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An Empirical Analysis on the Effectiveness of Search

by

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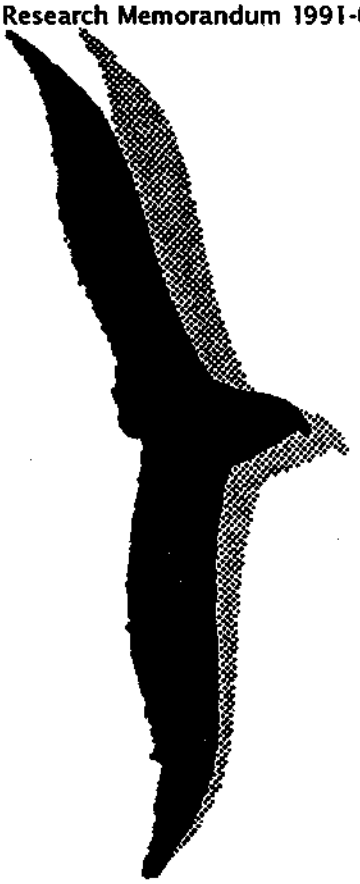
Research Memorandum 1991-63 October 1991



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MATCHING EMPLOYERS AND WORKERS:

AN EMPIRICAL ANALYSIS ON THE EFFECTIVENESS OF SEARCH

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September 1991

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We would like to thank the Organisation for Labour Market Research (OSA) for their financial support and for access to their data bases. Furthermore excellent research assistance of Michael Berkenbosch and Johannes Bollen is gratefully acknowledged.

Abstract

Searching for a (new) job or searching for a new employee takes time. In the search or recruitment process the use of search/recruitment methods is extremely important. We distinguish four search/recruitment methods: advertisements, public employment office, informal channels and a rest category 'other'. In this paper we analyse the efficiency of the search-/recruitment methods; i.e. the speed at which potential contacts in the market result in a match. We also analyse the effect of the total number of vacancies and job seekers on the number of matches. Therefore we develop a model to estimate matching functions using both micro data on vacancy and search duration combined with data on supply and demand in the market.

1. Introduction

This paper aims to analyse the effectiveness of different search and recruitment channels used by workers and employers. In our model the success of the use of a search/recruitment channel depends on the efficiency of a channel, i,e, the speed at which potential contacts result in a match, and on the total number of jobseekers and vacancies that use the channel.

Generally the effectiveness of search/recruitment channels is assessed along two different ways. First, by the number of job offers for workers and the pool of applicants for employers that are generated when these channels are used. Secondly, the effectiveness of a search/recruitment channel is measured by the time it takes to find a new job or a new employee. Contributions regarding the success of the use of search methods can be found in e.g. Holzer (1987, 1988) and Blau and Robins (1990) for worker's search and Roper (1988) for employer's search. In these contributions four different search or recruitment channels are distinguished: advertisements, employment office, informal search and other.

With regard to workers' search Holzer (1987,1988) found informal search, using friends and relatives, to be the most productive in terms of the number of job offers and accepted jobs. This is confirmed by Blau and Robins (1990), who also find that employed job seekers experience a higher probability of finding a job than unemployed job seekers. Blaschke (1987) using German data, also found the informal search channel to be the most productive, whereas Jones (1989) found no significant differences. Roper (1988), conducting an analysis for employer's search duration, concluded that informal search is also the most productive channel for firms (in terms of expected duration).

There are some drawbacks in these earlier studies. First, they are partial in the sense that worker's search and employer's search are analysed separately. Second, the total number of workers and employers operating through a specific search or recruitment channel is ignored. It is obvious that if the number of workers on the market, searching through a specific channel, is large relatively to the number of vacancies at that market, long 'search' durations for workers and short vacancy durations are expected. In general the effectiveness of a specific search or recruitment channel depends on the size of the pool of applicants and vacancies at the market level.

We estimate a general model that allows for both sides of the labor market to interact, and that takes account of their relative numbers. For each separate search/recruitment channel we specify a matching function. The number of matches per channel depends on the number of vacancies and the number of job seekers coming to the market through that channel. The parameters of the matching function are an efficiency parameter and scale parameters (or 'geometric weights') indicating the relative importance of supply and demand. The effectiveness of a specific search/recruitment channel can be assessed on the basis of the estimated parameters.

We explicitly allow the parameters to differ for employed and unemployed workers. For example, it is not a priori clear that informal search will be as effective for unemployed workers as it is for employed; the former may loose their informal contacts as time goes on.

From the matching functions defined at the market level, we derive micro economic duration models for employers and workers. In the specification of the hazard, the same parameters of the matching function appear. At the micro level, every time a worker finds a new job we have a match. The same holds when a vacancy is filled. Both processes are governed by the same matching function. Our approach allows us to analyse micro economic data on vacancy and job search duration simultaneously. To establish the effect of the total number of vacancies and the total number of workers on the effectiveness of the different search/recruitment channels we combine the micro data with data at the market level.

The results indicate large differences between the effectiveness of the search channels. Also within a given specific search channel large differences exist between employed and unemployed workers. Advertisements and informal search are most effective in matching employed workers and vacancies, but the employment office is very ineffective. The employment office is on the other hand very effective in matching unemployed workers and vacancies. In this case advertisements are very ineffective.

The plan of the paper is as follows. We present the model in section 2. In section 3 we discuss the data. In section 4 we present the empirical specification and the results. Section 5 briefly comments on the estimation procedure. Section 6 concludes.

2. The model

Taking our lead from previous empirical work (e.g. Holzer (1987,-1988)), we distinguish four different search/recruitment channels that employers (vacancies) and workers (jobseekers) use to meet each other: advertisements, informal search, public employment office and other[1]. The number of matches (or the flow of filled job vacancies c.q. the flow of job seekers finding a job) through each channel depends on the number of job seekers and vacancies using the channel, as well as on the speed at which each potential contact between jobseeker and vacancy is translated into a formal match. Following the literature we refer to the latter as the efficiency of the search channels. The total effect on the number of matches of the number of vacancies and jobseekers combined with the efficiency of the search channel is referred to as the effectiveness of the channel.

