[-\sum_{j=m_o+1}^{m_c}\vartheta_e^P\left(t_j|t_o,x,V_e\right)\right] \quad (B\text{-}3)$$

The first factor of this expression represents the probability of leaving unemployment for overeducated employment given that one leaves unemployment in month m_O and does not immediately transit to adequate employment. Next, the subsequent two factors express the probability of leaving unemployment in month m_O without transiting immediately to adequate employment conditional on remaining unemployed until month m_O-1. The last factor equals the survival probability in overeducated unemployment until the month m_c at which one is censored.

The last contribution relates to individuals who first transit to a job for which they are overeducated in month m_o and subsequently to an adequate job in month m_e. Expression *(B-4)* corresponds to *(B-3)* except that it is multiplied by (i) the probability of leaving overeducated employment in month m_e for adequate employment (the last factor) and (ii) the survival probability in overeducated unemployment until month m_e-1 (the before last factor).

$$I_{oe}(V) = \frac{\vartheta_o\left(t_{m_o}|x,V_o\right)}{\vartheta_e^A\left(t_{m_o}|t_o,x,V_e\right)+\vartheta_o\left(t_{m_o}|x,V_o\right)-\vartheta_e^P\left(t_{m_o}|t_o,x,V_e\right)}$$

$$\times exp\left[-\sum_{i=1}^{m_o-1}\vartheta_e^A\left(t_i|t_o,x,V_e\right)+\vartheta_o\left(t_i|x,V_o\right)\right]$$

$$\times\left[exp\left[-\vartheta_e^P\left(t_{m_o}|t_o,x,V_e\right)\right]-exp\left[-\vartheta_e^A\left(t_{m_o}|t_o,x,V_e\right)-\vartheta_o\left(t_{m_o}|x,V_o\right)\right]\right]$$

$$\times exp\left[-\sum_{j=m_o+1}^{m_e-1}\vartheta_e^P\left(t_j|t_o,x,V_e\right)\right]\times\left[1-exp\left[-\vartheta_e^P\left(t_{m_e}|t_o,x,V_e\right)\right]\right] \quad (B\text{-}4)$$

Appendix C: Complete estimation results

Table C-1: Main results - estimates for the selected models				
	A. Constant treatment effect model		B. Extended model	
	θ_e	θ_o	θ_e	θ_o
Treatment effect				
Constant: δ_0	-3.171***		-4.080***	
	(0.287)		(0.354)	
Interaction with $(t - t_0)$: δ_1			-0.014	
			(0.012)	
Interaction with $(t - t_0)^2$: δ_2*100			0.011	
			(0.011)	
Interaction with t_0: δ_3			0.232***	
			(0.088)	
Interaction with $(t_0)^2$: δ_4			-0.004	
			(0.004)	
Explanatory variables				
Constant	-3.076***	-7.308***	-3.905***	-7.068***
	(0.505)	(1.068)	(0.605)	(1.105)
Highest attained level of education				
Lower secondary education	0.308**	-0.085	0.275	-0.150
	(0.152)	(0.215)	(0.176)	(0.222)
Secondary education (ref.)				
Lower tertiary education	-0.331**	-0.650***	-0.458***	-0.664***
	(0.140)	(0.169)	(0.148)	(0.165)
Higher tertiary education	-1.333***	-0.940***	-1.614***	-0.959***
	(0.180)	(0.222)	(0.210)	(0.222)
Additional successful years at school after highest attained level of education	-0.134	0.102	-0.109	0.127
	(0.083)	(0.118)	(0.101)	(0.127)
Additional degree at highest attained level of education	0.159	0.084	0.141	0.062
	(0.211)	(0.267)	(0.248)	(0.254)
Tertiary education: grade				
No grade (ref.)				
With honours (cum laude)	0.309**	-0.226	0.324**	-0.187
	(0.141)	(0.197)	(0.176)	(0.198)
With great/highest honours (cum magna/maxima laude)	0.576**	0.130	0.691**	0.118
	(0.289)	(0.307)	(0.307)	(0.282)
Years of schooling delay (at age of 16)	-0.084	-0.146	-0.091	-0.129
	(0.071)	(0.108)	(0.080)	(0.093)
School orientation at age of 16				

