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ESTIMATING THE EFFECT OF COUNSELLING AND MONITORING THE UNEMPLOYED ON THEIR JOB FINDING RATE, APPLICATION INTENSITY AND MATCHING PROBABILITY

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ESTIMATING THE EFFECT OF COUNSELLING AND MONITORING THE UNEMPLOYED ON THEIR JOB FINDING RATE, APPLICATION INTENSITY AND MATCHING PROBABILITY.

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ABSTRACT

This paper examines the impact of "Counselling and Monitoring" the unemployed on their job finding rate, application intensity and matching probability by using a semi-structural duration model in which the job finding rate is equal to the product of the application intensity and the matching probability. "Counselling and Monitoring" is an intensive guidance programme for unemployed people receiving unemployment benefits which should help them to escape from the state of unemployment as quickly as possible.
The empirical results, based on a control-group approach, show that "Counselling and Monitoring" the unemployed reduces the duration to find a job because guided people apply more than non-guided people, while keeping about the same matching probability.

INTRODUCTION

Since the economic recession at the beginning of the eighties, many western countries face a high level of unemployment. The persistent nature of unemployment is clearly shown by the high percentage of long-term unemployed (e.g. more than 50% for several countries). On the individual level, this phenomenon is reflected by the well-known fact that the probability of leaving unemployment is rapidly decreasing after the first months of unemployment.

In the Netherlands, various labour market policies are used to combat long-term unemployment such as, for example, wage-subsidies for the employer when hiring a long-term unemployed person, "schooling" programmes for the unemployed and the creation of so-called "job-pools" through which the unemployed obtain work-experience. However, the overall effectiveness of these policy instruments appeared to be rather modest (see, for example, De Koning, 1991, who concluded that "only selective wage-subsidies have had a demonstrable effect on long-term unemployment"). Therefore, it is important to develop policy measures which prevent that people become long-term unemployed, so that the individual well-being will be improved in terms of income, social contacts and of social status. Moreover, the re-entering of short-term unemployed people will substantially reduce the costs of the social system (total of unemployment benefits) and also improve the functioning of the labour market. Hence, an instrument is asked for, which can positively influence the entry and re-entry probabilities of short-term unemployed job seekers.

In the light of these considerations, the Joint Administration Office (GAK), i.e., the office that - among other benefits - takes care of the allocation of unemployment benefits, has designed a special programme for the people who become unemployed and are entitled to receive unemployment benefits. This programme is called "Counselling and Monitoring" and aims to assist unemployed people in their attempts to find a job. Essentially, the programme consists of two parts. First, unemployed people are informed about present vacancies, potential search methods to discover suitable vacancies, schooling possibilities and various application techniques (i.e., the counselling process). Moreover, unemployed are stimulated to search intensively on the labour market and to develop their own search strategies. The second part of "Counselling and Monitoring" consists of recording the search activities of the unemployed, so that it can be verified whether they actually show active search behaviour (i.e., the monitoring process). In short, "Counselling and Monitoring" is an intensive guidance programme for the unemployed which should help them to escape from the state of unemployment as quickly as possible.

The aim of this paper is to assess the effect of the "Counselling and Monitoring" programme on the duration to find a job. This effect will be estimated by means of a semi-structural job search model in which the job finding rate is written as the product of the application intensity and the conditional matching probability. By using this model, it can be taken into account that the unemployed job seeker influences the probability of receiving a job offer, i.e., the job offer arrival rate is endogenous. In job search theory, the arrival of job offers is originally assumed to be a - random - exogenous process, reflecting the demand-side of the labour market. More recently, the job search literature has found that individual differences in unemployment are driven by differences in the job offer arrival rates (see, for example, Devine and Kiefer, 1989). Empirical job search models with an endogenous job offer arrival rate have, until now, been scarce (see, for example, Yoon, 1981, Jensen and Westergard-Nielsen, 1987, and Lindeboom and Theeuwes, 1991). In addition, relatively few empirical studies have been carried out in which the emphasis is

on the determinants of search intensity. Some authors have focused on the effect of unemployment benefits on search intensity, measured by the number of search methods used (see, for example, Barron and Mellow, 1979, Tannery, 1983, Wadsworth, 1991, Schmitt and Wadsworth, 1991, and Blau and Robbins, 1990). Holzer (1988) also investigated the determinants of search intensity, but he included the expected outcomes on the job offer probabilities in the model (i.e., endogenised the job offer arrival rate in the search intensity equation). Kahn and Low (1988) consider the choice of the search channel as "an important step in understanding the process by which the arrival of job offers varies across job seekers". Therefore, they develop and test a model for the job seeker's demand for labour market information.

In the present paper, search intensity is captured by the number of applications made (cf. Jensen and Westergard-Nielsen, 1987). Empirical findings on the determinants of the application intensity are almost absent in the literature (see, for exceptions, Daniel, 1990 and Gorter et al., 1993a). Moreover, the explicit use of the application intensity in a structural job search model offers the possibility to identify the probability that a match will occur if an application is made. Lindeboom et al. (1993) have estimated matching probabilities (conditional on an application) for employers and workers who use personnel advertisement as a search channel. Starting from a so-called matching function for employers and job seekers, they derive a micro model for vacancy and job search duration. In this model, the contact probability and the conditional matching probability are identified by using information on whether or not applicants have arrived at a vacancy and whether or not a worker has made an application. Moreover, it is assumed that (1) the parameters of the application probability and the conditional matching probability of the job search model are equal in the duration models for vacancy and job seekers and (2) duration dependence in the hazard rates for workers and vacancies is absent.

The empirical model used in this paper allows for the effects of duration dependence and unobserved heterogeneity on the duration to find a job and the application intensity. Furthermore, the data is collected to allow a control-group approach to consider the impact of the guidance programme.

In sum, we will estimate the effect of "Counselling and Monitoring" the unemployed on their job finding rate, application intensity and matching probability. By doing so, we can conclude whether the programme reduces the period to find a job and if so, whether this reduction stems from an increase in the number of applications per period or the "success" probability of an application.

The structure of this paper is as follows. In section 2, we present a theoretical search model with an endogenous job offer arrival rate. A statistical model for the duration to find a job and the number of applications made is introduced in section 3. Section 4 describes the data and the estimation results are presented in section 5. Finally, in section 6, we draw some conclusions.

2. A SEARCH MODEL WITH AN ENDOGENOUS JOB OFFER ARRIVAL RATE

Job search theory has been developed to describe the behaviour of unemployed people who want to fill vacant jobs in an uncertain and dynamic environment. In this theory, the probability of finding a job for an unemployed job seeker is equal to the product of the probability of receiving and accepting a job offer. In empirical studies, the job offer arrival rate is usually modelled as an exogenous process. In this paper, we will use a search model with an endogenous job offer arrival

rate, so that search activities of the job seeker can affect the probability of receiving an offer (theoretical search models with variable search intensity are introduced by Mortensen, 1977 and Burdett, 1978). An empirical application of this kind of model can be found in Lindeboom and Theeuwes (1991) who used the number of direct searcher-employer contacts as an indicator for search intensity.