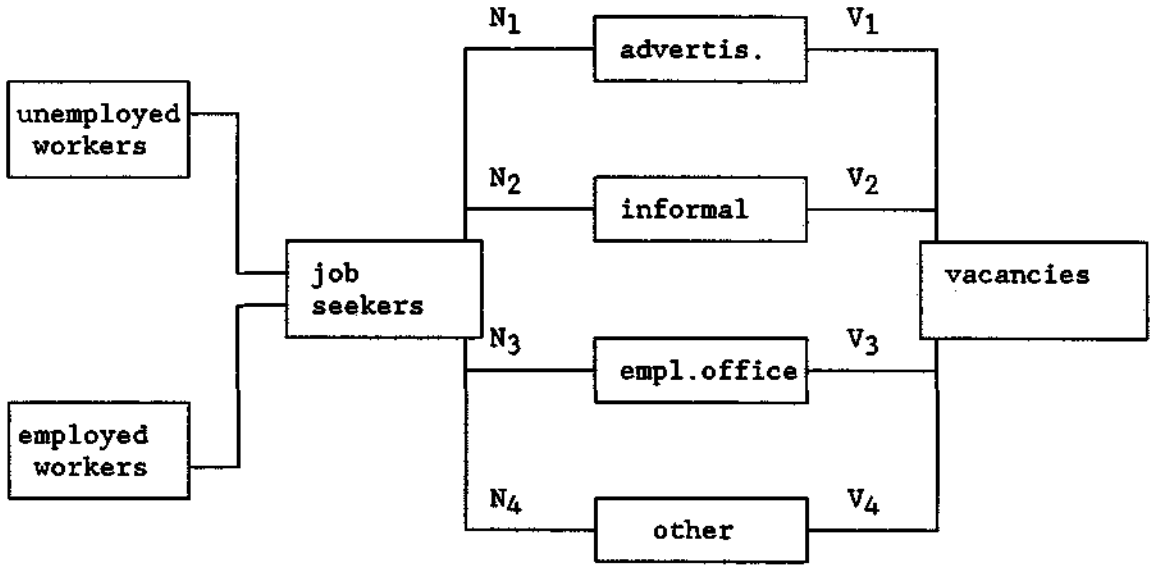

Figure 1. Search of employers and workers

The number of vacancies and job seekers differ over job types. We expect that employers will use recruitment channels in different proportions for different job types. When they want to fill a vacancy requiring a high level of education they might prefer using advertisements to using the

1. For workers (employers) informal search methods include checking friends/relatives (friends/relatives/own personnel) or inquiring for work by an employer (recruiting those who inquired). Other search methods is a collection of remaining categories.

public employment office. Different job seekers might also want to use different search channels. The effectiveness of a specific search method generally depends on the type of job. Informal search for example may be efficient for construction workers, but may be ineffective for administrative workers. Figure 1 gives a graphic illustration of our view of the market per job type.

For each submarket, characterised by job type i and search channel j, the pool of job seekers is generated by the search process at the individual level. Each worker decides whether or not to search and if so, which search method(s) to use. The same holds for the employer. Aggregation gives the pool of job seekers and vacancies at the market level. Of course the decisions what search/recruitment channel to use is based on the expected success using the channel. These decisions are not explicitly modelled in this paper.

In each of the four submarkets characterised by search channel j a potential contact may or may not end in an actual match. The number of contacts per time period depends on the average time between contacts and on the number of job seekers and vacancies. More formally, we specify for each submarket, characterised by search channel j and job type i:

$$C_{ij} = N_{ij}^{\alpha_j} V_{ij}^{\beta_j} / \tau_{ij} \qquad (1)$$

C_{ij} equals the number of contacts in a period of time, [t,t+dt>, N_{ij} the number of job seekers at time t, V_{ij} the number of vacancies at time t, and τ_{ij} the average time between two contacts. The parameters α_j and β_j are weights assigned to the number of job seekers (N_{ij}) and the number of vacancies (V_{ij}) in the market, indicating the relative importance of N_{ij} and V_{ij}. An extremely tight labour market corresponds to the case $\alpha_j=0$, $\beta_j\neq 0$: i.e. the number of job seekers play no role in the matching process. We assume that the effects of the total number of job seekers (α_j) and of the total number of vacancies (β_j) are the same for all job categories. Given a contact between jobseeker and vacancy (employer), the flow of filled vacancies (F_{ij}) in a short time period, or equivalently the flow of job seekers finding a (new) job, equals the number of contacts multiplied by the probability that a contact turns into a match (Pc_{ij}):

$$F_{ij} = (N_{ij}^{\alpha_j} V_{ij}^{\beta_j} / \tau_{ij}).Pc_{ij} \qquad (2)$$

Define λ_{ij} as Pc_{ij}/τ_{ij}. The parameter λ_{ij} may be interpreted as an efficiency parameter indicating the speed at which, conditional on the number of job seekers and vacancies, potential contacts result in a match[2]. We use the parameter λ_{ij} to obtain:

$$F_{ij} = \lambda_{ij} N_{ij}^{\alpha_j} V_{ij}^{\beta_j} \qquad (3)$$

Equation (3) is the familiar Cobb-Douglas specification of the matching function. Examples of previous empirical studies using aggregate time series are Blanchard and Diamond (1989), Jackman, Layard and Pissarides (1989) and Van Ours (1991). Following Diamond (1982), Blanchard and Diamond (1989) we allow for the possibility of increasing returns to scale. As Blanchard and Diamond argue, 'Active "thick" markets may lead to easier matches, with or without more intensive search.' We will return to this point when we discuss the estimation results. In contrast to the previous studies we specify for each search channel j and job type i, a separate matching function.

Estimation of (3) is not possible since that would require data at the market level on the flow of filled vacancies in a certain time period, the number of job seekers and the number of vacancies at the beginning of the period, each stratified according to type of job as well as to search channel (F_{ij}, N_{ij} and V_{ij}). In the Netherlands, and presumably in most other countries, these stratified data are not available.

Empirical implementation

In this section we develop an empirical model based on the matching function (3). We show that micro data on vacancy and search durations can be combined with aggregated data on the total number of job seekers of type i (N_i) and the total number of vacancies of type i (V_i) in order to estimate the parameters of the matching function (3).

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2. In a steady state situation we may write the expected vacancy duration t_v as V/F and the expected search duration for jobseekers t_s as N/F. Assume that $\alpha+\beta=1$, then we have that:

$\lambda=1/\{ t_s^{\alpha} t_v^{1-\alpha} \}$.

This is the inverse geometric average of expected vacancy duration and expected job search duration.

Data on V_i are available in The Netherlands. Data on the total number of job seekers can be constructed in the following way. There are data available on the number of unemployed job seekers categorized by job type. Also there are data available on the total number of people employed on job type i. Of the latter category we have to determine who is looking for a job. Micro data on the search behaviour of employed people enable us to predict the probability that someone working in job type i searches for a job. Combining this probability with the total number of workers employed on job type i gives us the total number of employed job seekers. Note that we implicitly assume that workers are looking for a job of the same type.

Given aggregated data on N_i and V_i, we have to determine which fraction is assigned to advertisement, informal search, employment office and other search methods. These are constructed as follows.

At a specific point in time, say t_0, we define q_{ij} as the probability that a randomly selected vacancy of type i is from submarket j, j=1,..,4. Furthermore define p_{ij} as the probability that a randomly selected worker of type i is searching through channel j, j=1,..,4. Then, if V_i is the total number of vacancies in the population at time t_0, we have that $V_{ij}=q_{ij}.V_i$. Analogously, given the total number of workers N_i at time t_0, we have that $N_{ij}=p_{ij}.N_i$. So the pool of vacancies and searchers per job type, using search channel j, can be obtained from aggregated data on V_i, N_i and the probabilities q_{ij} and p_{ij}.