General secondary education	-0.197*	-0.226	-0.211*	-0.223
	(0.105)	(0.156)	(0.121)	(0.140)
Technical secondary education (ref.)				
Arts secondary education	0.037	0.636	0.002	0.525
	(0.396)	(0.520)	(0.402)	(0.456)
Vocational secondary education	-0.280**	0.151	-0.238*	0.136
	(0.123)	(0.193)	(0.139)	(0.164)
Father's educational level	0.038**	0.036	0.043***	0.026
	(0.015)	(0.023)	(0.017)	(0.021)
Mother's educational level	0.023	-0.011	0.027	-0.004
	(0.017)	(0.024)	(0.019)	(0.022)
Grandmother (mother's side) foreign	-0.065	-0.948***	-0.122	-0.907***
	(0.163)	(0.280)	(0.190)	(0.271)
Year of birth				
1978	0.031	-0.044	0.012	-0.077
	(0.081)	(0.112)	(0.100)	(0.121)
1980 (ref.)				
Any internship during education	-0.157*	0.102	-0.155	0.125
	(0.090)	(0.128)	(0.103)	(0.120)
Any student job during education	0.372***	0.352**	0.422***	0.340**
	(0.113)	(0.151)	(0.132)	(0.146)
Start of job search: quarter in the year				
First quarter	0.149	0.085	0.139	0.040
	(0.139)	(0.193)	(0.158)	(0.202)
Second quarter	-0.142	-0.488***	-0.238**	-0.480***
	(0.106)	(0.142)	(0.119)	(0.142)
Third quarter (ref.)				
Fourth quarter	0.131	0.398**	0.214	0.398**
	(0.160)	(0.192)	(0.173)	(0.183)
Months between leaving school and starting job search	-0.014	-0.034**	-0.019	-0.034**
	(0.011)	(0.016)	(0.014)	(0.016)
Youth unemployment rate	-0.010	0.004	-0.008	0.012
	(0.013)	(0.018)	(0.014)	(0.019)
Duration dependence				
t ∈ [0,1) (ref.)				
t ∈ [1,2)	-0.276**	0.007	-0.104	0.005
	(0.136)	(0.142)	(0.136)	(0.131)
t ∈ [2,3)	-0.164	0.218	0.206	0.243
	(0.204)	(0.259)	(0.210)	(0.235)
t ∈ [3,4)	-0.295	0.661*	0.254	0.683**
	(0.281)	(0.390)	(0.288)	(0.328)
t ∈ [4,6)	-0.714**	0.366	-0.053	0.337
	(0.330)	(0.548)	(0.316)	(0.426)
t ∈ [6,9)	-0.555*	0.998*	0.154	0.898*
	(0.335)	(0.600)	(0.317)	(0.458)
t ∈ [9,18)	-0.662**	1.221**	0.046	1.025**
	(0.322)	(0.567)	(0.309)	(0.489)

t > 18	-0.881***	2.09***	-0.052	1.862**
	(0.288)	(0.790)	(0.394)	(0.763)
Unobserved heterogeneity: estimates				
γ_2	1.633		1.551	
	(0.377)		(0.335)	
γ_3	2.896		2.983	
	(0.316)		(0.271)	
v_2	1.164***	4.163***	1.059**	4.015***
	(0.409)	(0.949)	(0.478)	(0.977)
v_3	2.113***	6.785***	2.969***	6.386***
	(0.446)	(1.009)	(0.498)	(1.039)
Unobserved heterogeneity: resulting probabilities and correlation coefficients				
p_1	0.041		0.039	
p_2	0.211		0.185	
p_3	0.747		0.776	
$cor[exp(v_e), exp(v_o)]$	0.990		0.990	
Log-likelihood	-4606.553		-4594.661	
AIC	9347.107		9331.321	
Parameters	67		71	
Observations	1434		1434	

*** indicates significance at the 1% level, ** significance at the 5% level and * significance at the 10% level. Standard errors in parentheses.