In this paper, search intensity is measured by the number of attempts to acquire an offer, i.e., the number of applications made by the job seeker (cf. Jensen and Westergard-Nielsen, 1987, and Gorter et al., 1993a). This implies that the job offer arrival rate is equal to

$$\lambda = \mu_a . P_r \qquad (1)$$

with

λ = job offer arrival rate,

μ_a = application intensity,

P_r = probability of receiving a job offer (given that one applied for it).

Starting from the standard job search model, we assume that unemployed job seekers have imperfect information about the availability of jobs and associated wages. Information on the existence of vacancies is spread by employers via various recruitment channels such as the use of advertisements, informal contacts and the labour exchange office. The unemployed job seeker tries to acquire information about the wages and other vacancy characteristics associated with the job openings by submitting applications[1]. Each application may lead to a job offer with a wage w (without recall); the probability of receiving an offer, conditional on an application, is equal to P_r. The distribution of wage offers f(w) with c.d.f. F(w) is assumed to be known to the job seeker and he or she is confronted with an observation of this distribution if a job offer is generated. Applications for jobs are not without costs. Indirect costs of forgone leisure and direct costs of locating a job vacancy and applying for it (for example, by writing a letter) are the most important contributors to the application costs $c(\mu_a)$. Each time that an application leads to an offer, the job seeker has to decide whether to accept or reject a job offer. It is assumed that the accepted job will be kept forever at the same wage. Consequently, the present value of the future wage is w, divided by the subjective discount rate ρ. Rejecting an offer means a loss of expected income and a continuation of search (application) costs, while accepting implies that income gains from higher future wage offers cannot be realised any more. If search is continued, the job seeker receives unemployment benefit b which may vary over time.

Hence, the job seeker is facing a non-stationary search environment in which the benefit level b(t), the wage offer distribution F(w,t) and the subjective rate of discount ρ are known to the job seeker, while the job offer arrival rate λ is influenced by the number of applications submitted per period. Moreover, the job seeker has to accept or reject the generated job offers. Now, if the aim of the unemployed people is to maximise their individual expected present value of the income streams over an infinite horizon, it follows that the optimal strategy is to search sequentially and accept a job offer if the wage is higher then the so-called reservation wage, i.e., the minimum

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[1] Of course, job vacancies have to be discovered before applications can be made (see also Narendranathan and Nickell, 1985). The job seeker's access to information on job openings may be limited by the recruitment strategy of the employer (see for example, Gorter et al., 1993b).

wage level for which he or she is willing to work.

The level of the reservation wage w* and the optimal application intensity μ_a can be found by applying Bellman's dynamic optimality principal. If V(t) is defined as the expected present value of income at t when following the optimal strategy, it follows that w* and μ_a satisfy the following first order conditions:

$$\frac{\partial V(t)}{\partial t} = w^*(t) - [b(t) - c(\mu_a(t))] - \frac{\mu_a(t).P_r(t)}{\rho}. \int_{w^*(t)}^{\infty} [w - w^*(t)]dF(w,t) \qquad (2)$$

$$\text{with } w^*(t) = \rho.V(t)$$

$$\frac{\partial c(\mu_a(t))}{\partial \mu_a(t)} = \frac{P_r(t)}{\rho}. \int_{w^*(t)}^{\infty} (w - w^*(t))\,dF(w,t) \qquad (3)$$

In equation [2] we observe the non-stationary relation for the reservation wage (see also for example, Van den Berg, 1990). The first order condition with respect to the application intensity (equation 3) gives rise to an equality of marginal costs and benefits of applying. It implies that at the optimum the marginal costs of applying once more (per period) is equal to the (discounted) marginal income gain of an offer multiplied by the probability that an additional application induces a job offer. It can be seen from [3] that the marginal benefits of applying are not varying with the application intensity so that we must have - for arriving at an unique equilibrium - that the marginal costs of applying are rising with the application rate. This means that each additional application is more costly than the previous one, which may, for example, be due to the fact that locating an additional suitable job vacancy requires an increasing amount of time and search efforts. In conclusion, the optimal application rate will be higher at lower costs and higher benefits (ceteris paribus).

If the unemployed job seeker follows the decision rules [2] and [3] then the hazard rate of leaving unemployment is

$$\theta = \lambda . [1 - F(w^*)] = \mu_a.P_r. [1 - F(w^*)] = \mu_a.P_m \qquad (4)$$

with

θ = hazard rate

P_m = matching probability, given an application (P_r.[1-F(w*)])

In the standard model, the arrival rate of job offers is random, not influenced by search activities of the job seeker and can therefore be interpreted as the "chance" component of the job search process (in other words, it accounts for the demand-side of the labour market). The probability of accepting an offer, on the other hand, is entirely controlled by the job seeker, representing the "choice" component. This interpretation changes if the job offer arrival rate is divided into the application intensity and the **conditional** probability of receiving a job offer. In this extended specification of the hazard, the "choice" behaviour of the job seeker also arises at the beginning of the job search process. This seems to be more realistic - in our opinion - than assuming that job offers arrive at random ("come as manna from heaven"). Moreover, the conditional "chance" component is the response of the selective choice behaviour of the employer, who is confronted

with an application of a job seeker[2]. This conditional "chance" component is multiplied by the familiar choice component of accepting an offer to arrive at the so-called matching probability. Consequently, the matching probability represents the acceptance behaviour of both the employer and the job seeker after a contact is made via an application. We note that if one knows the wage level of the vacancy before applying for it and one only applies if one is prepared to accept its offer, the matching probability exclusively reflects the effect of the employers's acceptance behaviour. In that case, the matching probability is equal to the job offer probability, given that an application is made (see Gorter et al., 1993)[3].

In sum, the full model is defined by the two first order conditions for the reservation wage and the optimal application intensity (see [2] and [3]) and the structural equation for the hazard rate (see [4]. Information on both the reservation wage and the number of applications is needed to apply a fully structural approach, that is to make explicit use of the optimality conditions. This approach will not be followed here, because we do not have data on the reservation wage[4]. In addition, estimating a fully structural, non-stationary, model with an endogenous offer arrival rate is far from easy and will lead to burdensome computations.

In this paper, we will estimate reduced form equations for the number of (unsuccessful) applications and the hazard rate, separately. This model is in line with the approach followed by Lindeboom and Theeuwes (1991), but - as mentioned before - they use the number of direct searcher-employer contacts in which no distinction is made between attempts to make contacts and actual contacts made. Furthermore, they can not identify the underlying components of the hazard rate. In this paper, the hazard rate is equal to the product of the application rate and the probability that a match occurs if an application is made (see [4]). In our empirical work, we will identify both components by using information on the duration and the number of applications[5].

The aim of this paper is to investigate whether "Counselling and Monitoring" (abbreviated as CM) the unemployed reduces the period to find a job. The semi-structural search model described above makes it possible to examine whether "Counselling and Monitoring" the unemployed leads to a reduction of the period to find a job (ceteris paribus), and if so, whether this reduction is caused by the fact that "guided" unemployed apply more frequently than "non-guided" unemployed or that "guided" unemployed have a higher matching probability than "non-guided" unemployed

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[2] Probably, several people will apply for a vacancy, offering the employer the possibility to pick out the "best" one from a pool of applicants. Alternatively, the employer might also consider the applicants at the moment of arrival on the basis of the expected level of labour productivity.