Furthermore, given the pool of vacancies V_{ij}, the flow of filled vacancies per time period [t,t+dt>, can be obtained using the instantaneous rate of leaving this pool. It is obvious that the total number of vacancies form the risk set to turn into matches. Hence as a natural interpretation we have the hazard rate for the durations of vacancies (θ_{ij}^{V}) as a simple ratio of F_{ij} to V_{ij}. Analogously, the hazard rate for the search duration (θ_{ij}^{S}) follows from the definition of F_{ij} and the pool of searchers N_{ij}.

In sum, we have for each j the following relations:

$$F_{ij}=\lambda_{ij}N_{ij}^{\alpha_j}V_{ij}^{\beta_j} \tag{3'}$$

$$V_{ij}=q_{ij}\,V_i \tag{4}$$

$$N_{ij}=p_{ij}N_i \tag{5}$$

$$F_{ij}=\theta_{ij}{}^{v}V_{ij} \tag{6}$$

$$F_{ij}=\theta_{ij}{}^{s}V_{ij} \tag{7}$$

Using equation (6) we rewrite equation (3') as:

$$\theta_{ij}{}^{v}= \lambda_{ij}\ N_{ij}{}^{\alpha_j}\ V_{ij}{}^{\beta_j-1} \tag{8a}$$

And using equation (7):

$$\theta_{ij}{}^{s}= \lambda_{ij}\ N_{ij}{}^{\alpha_j-1}\ V_{ij}{}^{\beta_j} \tag{8b}$$

Reformulating the macro matching function we derive a micro economic model in which the hazard rates are a function of N_{ij} and V_{ij}, and where λ_{ij}, α_j and β_j are the parameters of interest. Even in the absence of macro data on N_{ij}, V_{ij} and F_{ij} the parameters of the macro matching function, equation (3), can be obtained using micro data from workers' and/or employers' surveys combined with aggregate data on N_i and V_i.

Our estimation procedure consists of two steps. First, from micro data on the use of search/recruitment methods we determine the probabilities q_{ij} and p_{ij} using simple probit analyses. In combination with aggregated data on N_i and V_i, we use the predicted probabilities to obtain N_{ij} and V_{ij}, j=1,..,4. In the second stage, using data on search and vacancy duration, the parameters of the matching function, λ_{ij}, α_j and β_j, are estimated.

The probabilities q_{ij} and p_{ij} are determined from analyses on the use of search methods by employers and workers. This is an interesting intermediate result of the above sketched estimation procedure. Contributions to the use of search methods are not plentiful. Exceptions are Holzer (1987, 1988), Blaschke (1987), Jones (1989) and Blau and Robbins (1990) for workers' search, and Roper (1988), Van Ours (1989) and Van Ours and Ridder (1992) for employers' search.

Note that in our analysis simultaneous relationships between the use of search or recruitment channels and the probability of success are ruled out[3]. The probabilities q_{ij} and p_{ij} are estimated using reduced form

3. Implementation of the estimated q_{ij} and p_{ij} in equation (8) or (8') would be troublesome if for example the probability of success is included in the set of regressors for q_{ij} or p_{ij}.

equations. We briefly discuss the intermediate results on the use of search and recruitment channels in section 3.3.

3. Data

In order to estimate our model we need micro data on the use of search and recruitment channels, duration of search, vacancy duration, and aggregated data on the number of vacancies (V_i) and the number of workers (N_i). Aggregated data on N_i and V_i are obtained from the Manpower Survey ('Arbeidskrachtentelling' (AKT)) and the Vacancy Survey of the Netherlands Central Bureau of Statistics (CBS). Micro data on the use of search and recruitment channels, vacancy duration and the duration of search are obtained from two different panel surveys conducted by the Organisation for Labour Market Research (OSA).

3.1 Data on vacancies: the OSA job vacancy survey

In this survey the employer is asked whether he has vacancies for which he is searching employees whom he wants to put to work immediately or as soon as possible. This implies that vacancies are not restricted to unoccupied jobs. The employers' sample is drawn from the database of the Dutch Chambers of Commerce, from which government and education as well as temporary help agencies are excluded. The sample is stratified according to firm size and industry. In the original sample 1288 medium sized (> 10 employees) and 625 large (> 100 employees) employers were included.

The job vacancy survey was held in two stages. In the first wave, held in the period November 1986 to January 1987, firms were asked whether they had vacancies. 648 employers (out of 1913) had vacancies; 580 firms agreed to participate in the panel survey. The employers were asked about the skills they require for their job vacancies, the sort of jobs the vacancies referred to, their search methods and selection procedures, the number of applicants, the elapsed duration of the job vacancies, the characteristics of the hard-to-fill job vacancies and the chances long-term unemployed would have if they would apply. Employers were also asked whether they had single or multiple vacancies. By the latter we mean a job vacancy for which the employer is searching more than one applicant with the same required skills.

550 employers (out of 580) participated in the second wave, held approximately four months later. The employers were asked whether the job vacancies registered in the first wave had been filled, and if so, at what time. Also the characteristics of the new employee were denoted.

Discarding incomplete and unreliable observations a sample of 1189 job vacancies remains.

3.2 Data on employed and unemployed job seekers: the OSA labour force panel survey

We use data on individuals from the second and the third wave of the OSA labour force panel. The second wave held in October 1986, has 4115 respondents between 15 and 61 years at the time of the first interview (April 1985) who were not attending full time education. In the second wave we selected all employed and unemployed respondents and obtained information on elapsed job search durations and personal and labour market characteristics. Using information from the third wave (held in september 1988) we established the job search duration.

It should be noted that the OSA labour force panel survey is subject to a substantial attrition rate (approximately 30% in each wave). The effect of the attrition rate however, is found to be negligible (see Van den Berg, Lindeboom and Ridder (1991)).

After discarding incomplete and/or inconsistent observations 2442 employed and 212 unemployed workers remained in our sample. Of the employed workers 335 were looking for a new job. A person was considered to be unemployed if he or she was not working and reported to be actively seeking for a job, irrespective of the registration at the public employment office.

3.3 Constructing stratified data on N_{ij} and V_{ij}

The Vacancy Survey of the Central Bureau of Statistics (1986) provided us with the total number of vacancies stratified by job type. From the Manpower Survey 1985 of the Central Bureau of Statistics we have aggregated data on the number of unemployed job seekers per job type and the number of employed per job type i. In this section we have a closer look at the demand/supply ratio (V_i/N_i) over the search/recruitment channels. Table 1 gives a first impression of the use of search channels by employers and workers.