Table C-2: Main results - estimates in case of not controlling for unobserved heterogeneity				
	A. Constant treatment effect model		**B. Extended model**	
	θ_e	θ_o	θ_e	θ_o
Treatment effect				
Constant: δ_0	-2.099***		-2.280***	
	(0.109)		(0.139)	
Interaction with $(t - t_0)$: δ_1			0.018*	
			(0.011)	
Interaction with $(t - t_0)^2$: δ_2*100			0.015	
			(0.010)	
Interaction with t_0: δ_3			0.022	
			(0.034)	
Interaction with $(t_0)^2$: δ_4			0.000	
			(0.001)	
Explanatory variables				
Constant	-1.330***	-1.238***	-1.325***	-1.238***
	(0.285)	(0.297)	(0.286)	(0.297)
Highest attained level of education				

Lower secondary education	0.289**	-0.122	0.299**	-0.122
	(0.144)	(0.150)	(0.143)	(0.150)
Secondary education (ref.)				
Lower tertiary education	-0.244**	-0.366***	-0.242**	-0.366***
	(0.122)	(0.128)	(0.122)	(0.128)
Higher tertiary education	-1.076***	-0.297**	-1.086***	-0.297**
	(0.156)	(0.134)	(0.156)	(0.134)
Additional successful years at school after highest attained level of education	-0.145*	0.080	-0.146*	0.080
	(0.077)	(0.074)	(0.077)	(0.074)
Additional degree at highest attained level of education	0.167	0.051	0.168	0.051
	(0.195)	(0.163)	(0.195)	(0.163)
Tertiary education: grade				
No grade (ref.)				
With honours (cum laude)	0.320**	-0.131	0.319**	-0.131
	(0.135)	(0.118)	(0.135)	(0.118)
With great/highest honours (cum magna/maxima laude)	0.458*	-0.125	0.452*	-0.125
	(0.250)	(0.228)	(0.252)	(0.228)
Years of schooling delay (at age of 16)	-0.088	-0.135*	-0.086	-0.135*
	(0.069)	(0.069)	(0.069)	(0.069)
School orientation at age of 16				
General secondary education	-0.198**	-0.199*	-0.195**	-0.199*
	(0.099)	(0.103)	(0.099)	(0.103)
Technical secondary education (ref.)				
Arts secondary education	-0.393	-0.199	-0.325	-0.199
	(0.473)	(0.501)	(0.451)	(0.502)
Vocational secondary education	-0.349***	-0.008	-0.345***	-0.009
	(0.117)	(0.116)	(0.117)	(0.116)
Father's educational level	0.035**	0.014	0.035**	0.014
	(0.014)	(0.014)	(0.014)	(0.014)
Mother's educational level	0.016	-0.018	0.017	-0.018
	(0.015)	(0.015)	(0.015)	(0.015)
Grandmother (mother's side) foreign	0.037	-0.624***	0.040	-0.624***
	(0.163)	(0.181)	(0.161)	(0.181)
Year of birth				
1978	0.025	-0.029	0.026	-0.029
	(0.076)	(0.075)	(0.076)	(0.075)
1980 (ref.)				
Any internship during education	-0.138	0.137	-0.141	0.137
	(0.087)	(0.086)	(0.086)	(0.086)
Any student job during education	0.325***	0.237**	0.332***	0.237**
	(0.103)	(0.098)	(0.103)	(0.098)
Start of job search: quarter in the year				
First quarter	0.097	-0.009	0.100	-0.009
	(0.138)	(0.161)	(0.138)	(0.161)
Second quarter	-0.005	-0.162	-0.013	-0.162
	(0.094)	(0.099)	(0.094)	(0.099)
Third quarter (ref.)				

