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Recruitment Model for New Employees
on the Basis of a Personnel Management-
Employer's Search Approach**

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EMPLOYERS' SEARCH STRATEGIES

A Recruitment Model for New Employees on the basis of a Personnel Management-Employer's Search Approach.*

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Abstract

The role of recruitment is receiving increasing attention in labour market research. The impact of recruitment on the quitting and firing behaviour has usually been neglected. Hiring a person who better matches the vacancy concerned may be more expensive in terms of search costs, but it is plausible that turnover costs may be reduced as a result of a lower probability of mismatch. The standard economic model used to investigate employers' recruitment behaviour - an adjusted job-search model - is too stylized to encompass relevant aspects of recruitment.

In light of the above observations and after a review of the literature on the issue, this paper aims to enrich the existing search skeleton on recruitment behaviour with notions from personnel management.

1. Introduction

Economic theory assumes traditionally that employers are able to assemble a reliable and efficient work force in order to be competitive in the product market. In the research practice, normally two interesting cases can be observed. On the one hand, empirical findings show that personnel managers and labour psychologists tend to focus their attention mainly on the quality of job applicants through the development and use of proper recruitment and selection practices. On the other hand, there is economic theory which is more concerned with the duration of the recruitment procedure and its related costs (not only the direct costs of the hiring procedure, but also the indirect ones such as the loss of production, and the production disruption due to changes in the work force composition). In this introductory section, we will first give a concise overview of some recent findings on search behaviour from the literature.

Recruitment practices are in general influenced by the relative position of the firm on both the product market and the labour market. In particular, the company's "image" (mainly given by the relative position of the firm in respect to its competitors in the product market) and its recruitment procedure tend to determine the composition and the number of applicants that may respond to a vacancy notification.

Evidence for the latter phenomenon can be found in various studies on job seekers' behaviour. Fombrun and Shanley (1990) and Gatewood et al. (1993) report that an initial job choice decision (the decision whether to apply for an employment position within a given firm) is influenced by the image of the organization as perceived by potential applicants. This image is also highly related to the amount of information available to applicants. On this point Rynes et al. (1991) claim that, given the small amount of information applicants have at their disposal at the very beginning of their search process, initial application decisions are mainly based on impressions of organizational attractiveness. Moreover, the company's image is very much an indicator for the working conditions within the firm. On this subject, Devine and Kiefer (1993) stress, in a recent survey on empirical job search, the potential importance of non-wage job characteristics in the workers' job evaluation. This is also argued by Akerlof et al. (1988) who found that non-pecuniary considerations had motivated most of the job-related quits they considered. The authors reported that many job changers experience even small or negative wage changes in a new job and yet achieve gains in overall job satisfaction. The non-pecuniary considerations included firm-specific rewards such as a special like (or dislike) of workers by their coworkers, supervisors or company managers. Also Van Ophem (1991) found that non-wage job characteristics have a strong impact on the on-the-job search decision of employed agents. Clearly, if the search is successful, then the worker will quit for the new job, thus usually leaving the firm with a vacancy to be filled. In an interesting paper on quit behaviour, Holmud and Lang (1985) identified three explanations for the negative correlation between job tenure and quit rates. One is **human capital theory**, according to which the gap between the worker's current wage and its alternative on the labour market is an increasing function of the job tenure. Another cause is related to **unobserved heterogeneity** among workers, so that those who are more mobile are more likely to show a short tenure. A third explanation is based on a **search-theoretic model** that is extended to allow for imperfect information about non-wage job characteristics; hence jobs will be accepted without full knowledge on the value of the offer received. It is thus also plausible that a correct design and management of the **content of the vacancy notification** may to a large extent ease the recruitment procedure; in this way newly hired persons would stay in their job for a relative longer period, thus lowering the turnover costs. Clearly, the role of the information included in the vacancy notification is to reduce the applicants' uncertainty about non-wage characteristics of the job in order to avoid dissatisfaction with the job in the future. In essence, hiring costs together with firing costs, training costs and quitting costs, are part of the broader cost category labelled **turnover costs**. Turnover costs are the costs incurred by the firm while adjusting its own labour force to the market necessities. These costs have different impacts on employment at different economic levels. At the **macro** level turnover costs affect labour demand by causing time lags in the adjustment to economic shocks (structural economic changes) (see Nickell 1986; Bertola 1992). At the **meso** level they affect the firm's wage setting;