[3] This kind of search behaviour can also be described by means of a systematic search model in which job seekers have information of the wage offer and associated offer probability for n vacancies and tend to contact their best opportunities first.

[4] Under certain conditions, it is possible to estimate the (stationary) equation for the reservation wage from other information. Jensen and Westergard-Nielsen (1987) used the number of offers obtained, the observed wage and the number of periods searching to estimate the relation between the reservation wage and the expected wage offer and the offer probability.

[5] An analogous approach is used by Van Ours and Ridder (1992) in a semi-structural model of vacancy duration. In this model the hazard rate is split up into the product of the rate at which applicants arrive and the probability that an applicant is suitable and hired by the firm.

if an application is made. Summing up, we will estimate the effects of CM on the hazard rate, the application intensity and the matching probability by using the following relation:

$$\theta(Z,X(t),t,CM) = \mu_a(Z,X(t),t,CM) \cdot P_m(Z,X(t),t,CM) \qquad (5)$$

with X(t) and Z vectors of relevant person-related characteristics.

3. A STATISTICAL MODEL OF THE DURATION TO FIND A JOB AND THE NUMBER OF APPLICATIONS.

In order to estimate the effect of CM on the search behaviour of the unemployed job seeker (see also [5]), we will use data on the duration to find a job and the number of applications made in each subsequent period of four weeks. Let T be the duration to find a job and k the number of applications, then we observe $(T,k^*,k_{n-1}, k_{n-2},..,k_1)$ with k_i at t=28i days for i=1,..n-1, and k^* at t=T. To arrive at empirical results, we need the joint distribution of the random variables $(T,k^*,k_{n-1}, k_{n-2},..,k_1)$. It is assumed that unemployed individuals search according to the theoretical model described in the previous section. This implies that applications are evaluated by the firm at the moment of arrival and immediately accepted or rejected. If the job is offered to the applicant, he or she also decides to accept or reject at once. Moreover, we assume that the optimal reservation wage and number of applications per period are set by the job seeker at the beginning of each period (of 28 days) and remain constant during this period.

We will derive the joint distribution function of the duration and the number of applications (in each period) as follows. First, note that the marginal density function of duration t is given by

$$f(t) = \theta(t).\exp\left(-\int_0^t \theta(s)ds\right) \qquad (6)$$

so that the survivor function S(t)=1-F(t) is equal to

$$S(t) = \int_t^\infty f(s)ds = \exp\left(-\int_0^t \theta(s)ds\right) \qquad (7)$$

Let $\mu_r = \mu_a.[1-P_m]$ be the arrival rate of unsuccessful applications. We will assume that the number of unsuccessful applications follows a Poisson process with parameter μ_r, so that the density function for the number of unsuccessful applications k_i during the period t_{i-1}, t_i (registered at t_i) becomes:

$$h(k_i \mid t>t_{i-1}) = \exp\left(-\int_{t_{i-1}}^{t_i} \mu_r(s)ds\right).\frac{\left[\int_{t_{i-1}}^{t_i} \mu_r(s)\right]^k}{k!} \qquad (8)$$

Next, we can write the joint probability of the event $(T,k_n,k_{n-1},..,k_1)$ as:

$$Pr(T,k_n,k_{n-1},..,k_1) =$$
$$Pr(T,k_n \mid t>t_{n-1},k_{n-1},..,k_1).Pr(t>t_{n-1},k_{n-1},..,k_1) = \quad (9)$$
$$Pr(T \mid t>t_{n-1},k_{n-1},..,k_1).Pr(k_n \mid T,t>t_{n-1},k_{n-1},..k_1).Pr(t>t_{n-1},k_{n-1},..k_1)$$

and repeat this for $Pr(t>t_{n-1},k_{n-1},..,k_1)$, $Pr(t>t_{n-2},k_{n-2},..,k_1)$,..,$Pr(t>t_1,k_1)$, so that

$$Pr(T,k_n,k_{n-1},..,k_1) =$$
$$Pr(T \mid t>t_{n-1},k_{n-1},..,k_1).Pr(k_n \mid T,t>t_{n-1},k_{n-1},..k_1). \quad (10)$$
$$\prod_{i=1}^{n-1} Pr(t>t_i \mid t>t_{i-1},k_{i-1},..k_1).Pr(k_i \mid t>t_{i-1},k_{i-1},..k_1)$$

Hence, we find for the joint density of a completed spell of vacancy duration T (i.e., one successful application at t=T), k_i unsuccessful applications at t=28i days for i=1,..n-1, and k^*-1 unsuccessful applications at t=T:

$$g(T,k^*,k_{n-1},..k_1) =$$
$$f(T \mid t>t_{n-1},k_{n-1},..,k_1) \cdot h(k^*-1 \mid T,t>t_{n-1},k_{n-1},..,k_1) \cdot$$
$$\prod_{i=1}^{n-1} S(t_i \mid t>t_{i-1},k_{i-1},..k_1) \cdot h(k_i \mid t>t_{i-1},k_{i-1},..,k_1) = \quad (11)$$
$$f(T \mid k_{n-1},..,k_1).h(k^*-1 \mid T,t>t_{n-1},k_{n-1},..,k_1).\prod_{i=1}^{n-1} h(k_i \mid t>t_{i-1},k_{i-1},..,k_1)$$

so that the joint density can be written as the product of the marginal density of T and the conditional - on survival - density of the number of unsuccessful applications $(k^*-1,k_{n-1},..,k_1)$[6].

Our data consists of both completed spells and incompleted spells of duration. In case of incompleted spells (t>T), the contribution to the likelihood function is:

$$S(T \mid k_{n-1},..k_1).h(k^* \mid T,t>t_{n-1},k_{n-1},..,k_1).\prod_{i=1}^{n-1} h(k_i \mid t>t_{i-1},k_{i-1},..,k_1) \quad (12)$$

4. DATA AND EXPLANATORY VARIABLES

The data was collected by the Department of Statistics and Research of the Joint Administration Office in order to evaluate the effectiveness of an experimental programme in which people, who enter the state of unemployment and are eligible to unemployment benefits, are assisted to find a job (see also Overbeeke and Kalb, 1991). The sample is drawn from the flow into unemployment during November 1989 - January 1990 at seven regional offices of the administration (located in Haarlem, Maastricht, Arnhem, Vlaardingen, Apeldoorn, Venlo and Rijswijk). To be included in the sample, one should satisfy the following conditions, however. The unemployed persons must be less than 57.5 years old, willing to obtain a permanent position if they were previously employed

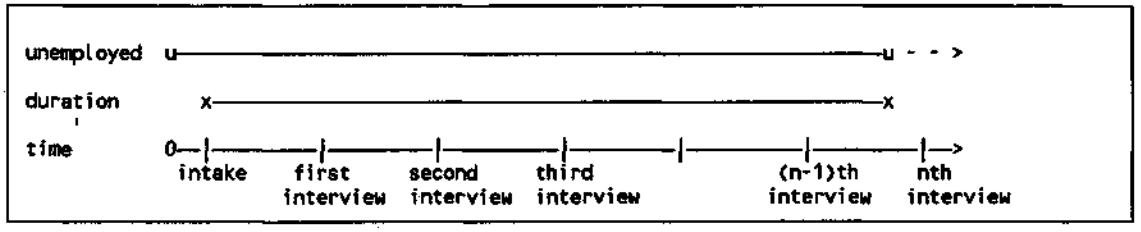
[6] Note that we have used that $S(t_{i-1} \mid k_{i-1},..,k_1)$ is equal to $S(t_{i-1} \mid k_{i-2},..,k_1)$.

via a temporary employment agency, and should not begin to work in a new job within a period of three weeks.