Fourth quarter	0.099	0.231*	0.097	0.231*
	(0.146)	(0.138)	(0.147)	(0.138)
Months between leaving school and starting job search	-0.009	-0.020	-0.009	-0.020
	(0.011)	(0.013)	(0.011)	(0.013)
Youth unemployment rate	-0.004	0.025*	-0.004	0.025*
	(0.012)	(0.013)	(0.012)	(0.013)
Duration dependence				
t ∈ [0,1) (ref.)				
t ∈ [1,2)	-0.523***	-0.451***	-0.512***	-0.451***
	(0.117)	(0.099)	(0.117)	(0.099)
t ∈ [2,3)	-0.621***	-0.680***	-0.604***	-0.681***
	(0.141)	(0.128)	(0.141)	(0.128)
t ∈ [3,4)	-0.932***	-0.717***	-0.911***	-0.717***
	(0.182)	(0.153)	(0.181)	(0.153)
t ∈ [4,6)	-1.470***	-1.512***	-1.451***	-1.512***
	(0.186)	(0.182)	(0.186)	(0.182)
t ∈ [6,9)	-1.415***	-1.359***	-1.407***	-1.359***
	(0.177)	(0.170)	(0.176)	(0.170)
t ∈ [9,18)	-1.624***	-1.916***	-1.668***	-1.917***
	(0.151)	(0.203)	(0.155)	(0.203)
t > 18	-1.811***	-2.766***	-2.116***	-2.766***
	(0.137)	(0.375)	(0.233)	(0.375)
Log-likelihood	-4640.855		-4638.876	
AIC	9403.709		9407.751	
Parameters	61		65	
Observations	1434		1434	

*** indicates significance at the 1% level, ** significance at the 5% level and * significance at the 10% level. Standard errors in parentheses.

	A1. Sensitivity analysis 1 Subpopulation "Lower secondary education"		A2. Sensitivity analysis 1 Subpopulation "Secondary education"		A3. Sensitivity analysis 1 Subpopulation "Lower tertiary education"		A4. Sensitivity analysis 1 Subpopulation "Higher tertiary education"		B. Sensitivity analysis 2 Additional treatment interactions		C. Sensitivity analysis 3 Modified subjective overeducation measure	
Table C-3: Sensitivity analysis - estimates for the selected models												
	θ_e	θ_o	θ_e	θ_o	θ_e	θ_o	θ_e	θ_o	θ_e	θ_o	θ_e	θ_o
Treatment effect												
Constant: coefficient δ_0	-4.322***		-4.893***		-4.149***		-4.044		-4.216***		-4.103***	
	(0.618)		(0.689)		(0.606)		(2.906)		(0.605)		(0.267)	
Interaction with $(t - t_0)$: δ_1	-0.006		-0.006		0.015		0.081		-0.015		-0.045***	
	(0.022)		(0.017)		(0.042)		(0.088)		(0.012)		(0.016)	
Interaction with $(t - t_0)^2$: δ_2*100	0.005		0.011		-0.020		-0.143		0.012		0.032**	
	(0.018)		(0.015)		(0.053)		(0.125)		(0.010)		(0.015)	
Interaction with t_0: δ_3	0.357***		0.421***		0.219		0.200		0.229**		0.320***	
	(0.121)		(0.152)		(0.214)		(0.350)		(0.090)		(0.072)	
Interaction with $(t_0)^2$: δ_4	-0.008		-0.011*		-0.009		-0.003		-0.004		-0.009**	
	(0.005)		(0.006)		(0.013)		(0.012)		(0.004)		(0.003)	
Interaction with unemployment rate: δ_5									0.012			
									(0.028)			
Interaction with years of schooling delay (at age of 16): δ_6									-0.222			
									(0.153)			
Explanatory variables												
Constant	-4.290***	-3.073***	-2.475***	-7.659***	-5.483***	-3.086***	-6.841***	-2.458	-3.896***	-7.060***	-2.900***	-3.743***
	(1.040)	(1.077)	(0.676)	(1.211)	(1.195)	(0.972)	(1.611)	(1.574)	(0.649)	(1.113)	(0.372)	(0.706)
Highest attained level of education												
Lower secondary education									0.277	-0.149	-0.082	0.096
									(0.176)	(0.221)	(0.166)	(0.228)
Secondary education (ref.)												