Table 1. The use of search channels by employers and workers

	Employers	Empl. workers	Unempl. workers
Advertisement	66%	85%	78%
Informal	63%	29%	50%
Empl. office	44%	12%	52%
Others	33%	33%	27%
Average number of channels	2.1	1.8	2.8

Advertisement appears to be the most frequently used search channel for both workers and employers. Employed workers use informal search channels and the employment office less frequent than advertisement. The average number of search channels used by employers and employed workers is about two; unemployed workers use approximately three different search channels.

Next, to obtain estimates on the 'weights' p_{ij} and q_{ij}, we perform probit analyses on the use of search methods by employers and workers. The estimation results for employers are given in Table A of the Appendix. We briefly report some of the results.

We find that large firms (firms with more than 300 employees) use advertisement and the employment office as a search channel more frequently. In searching for construction and production workers the employment office is used more often. Highly educated and more experienced workers are mostly searched for by advertisements.

For the choice of search method by employed and unemployed workers we refer to Tables C and D of the Appendix. For employed workers we also had to estimate a probit equation explaining the decision to search (see section 2). Since the decision to search may be correlated to the decision to use a specific search channel, we also estimated a bivariate probit. It appeared that the two processes are uncorrelated. The probit equation explaining the decision to search is given in Table B of the Appendix.

Given the predicted probabilities and aggregated data on N_i and V_i we can predict N_{ij} and V_{ij}. In Table 2 we report some of the predicted job seekers/vacancy ratios (N_{ij}/V_{ij}) for different types of workers.

Table 2 *Job seekers/vacancy ratios (N_{ij}/V_{ij}) for different categories*

	advert.	informal	empl. agency
Administrative-lower voc.	11.1	3.8	12.1
Administrative-secondary	7.3	3.0	13.6
Administrative-Higher/ac.	5.1	3.2	7.2
Construction-lower voc.	2.6	1.7	1.7

From Table 2 we see that there are strong differences in the job seekers/vacancy ratios per channel. There are differences between both search channels and types of workers. Lower vocational administrative workers, for example, experience a job seekers/vacancy ratio of 12.1 for the employment agency, whereas this ratio equals only 1.7 for lower vocational construction workers. The high job seekers/vacancy ratio for lower vocational administrative workers using the employment agency, contrast also with the relatively small ratio of 3.8 for informal channels. It appears that for each type of worker the job seekers/vacancy ratio of the informal channel is most favourable to job seekers.

4. Likelihood, empirical specification and results

4.1 The likelihood and the empirical specification

Each individual in our sample (employer and worker) can be searching in either of the four states: advertisement, employment office, informal search and other search. In the theoretical model, discussed in section 2, we discussed two important factors. The total numbers of vacancies and job seekers that use the channel and the efficiency of the channel. We specify the efficiency parameter λ_{ij} as $\exp(X_i'\gamma_j)$, whereby the vector X_i describes the job type.

Denote the waiting time associated with worker's search in a specific search channel j by T_j. The waiting time associated with employer's search in this specific recruitment channel is denoted by S_j. We assume T_j and S_j to be independently distributed from the waiting times T_i and S_i, for every i, $i \neq j$, and furthermore $T_j \perp S_j$. The hazards corresponding to T_j and S_j are denoted by θ_j^S and θ_j^V.

Without duration dependence, the hazards correspond to exponentially distributed waiting times T_j and S_j. Both the employers' and workers' data are stock samples implying that in general the duration density functions of the sample will be different from the population density functions. However, in case of exponentially distributed waiting times the elapsed search duration (search duration as measured at the date of selection) and the residual duration (search durations beyond the selection date) are independently and identically exponentially distributed (Salant (1977), Ridder (1984)).

Since elapsed and residual durations of search channels i and j are independently distributed, we have that an uncensored observation for channel i can be treated as an independently censored observation for channel j. The likelihood function factorises neatly into separate parts for each of the search channels. Let f_j be a generic symbol for the density function of the workers' search duration and let g_j be a generic symbol for the density function of the employers' search duration. For a worker with elapsed search duration p, using all four channels and finding a job through channel 1 after t units of time, we write simply the following contribution to the likelihood (omitting the index i):

$$f_1(p).f_1(t) \prod_{j=2}^{4} \{ f_j(p).(1-F_j(t)) \} \qquad (9)$$

The functions $F_j(.)$ are the cumulative distribution functions corresponding to $f_j(.)$. And for example for an employer with elapsed search duration $\tilde{p}$, using only channel 1 and finding an employee after $\tilde{t}$ units of time we write:

$$g_1(\tilde{p}).g_1(\tilde{t}) \qquad (9')$$

The likelihood consists of parts like (9) and (9'). It need to be stressed that for each search channel both sources of information, the employers' survey and the workers' survey, contribute to the estimation of the parameters α_j, β_j and γ_j.

Some comments are in order. As can be seen in (8) and (8') the hazards $\theta_j{}^V$ and $\theta_j{}^S$ have the same set of parameters α_j, β_j and γ_j. So consistent estimates of the parameters can be obtained with either the employers' search or workers' search. Combining both sources, as we do, is however more efficient.

A second note concerns the interpretation of the channel: other search methods. This is a collection of remaining categories which may differ for employers and workers. Combining workers' and employers' information may give misleading results in this case. We therefore restrict ourselves to presenting the results of the remaining channels.

The assumption of exponentially distributed durations may be restrictive, but convenient. With this assumption no numerical integrations in the construction of the likelihood were required, and the likelihood remained simple. It is however well known that in the presence of unobserved heterogeneity a restrictive baseline hazard may seriously bias the parameter estimates (Ridder (1987)). In the next subsection we will distinguish different markets for unemployed and employed workers, thereby introducing a large amount of flexibility, that will capture some of the unobserved heterogeneity.

4.2 Unemployed versus employed job seekers

We specify different matching functions for unemployed and employed job seekers. For unemployed job seekers we have

$$F^u = \lambda^u N^{\alpha^u} V^{\beta^u} \tag{10}$$

For employed job seekers we write:

$$F^e = \lambda^e N^{\alpha^e} V^{\beta^e} \tag{11}$$

The matching functions for employed and unemployed workers differ in their efficiency parameter λ and the parameters α and β. Differences in the efficiency parameter λ for employed workers and unemployed workers may be due to differences in the probability that a contact turns into a match (Pc). Unfortunately we cannot identify whether these differences are due to workers' or employers' decisions. In the specification of the efficiency parameter λ we will allow for a constant shift (this corresponds with the incorporation of a dummy). Differences between α^u and α^e (and β^u and β^e) allow for differences in the relative importance of N_j and V_j.