firms set higher wages in order to bind and stimulate their work force, as postulated by the **efficiency wage** and **insider-outsider** theories (see Solow 1985 and Lindbeck and Snower (1989) for a review and a comparison between the two theories). At a **micro** level (see Pfann and Verspagen 1989) the three turnover cost components mostly studied are hiring, firing and quitting costs, albeit often in separate settings. In a more general framework, personnel management may function as the link (a mediator based on information on the quality of the match) between the firm's hiring activity and subsequent firm's firing behaviour on the one hand, and employees' quitting behaviour on the other (see also Figure 1).

In light of the previous observations, the paper is organized as follows. In Section 2 a personnel management perspective on hiring procedures is given, with due attention to the most salient steps like the job analysis, the choice of the most appropriate recruitment channel and the selection techniques. In Section 3 we will turn to the economic and formal aspects of the employer's search activity, with special attention to the role played by recruitment channels. In Section 4 the model designed and used will be presented. In Section 5 empirical results will be introduced, while Section 6 will contain some concluding remarks.

2. A Personnel Management Perspective

2.1. Introduction

Personnel management aims to integrate workers into the firm's production organization, keeping in mind the human nature of employees, their specific characteristics and the firm's environment. One of the tasks to be performed by the personnel manager is the recruitment of new employees. Rynes (1990) defines recruitment as follows: "Recruitment encompasses all organizational practices and decisions that affect either the number, or types, of individuals who are willing to apply for, or to accept, a given vacancy." (p. 249). The importance of this recruitment function is clear when one realizes that by hiring the most competent applicants the firm's performances can be significantly enhanced. Rynes et al. (1980) found that recruiters, recruitment timing and other aspects of the job search process have substantial effects on the allocation of applicants to vacancies. Arvey et al. (1975) also found that delays between recruitment phases had substantial effects on the size and composition of the pool of applicants. The picture that emerges is that professional and efficient recruitment will not only shorten vacancy duration but also improve the quality of the applicants hired. It is interesting to observe that Herriot and Rothwell (1981) reported that recruitment brochures did actually influence the potential applicant's decision to apply to a job in the organization concerned.

Thus, there is a need for a more thorough investigation of recruitment procedures. Below we will give an overview which takes Torrington and Hall (1991) as a starting point. According to their view three components can be distinguished in a recruitment procedure: **job analysis**, **recruitment strategy** and **selection methods**. A more detailed description of the contents of each of these phases will now subsequently be given.

2.2. Job Analysis

An important part of the **job analysis** is the **job description**. The job description should tell the applicant about the existence and contents of the job, and the contribution to the organization the job holder will be accounted for. Moreover, it should give the employer a measure (or indication) of the productivity the applicant should possess in order to meet the job demands. In order to have a clear picture of the skills a certain position or job requires the following information appears in general to be useful: **Job identification**: job title, department, division, company name, location; **Relationships with others**: vertical relationships (supervision and monitoring), or horizontal relationships (liaison with others, co-operation); **Job content**: actual tasks of the job, level of responsibility of the task, frequencies of performance, importance of the task; **Working conditions**: physical environment (noise, heat), social environment (working in a group, night shift), economic