Lower tertiary education									-0.457***	-0.665***	-0.762***	-0.366*
									(0.148)	(0.166)	(0.133)	(0.192)
Higher tertiary education									-1.614***	-0.956***	-2.015***	-0.340
									(0.212)	(0.221)	(0.185)	(0.236)
Additional successful years at school after	-0.340**	0.223	0.100	-0.427	0.438	0.075	0.303	0.479*	-0.106	0.128	0.071	-0.108
highest attained level of education	(0.133)	(0.128)	(0.138)	(0.327)	(0.391)	(0.356)	(0.430)	(0.274)	(0.102)	(0.127)	(0.090)	(0.132)
Additional degree at highest attained level of			0.256	0.824	-1.670*	-0.089	-0.404	-0.289	0.139	0.062	0.080	0.088
education			(0.400)	(0.615)	(0.864)	(0.694)	(0.552)	(0.496)	(0.249)	(0.255)	(0.212)	(0.253)
Tertiary education: grade												
No grade (ref.)												
With honours (cum laude)					0.355	0.140	0.614**	-0.402	0.329*	-0.188	0.244	-0.200
					(0.256)	(0.238)	(0.303)	(0.279)	(0.179)	(0.200)	(0.166)	(0.201)
With great/highest honours					1.866***	-0.980	0.250	0.047	0.692**	0.118	0.777***	0.099
(cum magna/maxima laude)					(0.433)	(1.186)	(0.771)	(0.317)	(0.307)	(0.281)	(0.284)	(0.369)
Years of schooling delay (at age of 16)	-0.077	-0.231*	-0.186**	-0.393	0.499*	0.269	-0.777*	-0.081	-0.023	-0.113	-0.060	-0.155
	(0.133)	(0.134)	(0.100)	(0.169)	(0.263)	(0.257)	(0.410)	(0.259)	(0.093)	(0.093)	(0.076)	(0.110)
School orientation at age of 16												
General secondary education	0.261	0.002	-0.095	0.574**	0.006	-0.436**	-0.672	-0.359	-0.209*	-0.222	-0.137	-0.304*
	(0.505)	(0.519)	(0.155)	(0.250)	(0.227)	(0.212)	(0.476)	(0.390)	(0.121)	(0.140)	(0.113)	(0.165)
Technical secondary education (ref.)												
Arts secondary education			-0.420	0.047	0.873	0.262	-0.893	15.483***	-0.020	0.521	-0.114	0.662
			(0.500)	(0.742)	(0.613)	(1.113)	(3.659)	(3.301)	(0.404)	(0.458)	(0.387)	(0.486)
Vocational secondary education	-0.145	-0.040	-0.109	0.558**					-0.243*	0.132	0.173	0.130
	(0.240)	(0.252)	(0.171)	(0.247)					(0.140)	(0.164)	(0.141)	(0.185)
Father's educational level	-0.020	-0.014	0.079***	0.083*	0.152**	0.054	-0.049	-0.001	0.043***	0.026	0.045***	0.046*
	(0.039)	(0.036)	(0.023)	(0.047)	(0.060)	(0.042)	(0.056)	(0.055)	(0.017)	(0.021)	(0.016)	(0.025)
Mother's educational level	0.018	-0.013	-0.015	-0.096**	-0.014	-0.001	0.169***	-0.012	0.027	-0.004	0.000	-0.016
	(0.043)	(0.036)	(0.024)	(0.042)	(0.055)	(0.042)	(0.058)	(0.050)	(0.019)	(0.022)	(0.016)	(0.024)
Grandmother (mother's side) foreign	-0.309	-0.950***	-0.040	-0.859**	0.323	-0.492	2.648***	1.276	-0.135	-0.907***	-0.426***	-0.886***
	(0.300)	(0.302)	(0.258)	(0.477)	(0.429)	(0.752)	(0.942)	(0.784)	(0.192)	(0.273)	(0.161)	(0.304)
Year of birth												