Omitting the index i, we adjust the notation in (6) and (7) as:

$$\theta_j^{su} = F_j^u/N_j \quad (12)$$

$$\theta_j^{se} = F_j^e/N_j \quad (13)$$

$$\theta_j^{vu} = F_j^u/V_j \quad (14)$$

$$\theta_j^{se} = F_j^e/V_j \quad (15)$$

Note that $\theta_j^s = \theta_j^{su} + \theta_j^{se}$ and $\theta_j^s = \theta_j^{su} + \theta_j^{se}$. From the demand side of the labour market this means that we deal with a competing risk model, i.e. a vacancy can be filled by either an unemployed or an employed worker. From the supply side of the market our setup implies competition between employed and unemployed job seekers for the same vacancies. For each different search/recruitment channel four subhazards are estimated (θ_j^{su}, θ_j^{se}, θ_j^{vu} and θ_j^{ve}), resulting in the estimation of twelve different subhazards.

4.3 Results

Using information on search durations from both workers and employers, we estimated the α's, β's and the parameters of λ's. Both employers and workers have the same efficiency parameter. The efficiency parameter depends on occupation variables (with 'managers' as reference group) education variables (reference group: primary education) and regional variables (the western part of the Netherlands (the economic centre) as the reference group). These variables describe the stratification in job types. Furthermore λ differs in a constant for employed workers and unemployed workers. The (geometric) 'weights' α and β, indicating the relative importance of N and V, are allowed to differ for employed and unemployed workers. The results are reported in Table 3.

Results on the efficiency parameter λ

For the advertisements there are significantly positive effects for administrative workers and for virtually all the education variables. Significant negative effects are found for vacancies and job seekers in the eastern part of the Netherlands and for unemployed workers. Ignoring the number of job seekers (N_{ij}) and the number of vacancies (V_{ij}), unemployed workers have a smaller probability of finding a job than employed workers.

For the informal search channel the small and insignificant coefficient for the unemployment dummy shows that there are no differences in

the efficiency parameter of employed and unemployed workers. For the public employment office the, on average very low, efficiency parameter appears to be much higher for unemployed workers. This large positive coefficient for unemployed workers may seem strange at first sight. However, at least in the Netherlands, the public employment office is primarily designed for unemployed job seekers. The sample of employed searchers using the employment office as a search tool may be a negative selection of the total sample of employed workers.

Comparing the efficiency parameters over the search channels we see that for unemployed workers advertisements are the least efficient, whereas the same channel is most efficient for employed workers. For employed workers the employment office is the least efficient search channel.

So far, the results presented are conditional on the number of job seekers and the number of vacancies. For the effect of the number of job seekers and the number of vacancies on the hazard (or equivalently on the flow of filled vacancies), we have to turn to the estimates of the scale parameters α and β.

Results on the parameters α and β: the relevance of N_{ij} and V_{ij}

We start with the results for the advertisements. For the flow of vacancies filled by unemployed workers (F^u) both the number of job seekers and the number of vacancies are of importance, whereas for the flow of vacancies filled by employed workers (F^e) only the number of vacancies has an effect[4]. Estimation of restricted model versions i.e. $\alpha^u=\alpha^e$, $\alpha^e=\alpha^u$ and $\beta^e=\beta^u$ (see bottom rows of Table 3) show that the restrictions cannot be imposed[5].

An increase in V_{ij} (an economic upswing) increases F^e and F^u. The change in F^u is however smaller than the change in F^e (since $\beta^u<\beta^e$). An increased number of vacancies and an increase in the number of filled vacancies by employed workers leads to an increase in the hazard θ^{se}

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4. The parameter α for employed workers attained the lower bound of zero. If we re-estimate the model with no lower bound, we obtained a very small negative insignificant estimate.

5. The likelihood ratio statistic for the restriction $\alpha^u=\alpha^e$ equals 6.4, which exceeds the chi-square(1) value (5.0). Imposing the additional restriction $\beta^u=\beta^e$ we see that the likelihood value drops another 7 points. Both hypotheses $\alpha^u=\alpha^e$, $\beta^u=\beta^e$ as well as $\alpha^u=\alpha^e$ are rejected.

(the hazard for an employed worker). The relatively small change in F^u is translated into a relatively small increase in the hazard θ^{su} (the hazard for an unemployed worker). Hence increasing V_{ij} is less advantageous for unemployed workers.

Increasing N_{ij} only affects F^u (since $\alpha^u>\alpha^e=0$). Increasing N_{ij} will definitely decrease the hazards for both employed and unemployed job seekers. Since the number of filled vacancies by employed workers (F^e) remains constant, the decrease in the hazard θ^{se} will be larger than the decrease in the hazard θ^{su}. Hence employed workers are worse of in case the number of job seekers increases. A possible explanation might be that with a fixed number of vacancies, an increase in N_{ij} is effectively a decrease in the number of offers per searcher. In response to this decrease in the 'offer arrival rate', unemployed and employed workers' reactions with respect to reservation wage and search intensity may differ.

For the public employment office we see that this phenomena does not happen. An increase in the number of job seekers has a stronger negative effect for unemployed than for employed workers. However the restrictions $\alpha^e=\alpha^u$ and $\alpha^e=\alpha^u$, $\beta^e=\beta^u$ are not rejected (see the bottom rows of Table 3). In the restricted model ($\alpha^e=\alpha^u$ and $\beta^e=\beta^u$) the coefficient α equals 0.02 whereas β equals 0.96. Since α is insignificantly different from zero, and β is insignificantly different from one, we may equally well write the matching function as a function of the number of vacancies alone. The number of matches is solely determined by the number of vacancies in the market (of course conditional on the efficiency parameter λ). A comparable picture arises for informal search channels. The restrictions $\alpha^e=\alpha^u$ and $\alpha^e=\alpha^u$, $\beta^e=\beta^u$ are not rejected and due to the estimated values of α and β in this restricted model, in the matching function only the number of vacancies are of importance.

For each of the search channels we also tested whether the restriction $\alpha+\beta=1$ (constant returns to scale of the matching function) could be imposed. As Blanchard and Diamond (1989) argue, 'Active "thick" markets may lead to easier matches, with or without more intensive search.' In table 3 we report the likelihood values of the restricted model. As in Blanchard and Diamond (1989) we cannot reject the hypothesis of constant returns to scale.