Next, the experimental programme Counselling and Monitoring ("Begeleiding en Controle") was randomly assigned to about 50% of this sample. The programme started for the people in the treatment group at the moment of the first contact with the administration (moment of intake) which took place shortly after becoming unemployed.

The search activities and labour market events of this sample were recorded by interviewing each individual every four weeks for a total period of about one year (see Figure 1). The interviews provide information on the number of applications made, the search channels used (looking at advertisements, consulting employers and the labour exchange office), and the number of offers to visit an employer for an application in the previous four weeks.

Figure 1 The observation plan



An important advantage of the use of administrative data is the **exact** knowledge of the pre-unemployment wage level (and the associated benefit level) and the length of unemployment duration (in days). Moreover, the data set provides detailed information on (a) person-related characteristics, namely age, educational level, gender and the presence of person-specific barriers, and (b) labour market characteristics, namely the number of hours available, labour market history of the individual (number of years of (un)employment in the previous five years, permanent or temporary previous job), and the occupational group the individual belonged to. The time period between assignment of CM and finding a job is used as the duration variable in our model. The data on duration includes right-censored observations for those who have not found a job at the moment of the last interview.

From the total sample, we selected the observations which provided full information on the "search-history" of the individual (that is the search channels used and the number of applications made). Furthermore, registered duration should be consistent with the number of interviews recorded and the period between becoming unemployed and assignment of CM (from now on referred to as pre-intake period) should be less than 60 days. The latter selection criterion is necessary because otherwise we would include people who became unemployed a long time ago, had a job for a short while, and then re-entered the state of unemployment before intake took place. As a result of these selection criteria, the sample mean of the number of days unemployed before the moment of the first contact (intake) falls from 46.2 to 9.6 days. Despite this change of composition, the random assignment of CM is still valid according to a simple test on the sample statistics (mean and standard error) of the "labour market history" variables for those receiving and those not receiving CM.

In Table 1, we present the sample means of the variables, both for the whole sample and for the selected subsample.

Table 1 Sample means of the variables.

	sample	subsample
Person-related characteristics (Z)		
* age (in years)	29	30
* educational level		
primary	21 %	16 %
low vocational	28 %	25 %
low secondary	18 %	21 %
medium vocational	11 %	12 %
medium secondary	10 %	12 %
high secondary	4 %	4 %
high vocational	5 %	7 %
academic	3 %	3 %
* female	34 %	33 %
* person-specific barriers	15 %	11 %
* wage per hour (in guilders)	15.35	15.25
* number of hours available	39.15	39.50
* permanent (previous) job	84 %	83 %
* years employed in previous five years	2.4	2.3
* years unemployed in previous five years	0.5	0.4
* days unemployed before intake	46.2	9.6
* occupational group		
management	10 %	10 %
administrative	26 %	30 %
sales	5 %	4 %
services	13 %	12 %
agricultural	1 %	1 %
construction	3 %	2 %
metal industry	5 %	5 %
other industries	19 %	15 %
transport	6 %	7 %
military service	12 %	14 %
* location of "district office"		
Haarlem	20 %	26 %
Maastricht	13 %	11 %
Arnhem	7 %	7 %
Vlaardingen	28 %	28 %
Apeldoorn	10 %	8 %
Venlo	13 %	8 %
Rijswijk	9 %	12 %
Person-related characteristics [X(t)]		
search strategy[7]:		
* looking at advertisements	75 %	83 %
* labour exchange office	47 %	51 %
* consulting employers	33 %	40 %
Counselling and Monitoring (CM)	53 %	55 %
Duration (t)		
* duration from the moment of intake (in days)	71.9	69.5
* completed spells	77%	88%
Number of applications per 28 days (k)	0.8	1.0
number of observations	1631	722

[7] These values are obtained by computing the percentage of people - who are still in the sample - using a certain search channel for each period and next, taking the mean over time.

5. EMPIRICAL RESULTS

In this section, we present estimation results of reduced form models for the number of unsuccessful applications (k_i) and the duration to find a job (T)[8]. Next, the reduced form estimates are used to identify the intensity of applications made (μ_a) and the matching probability (P_m). The reduced-form models are estimated with the data described in section 4. Except for the search (dummy) variables X which may have different values each period of four weeks, the exogenous variables Z do not vary over time. In the model for the number of unsuccessful applications, we omitted the last observation (k_n). This is done because, in case of completed spells, some observations on the number of applications are inconsistent with our model (k_n is equal to zero), while in case of incompleted spells, the observations refer to the last period of four weeks which may be longer or shorter than the remaining period being observed as unemployed (see also Figure 1). Furthermore, we only included the number of applications in the previous period (k_{-1}) to avoid multicollinearity between the number of applications reported in subsequent previous periods.

First, we estimate a reduced-form model for the number of unsuccessful applications reported at each interview (except for the last one). The likelihood is based on the density function of the number of applications ($k_{n-1}, k_{n-2}, .. k_1$), conditional on survival (see [12]). The arrival rate of unsuccessful applications is specified as

$$\mu_r(t \mid Z, X(t), CM, k_{-1}) = \exp(Z'\alpha_1 + X(t)'\sigma_1 + CM.\beta_1 + \sum_{i=1}^{8} D_i(t).[\gamma_{1i} + \delta_1.k_{i-1}]) \qquad (13)$$

and the time-varying dummy variables $D_i(t), i = 1,..,7$ equal to one if $28(i-1)$ days $<$ time $t < 28i$ days for $i = 1,7$ and more than 196 days for $i = 8$. We note that about 3% of the sample is left in the last period, which is considerably less in comparison with the entire sample due to the stringent criteria on "complete" search history.

Second, a reduced-form model for the duration to find a job (from the moment of intake) is estimated. For this purpose, we use a flexible base-line hazard model with the hazard of finding a job specified as

$$\theta(t \mid Z, X(t), CM, k_{-1}) = \exp(Z'\alpha_2 + X(t)'\sigma_2 + CM.\beta_2 + \sum_{i=1}^{8} D_i(t).[\gamma_{i2} + \delta_2.k_{i-1}]) \qquad (14)$$

The parameters of this model can now be estimated by maximizing the likelihood function based on the marginal density function of time T (see also [12]).