1978	-0.117	-0.027	0.024	0.164	0.383	0.137	0.936**	-0.712**	0.013	-0.077	-0.027	-0.014
	(0.198)	(0.179)	(0.122)	(0.196)	(0.269)	(0.267)	(0.391)	(0.358)	(0.102)	(0.123)	(0.085)	(0.119)
1980 (ref.)												
Any internship during education	-0.146	-0.034	-0.181	0.430	0.286	0.134	0.251	0.099	-0.158	0.125	-0.025	0.103
	(0.240)	(0.211)	(0.137)	(0.263)	(0.349)	(0.353)	(0.457)	(0.300)	(0.103)	(0.119)	(0.102)	(0.134)
Any student job during education	0.799***	0.503**	0.246	0.096	1.256**	0.511	1.017	0.956**	0.420***	0.335**	0.395***	0.442***
	(0.245)	(0.227)	(0.171)	(0.243)	(0.597)	(0.319)	(0.625)	(0.472)	(0.132)	(0.145)	(0.116)	(0.157)
Start of job search: quarter in the year												
First quarter	0.491*	-0.614	-0.014	0.373	0.710	-0.609	0.205	0.258	0.121	0.031	0.098	0.125
	(0.280)	(0.394)	(0.190)	(0.309)	(0.605)	(0.702)	(1.952)	(1.836)	(0.159)	(0.201)	(0.147)	(0.215)
Second quarter	0.597**	0.283	-0.403	-0.782**	-1.541***	-0.751**	0.134	-0.929***	-0.244**	-0.485***	-0.223**	-0.798***
	(0.246)	(0.245)	(0.163)	(0.311)	(0.344)	(0.343)	(0.552)	(0.355)	(0.121)	(0.142)	(0.110)	(0.179)
Third quarter (ref.)												
Fourth quarter	1.067**	0.056	0.105	1.245***	1.460***	0.689**	-0.451	0.329	0.216	0.398**	0.447***	0.548***
	(0.451)	(0.360)	(0.236)	(0.290)	(0.470)	(0.301)	(0.673)	(0.486)	(0.173)	(0.184)	(0.150)	(0.206)
Months between leaving school and starting job search	-0.039**	-0.013	-0.003	-0.097	-0.496***	-0.088	-0.217	-0.097	-0.019	-0.034**	-0.022*	-0.050**
	(0.019)	(0.022)	(0.015)	(0.043)	(0.141)	(0.088)	(0.242)	(0.143)	(0.014)	(0.016)	(0.012)	(0.020)
Youth unemployment rate	0.051	0.055	-0.027	-0.002	-0.082**	0.067*	0.056	-0.129**	-0.013	0.011	0.013	0.005
	(0.028)	(0.036)	(0.019)	(0.032)	(0.035)	(0.039)	(0.068)	(0.056)	(0.019)	(0.019)	(0.013)	(0.021)
Duration dependence												
$t \in [0,1)$ (ref.)												
$t \in [1,2)$	-0.187	-0.371	-0.532***	0.883**	0.571**	0.026	0.317	0.271	-0.099	0.006	-0.122	0.108
	(0.268)	(0.242)	(0.202)	(0.436)	(0.282)	(0.237)	(0.416)	(0.265)	(0.137)	(0.130)	(0.108)	(0.143)
$t \in [2,3)$	-0.535	-0.882	-0.055	1.688***	1.510***	-0.502	0.206	0.963***	0.217	0.246	0.314**	0.195
	(0.386)	(0.387)	(0.280)	(0.555)	(0.322)	(0.352)	(0.712)	(0.284)	(0.215)	(0.233)	(0.159)	(0.223)
$t \in [3,4)$	-0.311	-0.666	0.384	4.281***	1.130**	-0.056	0.591	1.415***	0.273	0.689**	0.384*	0.811***
	(0.453)	(0.458)	(0.473)	(1.300)	(0.482)	(0.368)	(1.206)	(0.370)	(0.296)	(0.322)	(0.216)	(0.289)
$t \in [4,6)$	-0.333	-1.293**	-0.412	4.659***	1.079**	-0.749*	0.638	1.908**	-0.032	0.344	0.162	0.655
	(0.544)	(0.633)	(0.523)	(1.200)	(0.525)	(0.448)	(2.072)	(0.824)	(0.325)	(0.415)	(0.243)	(0.410)
$t \in [6,9)$	0.005	-0.525	-0.383	4.869***	1.203**	-1.725**	1.106	3.116***	0.178	0.903**	0.562**	0.996**
	(0.539)	(0.520)	(0.482)	(1.232)	(0.467)	(0.735)	(2.354)	(0.900)	(0.328)	(0.444)	(0.231)	(0.481)