Table 3 Estimation results[a]

	A: Advertisements B: Employment office C: Informal search					
	A		B		C	
Constant	-3.33	(17.8)	-6.58	(6.6)	-3.96	(6.0)
Occupation						
services	-0.23	(1.5)	-0.08	(0.3)	-0.16	(0.7)
administrative	0.20	(2.1)	0.39	(2.5)	0.19	(1.7)
production	-0.20	(2.0)	0.08	(0.5)	-0.02	(0.1)
construction	-0.26	(1.2)	0.15	(0.6)	0.04	(0.2)
education:						
ext. primary	0.48	(3.2)	0.48	(2.4)	0.16	(0.9)
secondary	0.29	(1.8)	0.38	(1.6)	0.16	(0.7)
low vocational	0.42	(2.9)	0.42	(2.1)	0.10	(0.5)
sec. vocational	0.58	(3.7)	0.53	(2.1)	0.32	(1.5)
higher/academic	0.27	(1.8)	0.33	(1.6)	-0.17	(0.9)
Region						
north	-0.09	(0.5)	0.10	(0.5)	0.04	(0.2)
east	-0.31	(4.3)	-0.09	(0.7)	-0.09	(1.0)
south	-0.04	(0.5)	0.23	(2.2)	0.27	(3.2)
unemployed	-1.96	(3.8)	2.73	(2.8)	-0.17	(0.3)
α (unemployed)	0.34	(3.1)	0.00		0.00	-
β (unemployed)	0.68*	(9.2)	0.89	(3.1)	0.92	(10.9)
α (employed)	0.00	-	0.33	(4.4)	0.10	(0.5)
β (employed)	1.02	(19.8)	1.07	(5.5)	0.98	(11.1)
-log.lik	5774.48		3007.39		5003.96	

Restricted model versions	-log. likelihood values A	B	C
$\alpha^e+\beta^e=1$, $\alpha^u+\beta^u=1$	5774.59	3009.24	5004.38
$\alpha^u=\alpha^e$	5777.70	3007.73	5004.14
$\alpha^u=\alpha^e$, $\beta^u=\beta^e$	5784.60	3009.46	5004.41

a: absolute t-values in parentheses

*: significantly different from 1

Testing for differences in the matching process of employed and unemployed workers

The results obtained so far indicate marked differences between employed and unemployed workers. In order to see whether these differences also hold statistically, we have to test the 'single-risk' model (the model where no distinction is made between employed and unemployed workers, equations (6)-(8b)) against the augmented model (equations (10)-(15)). We consider two alternative procedures to test for differences between employed and unemployed workers in the augmented model.

A first route is to derive a modified likelihood ratio test. The test appears to be similar to the one proposed by Narendranathan and Stewart (1991) or Lindeboom and Theeuwes (1991). In this specific case however the test depends on all the individual observations in the sample, which makes it a litle more difficult to perform.

A second yet very simple testing procedure is based on a conditional argument. One may test whether in the restricted augmented model, $\alpha^e=\alpha^u$ and $\beta^e=\beta^u$, the (single) dummy variable for unemployed is significantly different from zero. Next conditional on significance of this coefficient, in the setting of a nested model, differences between α and β can be tested. Note that this procedure gives a sufficient condition for differences between employed and unemployed workers. Differences between employed workers and unemployed workers are not ruled out by an insignificant coefficient for the dummy variable in the augmented model.

We only performed the second, conditional test. The test indicates that for each search channel a distinction between employed and unemployed workers is meaningful[6].

In the discussion of the results, we separately examined the influence of the parameters contained in λ, and α and β. Assessing the effectiveness of the different search channels requires a joint examination

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6. According to the second procedure we have the following results (t-values in parentheses):

	dummy unemployed
Advertisements	-1.02 (10.2)
Employment Off.	1.02 (2.7)
Informal search	-0.47 (3.0)

of the effects of λ, α and β. To this end we will perform a small simulation analysis which will give us more insight in the effectiveness of different search channels.

4.3 Simulations

Table 4 below illustrates the estimation results of Table 3. The top part of the Table reports the probability that a worker finds a new job within six months, whereas in the bottom part of Table 4 the probability that an employer finds a new worker within three months is reported. We calculated these probabilities for different types of labour, each categorized by employed and unemployed job seekers.

The differences for employed and unemployed job seekers are substantial. A first glance at the top part of the Table reveals that neither for employed workers nor for unemployed workers a specific search channel could be pointed out as being the best. For employed job seekers advertising or informal search may be very effective whereas the use of employment offices may be very ineffective. The probability for an employed administrative worker with a secondary education using advertisements as a search channel is approximately 7 times larger than the probability if the employment office is used (15.5 percent versus 2.1 percent). For employed higher/academic administrative workers the odds are even more favorable (13.6 percent versus 0.9 percent). The supply (N_{ij}) and demand (V_{ij}) ratio for the employment office are very unfavourable resulting in an extreme low success probability of only 0.9 percent for employed administrative/higher/academic workers. Although it may be clear that the employment office is the least effective for employed workers, it is not apparent which of the remaining search channels is the most effective. This is a consequence of differences in the N_{ij} and V_{ij} ratio over different types of labour, resulting in an unclear overall (ranking) picture.

For unemployed workers an almost opposite picture emerges. Advertisement is definitely the least effective search channel for unemployed workers. For almost all categories informal search is the most effective for unemployed workers. The efficiency parameter of the public employment office and of the informal search is approximately the same for unemployed workers, but since employers use the informal search channel more often than the employment office (relatively large V_{ij}), more matches result.

Table 4 Success probabilities[a]

Job seekers: probability to find a new job within six months			
	Adver tising	Empl office	Infor mal
Administrative/low vocational			
employed worker	10.3	1.8	16.4
unemployed worker	3.9	6.9	12.0
Administrative/secondary			
employed worker	15.5	2.1	16.5
unemployed worker	4.9	9.6	12.8
Administrative/Higher/Academic			
employed worker	13.6	0.9	10.9
unemployed worker	4.5	5.3	7.3
Construction/low vocational			
employed worker	23.5	9.5	30.6
unemployed worker	6.0	28.4	21.6
Vacancies: probability for an employer to find a new worker within three months			
	Adver tising	Empl office	Infor mal
Administrative/low vocational			
employed worker is hired	58.6	13.2	35.4
unemployed worker is hired	27.5	43.3	26.9
Administrative/secondary			
employed worker is hired	54.0	11.0	36.2
unemployed worker is hired	20.8	42.7	29.0
Administrative/Higher/Academic			
employed worker is hired	53.9	8.9	29.6
unemployed worker is hired	21.6	44.2	20.7
Construction/low vocational			
employed worker is hired	43.3	10.6	31.2
unemployed worker is hired	12.3	31.1	22.0

a: vacancy and job seeker are located in the western part of the Netherlands

The relative success of the employment office in matching unemployed workers and vacancies as compared to employed job seekers and vacancies can be explained by two facts. First, from Table C in the appendix it can be seen that the probability that an employed workers uses the employment office is small (see also Table A for the probability that an

unemployed worker uses the employment office). Hence, the competition between the job seekers searching through this specific search channel, is primarily among unemployed workers. For the other search channels employed workers compete more prominently for the same type of job. Secondly, given the number of job seekers and the number of vacancies, employed workers using the employment office may become stigmatised. Averaged over the search channels, we see that employed workers have a higher probability of success than unemployed workers.

The lower half of Table 4 concerns the success probabilities of employers looking for a new worker. The employers' success probabilities are on average much higher than those for job seekers. This is clearly a result of the relatively small number of vacancies (as compared to the number of job seekers). Consequently vacancy durations will on average be much shorter than search durations of employed or unemployed workers. As expected, averaged over the different recruitment channels the probability that an employed worker is hired is higher than the probability that an unemployed worker is hired. Furthermore, the hiring of an employed worker is most effective using advertisements or informal search. Again, the employment office is very effective in matching unemployed workers and vacancies. It is very ineffective for employed workers.