The estimation results of the reduced-form models are shown in table 2. We start with a discussion of the person-related effects on the application rate and the duration to find a job. The

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[8] We found in section 3 that the joint density function factorises into a "duration" part and an "application" part. Consequently, it is possible to estimate the relation for the hazard rate and the arrival rate of rejected applications separately, given that the joint density function of the unobserved components (error-terms) for the duration and the number of applications can also be factorised (see also Lindeboom and Theeuwes, 1991).

outcomes of the "application model" can be interpreted in the context of our theoretical model in which the number of applications made will be higher at lower costs and/or higher benefits of an additional application. From Table 2, we can see that the application rate is significantly higher for people with a higher educational level, who were longer previously employed and applied more often in the previous period. Moreover, searching by consulting employers and - to some less extent -looking at advertisements leads to more applications per period than consulting the labour exchange office. On the other hand, there are significantly negative effects on the application rate from the age of the job seeker, personal-specific barriers and the total length of unemployment experiences in the past. It seems likely that these characteristics are associated with higher costs and lower benefits of applying, so that the optimal level becomes lower. We also observe considerable differences in the effects on the application rate that are related to occupational group, the location of the regional office and the number of days unemployed at the moment of intake. The results of person-related variables appear to be in line (except for education) with the findings of Gorter et al., 1993a, who found that older people apply considerably less, while the expected wage level and the preference for a full-time job have a strongly positive effect on the application rate.

Next, we discuss the results of the person-related variables on the duration to find a job. First of all, we note that less parameters are significant. Unemployed people with a medium educational level obtain a job more quickly than those who have a lower (primary, low vocational) and a higher (academic) educational level. A significantly positive effect on the job finding rate is also found for the use of consulting employers, while in case of the use of advertisements we observe the opposite effect. The negative effect of using advertisements (instead of not using them) is rather surprising, especially because people who report to use advertisements also appear to apply more frequently. A possible explanation might be that people who do not look at advertisements are not confronted with many competitors if they make a contact with an employer (e.g. they may be asked to apply for a job), while those who look at advertisements encounter severe competition when they apply for a job (which is probably announced via an advertisement)[9]. The wage level of the previous job appears to have a significantly negative impact on the duration. In the first period of unemployment, the Dutch unemployment benefit level has an one-to-one correspondence with the wage level received in the last job. Therefore, this variable might be interpreted as a measure for the unemployment benefit level (although it also reflects - of course - the level of the expected wage level in the next job). In this interpretation, there seems to be a negative effect of the absolute benefit level on duration which is usually not found in other Dutch empirical studies of unemployment duration (see, for example, Groot and Jehoel-Gijsbers, 1990 and Gorter and Gorter, 1993c). Differences in occupational group, the location of the regional office and the number of days unemployed before intake took place also give rise to substantial deviations in the duration to find a job. With respect to occupational group, we see that - in particular - construction workers are (re)-hired within a short period (while applying less frequent than other workers).

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[9] We checked whether the use of several search channels simultaneously biased the "main-effects" for the channels by extending the model with interactions terms. The results showed that the interaction played no role and the "main-effects" remained unchanged.

Table 2 Parameter estimates of reduced-form models for the application rate and the duration to find a job (standard errors); * : significant at 5%

	APPLICATION RATE (μ_τ)		DURATION TO FIND A JOB (HAZARD RATE)	
Person-related characteristics [Z]				
* log(age)	-0.24	(0.13) *	-0.34	(0.22)
* educational level (primary)				
low vocational	-0.00	(0.09)	0.14	(0.13)
low secondary	0.10	(0.09)	0.20	(0.15)
medium vocational	0.15	(0.10)	0.33	(0.16) *
medium secondary	0.10	(0.11)	0.32	(0.17)
high secondary	0.09	(0.13)	-0.10	(0.24)
high vocational	0.43	(0.12) *	0.20	(0.21)
academic	0.65	(0.15) *	-0.26	(0.31)
* female (male)	0.08	(0.07)	-0.07	(0.11)
* person-specific barriers	-0.39	(0.11) *	-0.17	(0.15)
* wage per hour/10	0.04	(0.04)	-0.22	(0.08) *
* log(hours work)	0.22	(0.16)	-0.01	(0.25)
* permanent job (temporary)	-0.19	(0.14)	-0.76	(0.16)
* number of years employed	0.05	(0.02) *	0.01	(0.03)
* number of years unemployed	-0.08	(0.03) *	-0.04	(0.04)
* days unemployed before intake	-0.006	(0.003) *	-0.02	(0.005) *
* occupational group (management)				
administrative	0.18	(0.10)	-0.29	(0.17)
sales	0.05	(0.17)	-0.17	(0.25)
services	0.05	(0.11)	-0.39	(0.18)
agricultural	-0.66	(0.38)	-0.83	(0.61)
construction	-0.57	(0.40)	0.61	(0.30) *
metal	-0.01	(0.15)	-0.17	(0.24)
other industries	-0.24	(0.12) *	-0.45	(0.19) *
transport	-0.34	(0.17) *	0.04	(0.21)
military service	0.19	(0.12)	-0.02	(0.19)
* location of regional office (Haarlem)				
Maastricht	-0.06	(0.11)	-0.27	(0.15)
Arnhem	0.16	(0.14)	0.12	(0.18)
Vlaardingen	0.31	(0.08) *	0.03	(0.12)
Apeldoorn	0.02	(0.13)	0.00	(0.17)
Venlo	0.01	(0.11)	-0.38	(0.19) *
Rijswijk	0.13	(0.11)	0.03	(0.15)
Person-related characteristics [X(t)]				
* search strategy				
advertisements (not)	0.25	(0.07) *	-0.31	(0.08) *
labour exchange office (not)	0.08	(0.05) *	-0.10	(0.08)
consulting employers (not)	0.39	(0.05) *	0.25	(0.07) *
* number of rejected applications in previous period of 28 days	0.16	(0.01) *	0.05	(0.03)
Elapsed duration (t)				
0 - 28 days	-3.71	(0.83) *	-1.74	(1.31)
28 - 56 days	-4.08	(0.83) *	-1.81	(1.31)
56 - 84 days	-4.16	(0.83) *	-1.83	(1.31)
84 - 112 days	-4.15	(0.84) *	-1.54	(1.32)
112 - 140 days	-4.22	(0.84) *	-1.58	(1.32)
140 - 168 days	-3.99	(0.84) *	-2.12	(1.35)
168 - 196 days	-4.74	(0.86) *	-2.17	(1.39)
more than 196 days	-4.42	(0.84) *	-3.55	(1.38) *
Counselling and Monitoring (CM)				
yes	0.05	(0.17)	-0.50	(0.20) *
yes x permanent job	0.17	(0.18)	0.61	(0.22) *
Number of observations	722		722	
Mean log-likelihood	-2.57		-4.57	

In the following part of this section, we discuss the main issue of this paper, namely the effect of Counselling and Monitoring. In addition, we show how the hazard rate, the application rate and the matching probability vary over time according to our estimates. The estimation results on the hazard rate and the arrival rate of unsuccessful applications can be used to calculate the application intensity and the matching probability.