t ∈ [9,18]	-0.406	-1.345*	-0.161	4.819***	1.403**	-1.264***	-0.041	2.620**	0.072	1.025**	0.437*	1.487***
	(0.616)	(0.768)	(0.447)	(1.207)	(577)	(0.467)	(2.768)	(1.049)	(0.315)	(0.477)	(0.265)	(0.533)
t > 18	-0.493	-1.759**	-0.645	3.727***	1.822**	[26]	-0.196	4.830***	-0.019	1.852**	0.512	2.490***
	(0.716)	(0.737)	(0.591)	(1.398)	(0.781)		(3.143)	(1.200)	(0.398)	(0.758)	(0.410)	(0.755)
Unobserved heterogeneity: estimates												
γ_2	1.435		1.259		0.782		1.337		1.559		1.599	
	(0.317)		(0.188)		(0.223)		(0.303)		(0.336)		(0.176)	
γ_3			0.157				-1.572		2.995		-1.107	
			(0.343)				(2.399)		(0.275)		(0.365)	
v_2	2.594***	1.451***	2.213***	6.432***	3.666***	-0.120	1.641	3.639***	1.081**	4.024***	2.142***	2.382***
	(0.713)	(0.537)	(0.512)	(1.029)	(0.558)	(0.342)	(2.438)	(0.910)	(0.466)	(0.985)	(0.211)	(0.488)
v_3			3.203***	$+\infty$[27]			0.987	$-\infty$[28]	3.021***	6.403***	-1.334***	$-\infty$
			(0.825)				(3.803)		(0.499)	(1.038)	(0.404)	
Unobserved heterogeneity: resulting probabilities and correlation coefficients												
p_1	0.192		0.176		0.314		0.199		0.039		0.159	
p_2	0.808		0.619		0.686		0.759		0.185		0.788	
p_3			0.206				0.041		0.776		0.053	
$cor[\exp(v_e), \exp(v_o)]$	1.000		0.918		-1.000		0.981		1.000		1.000	
Log-likelihood	-1024.419		-1978.052		-765.183		-670.047		-4593.340		-4058.329	
AIC	2156.839		4078.103		1648.365		1466.093		9332.680		8258.657	
Parameters	54		61		59		63		73		71	
Observations	338		620		244		230		1434		1434	

*** indicates significance at the 1% level, ** significance at the 5% level and * significance at the 10% level. Standard errors in parentheses.

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[26] No inflow into a job for which one is overeducated in this time interval.

[27] This heterogeneity parameter was estimated as a large positive number causing a 1 probability with respect to moving into overeducated employment for this particular type. This is numerically problematic. When we face this problem, in the spirit of Gaure *et al.* (2007), we mark the offending parameter as 'positive infinity' and keep it out of further estimation.