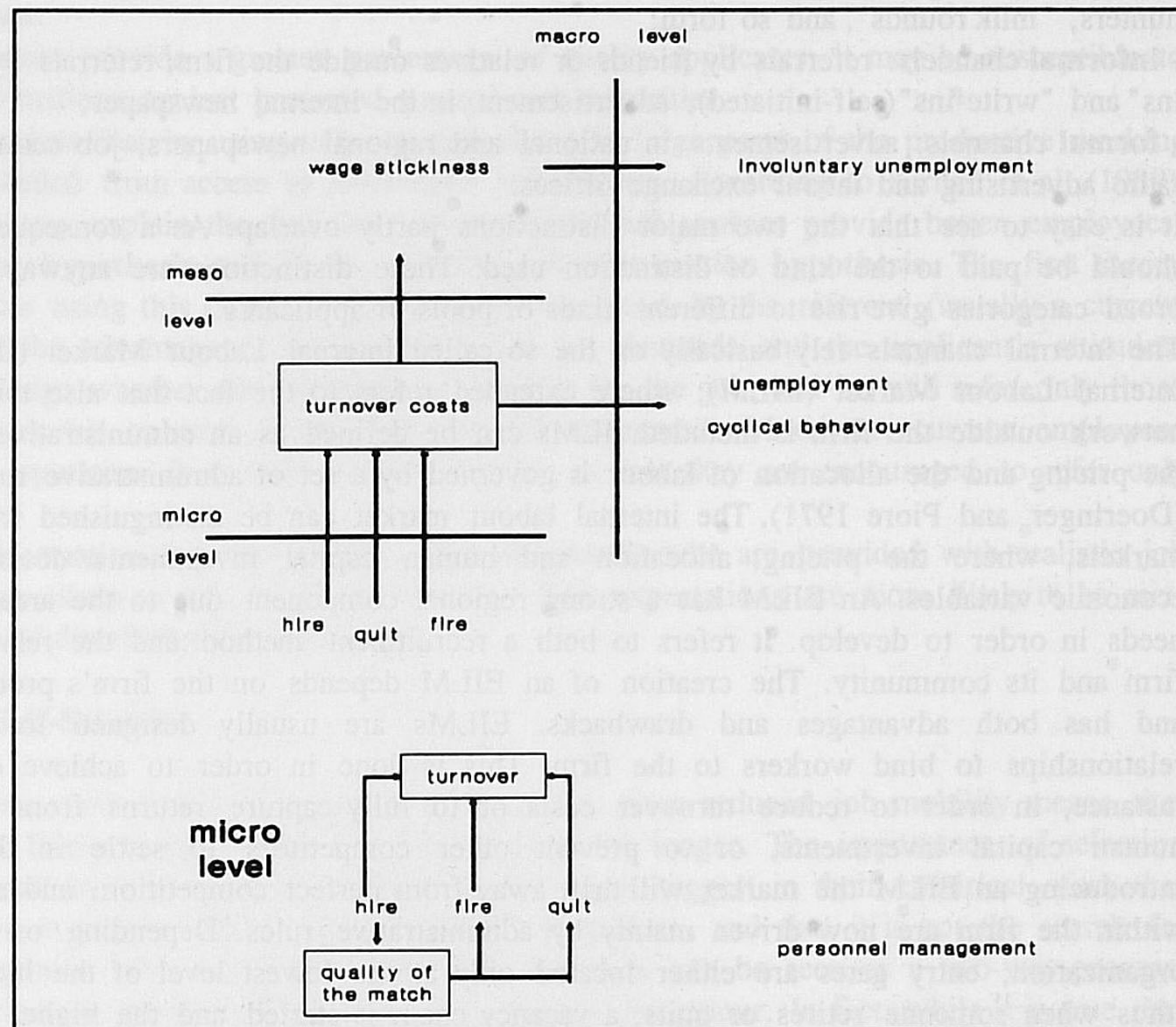


Figure 1 Turnover and hiring costs at different levels.

Upper part: impacts of turnover costs at different economic levels.