It follows from our theoretical model that the application intensity is equal to

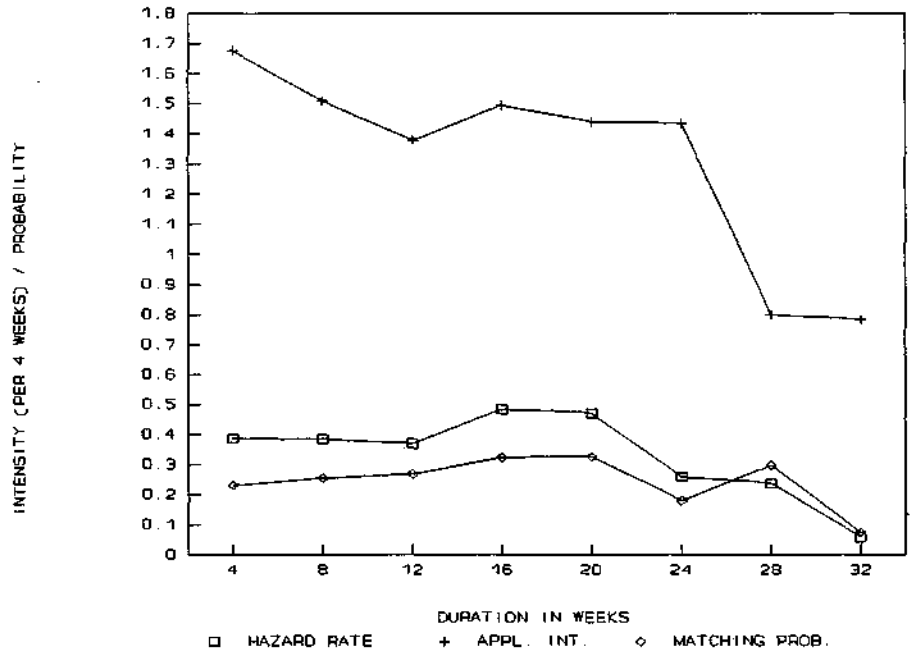
$$\mu_a = \mu_r + \theta \tag{15}$$

and the matching probability is equal to

$$P_m = \frac{\theta}{\mu_a} = \frac{\theta}{\theta+\mu_r} \tag{16}$$

Now, we first consider the hazard rate, the application intensity and the matching probability for an - econometrical - average unemployed individual (see Figure 1).

Figure 1 Hazard rate, application intensity and matching probability



It can be seen that the application rate is approximately equal to 1.5 during the first six periods of four weeks. After this period, the rate decreases to less than 1 per period (of four weeks)[10]. The hazard rate is negative duration dependent after reaching its maximum value of about 0.5 at 12-20 weeks. A falling hazard rate over time is usually found in empirical duration studies for the

[10] This fall of the application intensity also shows up when allowance is made for a structural change of parameters after six periods.

Netherlands (see for an overview, Gorter et al., 1993a). The matching probability of the "average" application is between 20-30% during the first six months, but becomes much lower in the last period. The estimate of the conditional matching probability is much higher than the values found in studies of Lindeboom et al., 1993 (about 8%) and Gorter et al., 1993a (4-6%). In the latter study, the conditional matching probability could be interpreted as the conditional job offer probability due to the assumption that people know the wage rate associated with a vacancy before they apply and that they will only apply if the wage rate is higher than the reservation wage. It should also be emphasized that both studies obtained their results on the basis of people who were not working and actively seeking for a job, while the present study concentrates on registered unemployed people, who are eligible to unemployment benefits.

Next, we show the effect of "Counselling and Monitoring" on the hazard rate, the application intensity and the matching probability for an average unemployed individual who had a previous permanent job (83 % of the sample) in Figure 2,3 and 4, respectively. The effect of CM is estimated separately for those who had a permanent job and those who had not. This is done because those who worked temporarily could only join the programma if they reported to be willing to search for permanent jobs. Clearly, this might bias the overall estimate of CM on the hazard.

Figure 2 Hazard rate for unemployed people, who had a previous permanent job

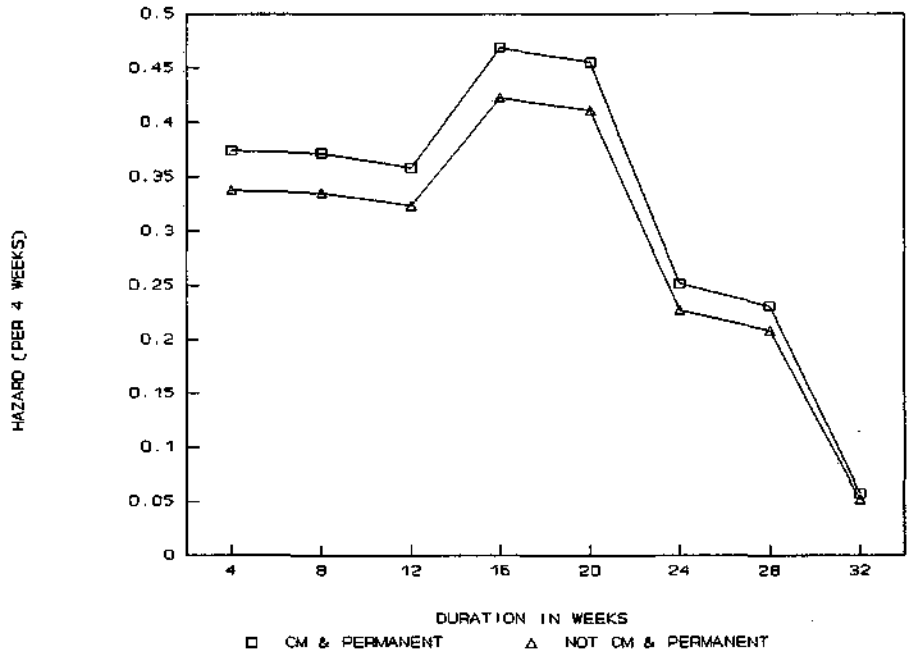


Figure 3 Application intensity for unemployed people, who had a previous permanent job