[28] This heterogeneity parameter was estimated as a large negative number causing a 0 probability with respect to moving into overeducated employment for this particular type. This is numerically problematic. When we face this problem, in the spirit of Gaure *et al.* (2007), we mark the offending parameter as 'negative infinity' and keep it out of further estimation.

Appendix D: Additional figures

Figure D-1: Kaplan-Meier estimates: survival in unemployment until entry in a first job (modified self-assessment method)
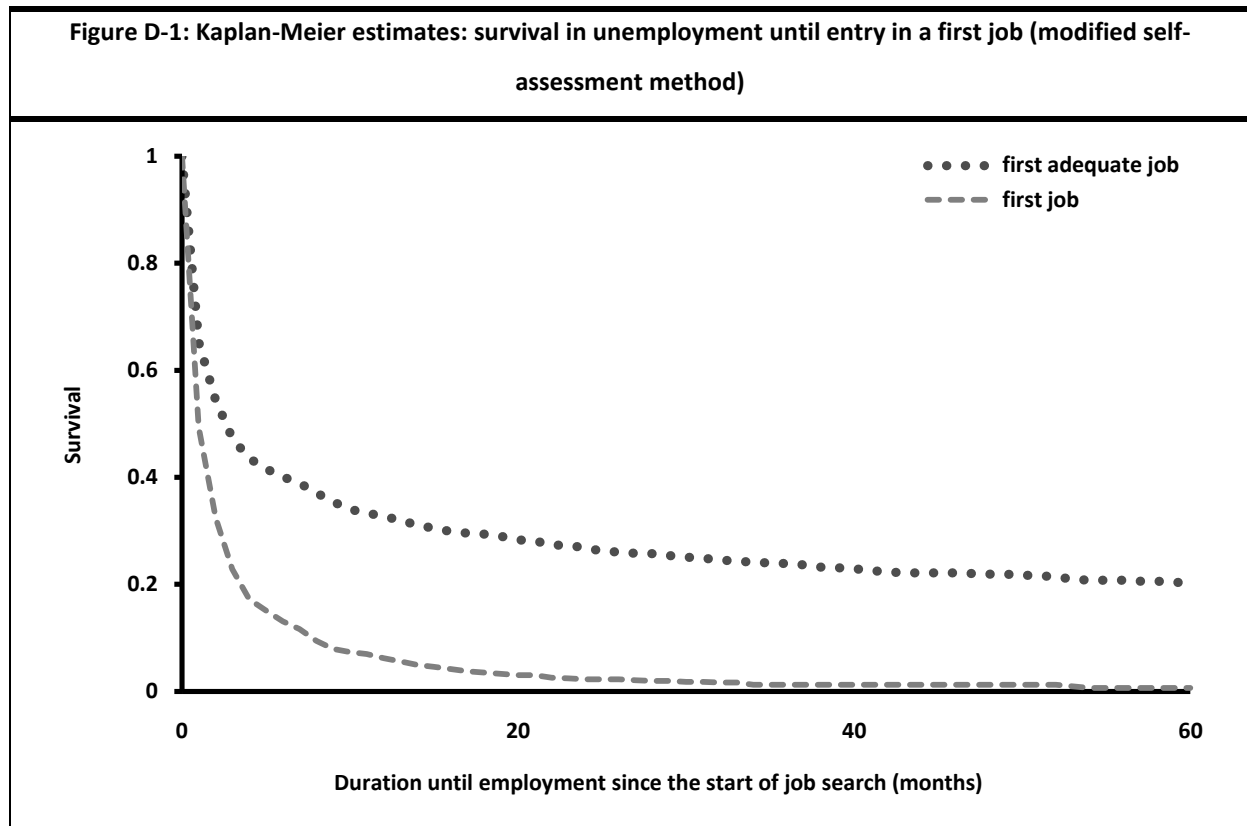
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