5. Comments on the estimation procedure

Estimation of the theoretical model (see section 2, equation (3)) required data on the flow of filled vacancies, the number of job seekers and the number of vacancies, each stratified according to the type of job as well as to search channel use. Since market data stratified according to search channel use are not available, we had to use estimated values in the empirical model (equations (4), (5), (8) and (8')). True values of N_{ij} and V_{ij} are replaced by estimated values $\hat{p}_{ij}N_i$ and $\hat{q}_{ij}V_i$. To see the consequences of this we write for one of our hazard specifications (omitting the indices):

$$\theta^S(X;\alpha,\beta,\gamma)=\exp[\ X'\gamma+(\alpha-1)\log(\hat{N})+\beta\log(\hat{V})+(\alpha-1)(\log(N)-\log(\hat{N}))+\beta(\log(V)-\log(\hat{V}))\ ]$$
$$=\exp[\ X'\gamma+(\alpha-1)\log(\hat{N})+\beta\log(\hat{V})\ ].\epsilon_1^{\alpha-1}.\epsilon_2^{\beta}$$

For the hazard of a vacancy we have an analogous expression with also the error terms ϵ_1 and ϵ_2 arise. As a result unobserved heterogeneity is introduced. Because of the specific form of the unobserved heterogeneity, θ^V and θ^S will be correlated over the search channels. Moreover, since p_{ij} is the product of two marginal probabilities a common error term is introduced into each of the hazards. As a consequence all hazards may be correlated.

It is well known that ignoring unobserved heterogeneity in duration models may lead to biased parameter estimates (see for example Lancaster and Nickel (1980)). A way to solve this problem is to specify for each search channel a distributions for ϵ_1 and ϵ_2, and integrate these (correlated) terms out of the total likelihood. Estimation of the likelihood function will become rather cumbersome since it does not factorize and, in general, no closed form analytical expressions of the likelihood contributions will exist.

Instead of actually solving the problem of unobserved heterogeneity, one can also examine to what extent the obtained estimation results are sensitive to 'random' variations in the predictions of N and V. We therefore performed a very simple sensitivity analysis. We generate the error terms ϵ_1 and ϵ_2 and reestimate the likelihood function for each drawing of ϵ_1 and ϵ_2. We used 10 different drawings. The results on these drawings are reported in Table E in the appendix. The parameters estimates appear to quite be robust.

6. Conclusions

This paper's main objective is to analyse the effectiveness of different search or recruitment channels used by workers and employers. in the empirical analyses we distinguish three different search or recruitment channels: advertisements, the employment office and informal search. Our approach to assess the effectiveness of the different search or recruitment channels differs from that in the literature. For each search/recruitment channel we specify a Cobb-Douglas matching function. The number of matches per channel depends on the number of vacancies and the number of job seekers coming through that channel. The parameters of the matching function consist of scale parameters (or 'geometric weights') α and β indicating the relative importance of N and V, and an efficiency parameter λ. The efficiency parameter indicates the speed at

which, conditional on the number of workers and vacancies, a contact between an employer and a worker is translated into a match. Apart form the usual parameterisation we explicitly allow the parameters α, β and λ to differ for employed and unemployed workers.

From the matching functions defined at the market level, we derive micro economic duration models for employers and workers. In the specification of the hazard, the same parameters α,β and λ appear. We estimate the model, using both micro economic data from an employers' survey and a workers' survey and data at the market level.

The results indicate clear differences between the effectiveness of the different search channels. This is caused not only by differences in efficiency (λ), but also by differences in the supply (N) demand (V) ratio. Within a specific search channel large differences exist between employed workers and unemployed workers. The large differences are a result of the compound effect of differences in the parameters λ, α and β. Averaged over the search/recruitment channels we see that employed workers have higher probability of success than unemployed workers. Advertisements and informal search channels are very effective in matching employed workers and vacancies. The employment office and informal search are very effective in matching unemployed workers and vacancies.

Appendix

Definition of the variables

A. *OSA job vacancy survey and OSA labour force panel survey*

Occupation:
- Services : Services (nurses included)
- Administrative: Administrative workers
- Production : Production workers (metal, electrotechnical, others)
- Construction : Construction workers
- Manegerial workers, policy makers, scientific: reference group

Education:
- Primary (reference group)
- Extended primary
- Secondary
- Low vocational
- Secondary vocational
- Higher or academic

Region:
- North: District Groningen, Friesland, Drenthe
- East : District Overijssel, Gelderland, Flevoland
- South: District Noord-Brabant, limburg
- West : Reference group (Economic centre of The Netherlands) District Utrecht, Noord-Holland, Zuid-Holland

B. *Additional variables in the OSA job vacancy survey (see Table A)*

Firm size:
- 10 - 50 employees (reference group)
- 50 -100 employees
- 100-200 employees
- 200-300 employees
- >300 employees

Work experience required:
- 0-1 year (reference group)
- 1-3 years
- >3 years

Single vacancy: Dummy variable which equals one if only one employee is needed, (reference group: multiple employees are needed)

C. *Additional variables in the OSA labour force panel survey (see Tables B,C, D)*

Age	: Age in years
Gender	: Dummy 1 if female
Experience	: Number of years on the labour market
# unempl betw, '80-'85	: Number of unemployment spells in years '80-'85
Part-time job	: Dummy 1 if number of hours workerd <33
Strenuous work	: Dummy 1 for strenuous work (subjective)
Irregular work	: Dummy 1 for irregular work (subjective)
Tempory work	: Dummy 1 for provisional or temporary work
Civilian Worker	: Dummy 1 for civilian workers
Satisfied with wage	: Dummy 1 if respondent is satisfied with wage (subjective)