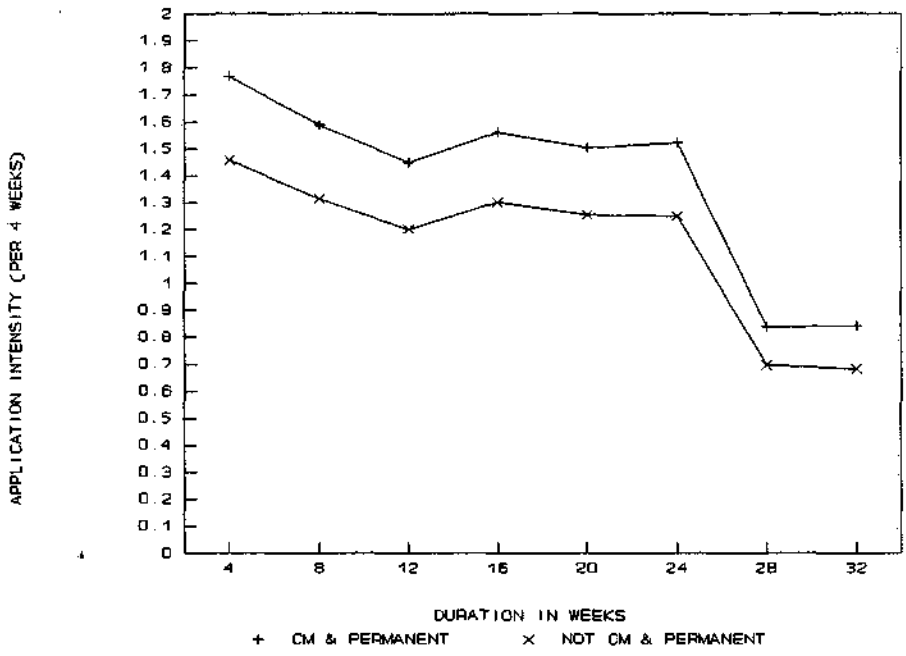
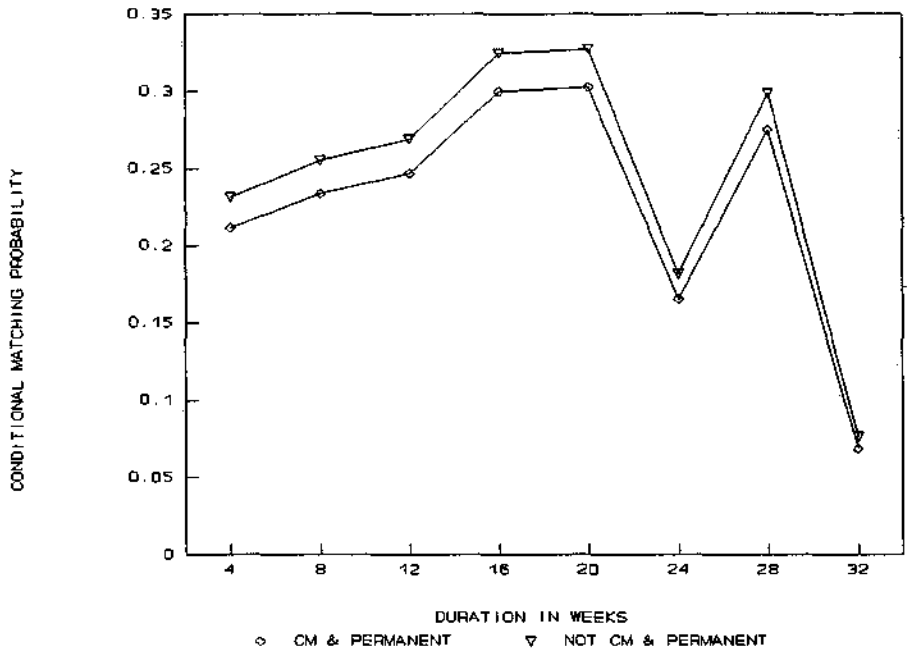


Figure 4 Matching probability for unemployed people, who had a previous permanent job

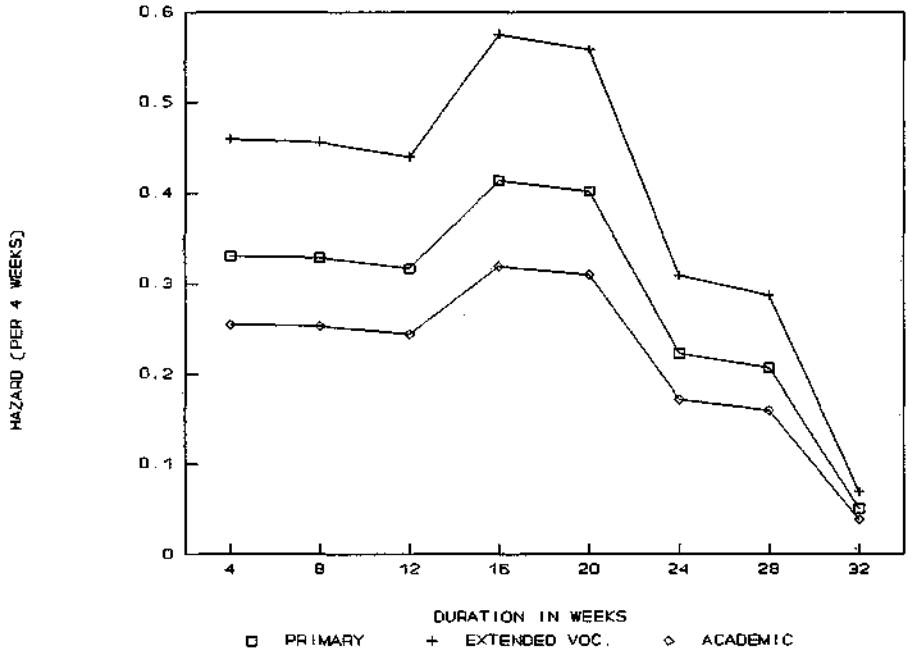


From Figure 2,3 and 4, we observe that CM has a positive effect on the hazard rate (although not significant, see Table 2) as a result of a higher application intensity[11], while the matching probability becomes even slightly lower. Hence, the conclusion can be drawn that CM unemployed people reduces the duration to find a job because "guided" people apply more than "non-guided" people, while keeping about the same "success" probability.

For people who were previously employed via a temporary employment agency, we find that CM increases duration due to a substantially reduced matching probability, indicating that either the job seeker or the employer has become more selective. At first sight, the impact of CM seems contraproductive, but we should take into account that this group aims to switch to permanent work which can be regarded as favourable from a long-term perspective.

Analogous to the effect of CM, we are able to demonstrate the impact of other exogenous variables on the hazard rate, the application intensity and the matching probability. In Figure 5,6 and 7, we present the effect of different levels of education (primary, extended vocational, and academic).

Figure 5 Hazard rate for unemployed people with different levels of education



[11] It is noteworthy that we find a significant positive effect of CM on the application intensity if we do not differentiate between subgroups (estimated parameter: 0.20, standard error: 0.05), while the overall fit of the model is unaffected.

Figure 6 Application intensity for unemployed people with different levels of education

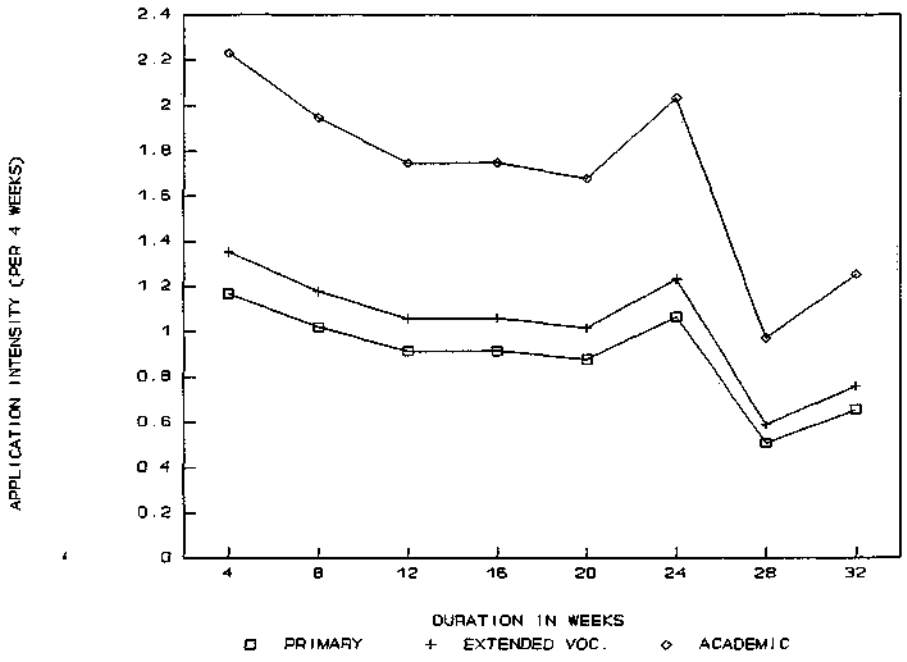
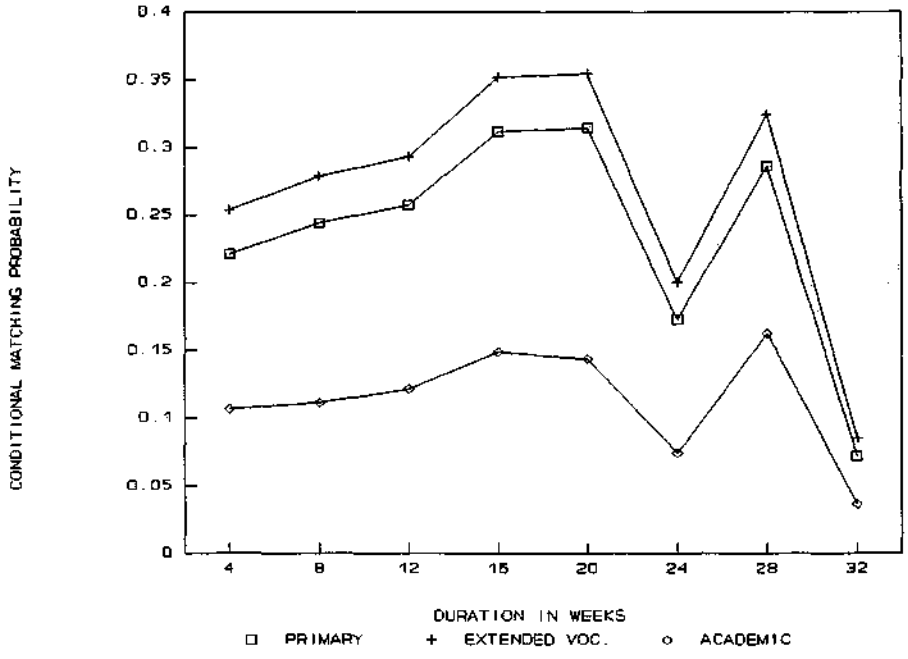


Figure 7 Matching probability for unemployed people with different levels of education



We conclude that people with an extended vocational education have a high job finding rate, mainly due to a high matching probability (which is rising from 25% to 35% per application during the first 20 weeks). It is also shown that people with a primary education have a much lower job finding rate than people with a extended vocational level due to both a lower application rate and lower matching probability. Our last remark concerns the outcome for academics who have the lowest job finding rate despite their many attempts to obtain a job (the application rate is about twice as high compared with the "primary" level) because they face an extremely low matching probability (which is less than 15% per application)

To conclude this section, we want to examine whether the estimation results of the reduced-form models for the duration and the application intensity are not biased by the effect of unobserved heterogeneity. For this purpose, the models are re-estimated with a two-points heterogeneity component (v_1,v_2) included in the constant term of the hazard (or application) rate. In case of the duration model, the marginal density function of duration becomes as follows

$$f(t) = p.f(t \mid \theta_1)+(1-p).f(t \mid \theta_2),$$

$$\theta_j(t \mid Z,X(t),CM,k_{-1}) = \exp(Z'\alpha_2+X(t)'\sigma_2+CM.\beta_2+\sum_{i=1}^{8} D_i(t).[\gamma_{2i}+\delta_2.k_{i-1}]+v_j) \quad , \text{for } j = 1,2 \tag{17}$$

with p reparameterised as

$$p = \frac{\exp(\epsilon)}{1+\exp(\epsilon)} \tag{18}$$

Next, the parameters of the duration model $(\alpha_2,\beta_2,\gamma_{2i},\delta_2,\sigma_2,\epsilon,v_1,v_2)$ are estimated by maximum likelihood. For the application model, a similar approach is followed. For both models, the added heterogeneity components (v_1,v_2) converge to the same value, while the probability parameter ϵ becomes zero (so that $p=1/2$). The parameters of CM and other variables remained approximately the same as in Table 2. Apparently, the statistical variation of the hazard (and also application) rate over time was already captured by the time-varying dummy variables and search variables. Hence, we conclude that neglected heterogeneity does not influence the outcomes of the reduced-form models.

6. CONCLUSIONS

In this paper, we examined the effect of "Counselling and Monitoring" the unemployed on their job finding rate, application intensity and the matching probability by using a semi-structural duration model in which the probability to find a job is equal to the product of the application intensity and the "success" probability of an application.

The empirical model is derived from a theoretical search model with variable search (i.e., application) intensity. Estimation results are obtained by using data, gathered by the Joint Administration Office in order to evaluate the "Counselling and Monitoring" programme, on the duration to find a job and the number of applications made.

The empirical results show that "Counselling and Monitoring" the unemployed reduces the duration to find a job because "guided" people apply more than "non-guided" people, while keeping about the same matching (or "success") probability. However, the estimated effects of CM are *not statistically significant* (at 10%) so that we *can not* rely too much on our results to formulate policy recommendations. Nevertheless, the results may be interpreted as favourable because CM increases the hazard rate of leaving unemployment for people who had a previous permanent job with approximately 11%.

We also observe that the "job search assistance" programma CM is not capable to increase the matching probability of the unemployed. More favourable effects on the success probability of an application, which is probably mainly determined by the employer's acceptance behaviour, might be obtained by using other programmes such as (re)-schooling and job training.

Moreover, the estimation results of our model are used to get more insight into the determinants of the application intensity of unemployed job seekers. The empirical results of the application model appear to be understandable in the context of our theoretical job search model. For example, it is found that younger persons with a higher educational level apply more frequently than older people with a lower educational level, which would - according to our underlying model - stem from their higher expected revenues or lower expected costs of applying.

Finally, we consider the approach followed in this paper to be promising because it reveals both the determinants of search (application) intensity of unemployed job seekers and the "success" probability of such activities.

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