Table A The use of search methods by employers

	Advertisement	Informal	Empl. office	Others
Constant	-0.06 (0.2)	1.00 (4.4)	-0.55 (2.4)	0.13 (0.5)
Size of firm				
50-100	0.31 (2.3)	-0.23 (1.7)	-0.03 (-.2)	-0.04 (0.3)
100-200	0.26 (2.2)	-0.15 (1.2)	0.12 (1.0)	0.05 (0.3)
200-300	0.23 (1.6)	-0.05 (0.3)	-0.08 (0.5)	-0.08 (0.4)
>300	0.32 (2.8)	-0.53 (4.5)	0.49 (4.2)	-0.35 (3.0)
Occupation				
Services	0.36 (2.0)	0.05 (0.2)	0.34 (2.0)	-0.01 (0.0)
Administrative	-0.06 (0.5)	-0.01 (0.1)	0.23 (1.9)	-0.09 (0.7)
Production	0.11 (0.7)	-0.08 (0.5)	0.53 (4.0)	-0.19 (1.3)
Construction	-0.30 (1.0)	-0.12 (0.3)	1.10 (3.4)	-1.10 (3.2)
Education				
Ext. primary	-0.19 (0.9)	-0.41 (1.9)	0.17 (0.8)	0.36 (1.7)
Secondary	0.09 (0.4)	-0.26 (1.2)	0.21 (0.9)	-0.31 (1.4)
Low vocational	-0.16 (0.8)	0.06 (0.3)	0.41 (2.3)	0.31 (1.7)
Secondary voc.	0.28 (1.5)	-0.10 (0.5)	0.08 (0.4)	-0.03 (0.1)
Higher/academic	0.40 (1.9)	-0.32 (1.5)	0.17 (0.8)	-0.11 (0.5)
Region				
North	-0.20 (1.1)	-0.16 (0.8)	0.72 (3.9)	-0.34 (1.7)
East	0.17 (1.4)	0.10 (0.8)	-0.17 (1.4)	-0.12 (1.0)
South	0.16 (1.6)	-0.00 (0.0)	-0.04 (0.4)	-0.06 (0.5)
Experience (years)				
1-3	0.16 (1.7)	0.12 (1.2)	0.06 (0.6)	-0.20 (2.0)
>3	0.30 (2.7)	0.21 (1.9)	-0.25 (2.3)	-0.21 (1.9)
Single vacancy	-0.22 (2.4)	-0.49 (5.2)	-0.31 (3.4)	-0.28 (3.1)

absolute t-values in parentheses

Table B *The search decision by employed workers*

Constant	0.58 (0.9)
Age (log)	-0.34 (1.6)
Gender	-0.19 (2.2)
Education	
Ext. primary	0.11 (0.8)
Secondary	-0.07 (0.3)
Low voc.	0.10 (0.8)
Secondary voc.	0.10 (0.7)
Higher/ac.	0.21 (2.1)
Region	
North	-0.03 (0.2)
East	-0.15 (1.6)
South	-0.15 (1.8)
Experience	-0.29 (4.1)
# unempl betw. '80-'85	0.06 (1.0)
part-time job	-0.13 (1.2)
strenuous work	-0.65 (0.8)
irregular work	-0.14 (1.5)
temporary work	0.62 (5.5)
civilian worker	-0.06 (0.9)
satisfied with wage	-0.42 (5.9)

absolute t-values in parentheses

Table C *The use of search methods by employed workers*

	Advertisement	Informal	Empl. office	Others
Constant	0.43 (0.2)	1.59 (0.9)	-2.71 (1.4)	-2.78 (1.8)
Age (log)	0.47 (0.8)	-0.79 (1.5)	0.06 (0.1)	0.79 (1.6)
Gender	0.02 (0.1)	-0.20 (1.1)	0.38 (1.7)	-0.03 (0.2)
Education				
Ext. primary	-1.06 (2.0)	0.04 (0.1)	0.71 (1.3)	-0.04 (0.1)
Secondary	3.99 (0.0)	0.30 (0.6)	1.46 (2.2)	-0.29 (0.6)
Low voc.	-0.83 (1.7)	0.07 (0.2)	1.04 (2.0)	0.10 (0.3)
Secondary voc.	-0.77 (1.6)	0.03 (0.1)	0.65 (1.2)	0.10 (0.3)
Higher/ac.	-0.63 (1.2)	0.40 (1.2)	0.14 (0.3)	-0.32 (1.0)
Occupation				
Services	0.02 (0.1)	-0.14 (0.6)	0.78 (1.6)	-0.25 (1.0)
Administrative	0.07 (0.2)	-0.02 (0.1)	0.55 (1.1)	-0.04 (0.2)
Production	-0.11 (0.4)	0.10 (0.4)	0.45 (0.9)	-0.09 (0.4)
Construction	-0.51 (0.9)	1.14 (2.2)	0.87 (1.3)	-0.98 (1.6)
Region				
North	0.53 (1.5)	-0.23 (0.9)	0.35 (1.3)	-0.59 (2.2)
East	0.43 (1.6)	0.30 (1.4)	-0.21 (0.7)	-0.16 (0.7)
South	0.04 (0.2)	-0.04 (0.2)	0.02 (0.1)	-0.01 (0.0)
Experience	-0.31 (1.4)	0.37 (2.0)	0.13 (0.6)	-0.05 (0.3)

absolute t-values in parentheses

Table D The use of search methods by unemployed workers

	Advertisement	Informal	Empl. office	Other
Constant	0.59 (0.4)	1.80 (1.2)	3.15 (2.1)	-2.05 (1.3)
Age (years)	-0.07 (0.1)	-0.63 (1.4)	-1.00 (2.2)	0.56 (1.2)
Gender	0.08 (0.3)	-0.15 (0.7)	-0.13 (0.6)	0.06 (0.3)
Education				
Ext. primary	0.28 (0.7)	-0.06 (0.2)	-0.07 (0.2)	0.22 (0.6)
Secondary	-0.10 (0.2)	0.06 (0.1)	0.55 (1.0)	0.02 (0.0)
Low voc.	-0.14 (0.4)	-0.34 (1.1)	-0.42 (1.3)	0.64 (1.8)
Secondary voc.	0.22 (0.6)	-0.21 (0.6)	-0.43 (1.2)	0.06 (0.2)
Higher/ac.	0.17 (0.4)	0.04 (0.1)	-0.72 (2.0)	0.19 (0.5)
Occupation				
Services	0.01 (0.0)	0.17 (0.5)	0.05 (0.1)	-0.27 (0.7)
Administrative	0.07 (0.1)	0.35 (0.8)	-0.24 (0.5)	-0.28 (0.6)
Production	0.14 (0.3)	0.07 (0.2)	-0.09 (0.2)	-0.33 (0.8)
Construction	-0.04 (0.0)	0.43 (0.5)	-0.01 (0.0)	-
Region				
North	0.51 (1.6)	0.13 (0.5)	0.34 (1.2)	-0.62 (2.0)
East	0.52 (1.9)	0.44 (1.9)	0.48 (2.0)	-0.72 (2.8)
South	0.10 (0.4)	0.61 (2.5)	0.83 (3.2)	-0.40 (1.5)
Experience	0.33 (0.2)	0.12 (0.7)	0.33 (1.9)	-0.11 (0.6)

absolute t-values in parentheses

Table E Some results on the sensitivity of the parameter estimates[a]

	dummy unemployed	α^u	β^u	α^e	β^e
Advertisement	-1.02	0.26	0.71	0.12	1.02
	(0.27)	(0.04)	(0.13)	(0.04)	(0.02)
Employment Off.	2.70	0.01	1.08	0.34	0.88
	(0.17)	(0.00)	(0.02)	(0.03)	(0.01)
Informal search	0.24	0.01	0.90	0.14	0.97
	(0.09)	(0.00)	(0.01)	(0.02)	(0.01)

a: standard errors in parentheses

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