Lower part: effects of hiring costs at a micro level.

environment (salary, fringe benefits); **Performance standards/objectives** : expressed in quantitative terms (level of output or sales, time limits to be met) or in qualitative terms (maintaining a certain quality standard within the group); **Human requirements**: physical and psychological characteristics of the applicant that would comply with the demands of the job; **Other important information**: examples are training and career opportunity, firm's performances in the product market (image related information). The human requirements item may end up with a focused specification of the hiring standards. These are requirements in order to guarantee a satisfactory performance of the job.

2.3. Recruitment Channels

After the gathering of all relevant information, the substance of the information must be made available to the job seekers; this is made possible by using recruitment channels. Recruitment channels can be classified according two major criteria:

- on the basis of the labour market **segmentation** the classification distinguishes **internal** and **external** recruitment channels, that is channels that recruit (spread information about vacancies) in the internal and external labour market (internal or external to the firm), respectively;
- on the basis of **institutional** dimensions, one may distinguish **informal** and **formal** channels, that is channels that use the personal social network or the institutional network (media) in order to convey information.

To better understand these classifications we will give some examples:

- **internal** channels: advertisements in the firm's newspaper, referrals from employees, referrals by managers;
- **external** channels: advertisements in national or regional newspapers, employment agencies, head

hunters, "milk rounds", and so forth;

- **informal** channels: referrals by friends or relatives outside the firm, referrals by employees, "walk-ins" and "write-ins" (self-initiated), advertisement in the internal newspaper;

- **formal** channels: advertisements in national and regional newspapers, job centres, "head hunters", radio advertising and labour exchange offices.

It is easy to see that the two major distinctions partly overlap. As a consequence, due attention should be paid to the kind of distinction used. These distinctions are anyway useful, since these broad categories give rise to different kinds of pools of applicants.

The internal channels rely basically on the so called Internal Labour Market (ILM) and Extended Internal Labour Market (EILM); where extended refers to the fact that also the employee's social network outside the firm is included. ILMs can be defined as an administrative unit within which the pricing and the allocation of labour is governed by a set of administrative rules and procedures (Doeringer and Piore 1971). The internal labour market can be distinguished from external labour markets, where the pricing, allocation and human capital investments decisions are ruled by economic variables. An EILM has a strong regional component due to the area's social stability it needs in order to develop. It refers to both a recruitment method and the relationship between a firm and its community. The creation of an EILM depends on the firm's production philosophy, and has both advantages and drawbacks. EILMs are usually designed to develop long-term relationships to bind workers to the firm. This is done in order to achieve different goals; for instance, in order to reduce turnover costs or to fully capture returns from training and other human capital investments, or to prevent other competitors to settle in the same area. By introducing an EILM the market will drift away from perfect competition, and salaries and careers within the firm are now driven mainly by administrative rules. Depending on the firm's internal organization, entry gates are either located only at the lowest level of the hierarchical structure (thus when someone retires or quits, a vacancy chain is started and the higher positions are filled via the internal channels and the lowest position is filled via the external labour market) or are widespread along the organizational pyramid.

Different sectors of the economy use different manpower strategies in relation to the openness or permeability of the internal/external labour market (Nielsen 1993). In fact, sectors with highly seasonal components (that is a high turnover rate, such as the construction sector, for instance) will use the external labour market much more than stable sectors (in which the output follows the business cycle, such as banking), where the high amount of on-the-job training (human capital investments) would suggest to bind more strictly the labour force in order to avoid high turnover costs and human capital losses. The kind of recruitment strategy a firm will adopt depends on the opportunities and constraints it faces; in the case of the internal labour market two important factors are noteworthy:

- 1) the employer's relative power in the labour market;
- 2) the question whether the local labour market can supply the skills needed.

The first point stresses the fact that in a local labour market - in order to develop an internal labour market - a certain degree of social stability is needed. Its presence allows seniority to develop between the workers also outside the working place.

Secondly, if there is a strong social stability, social networks are well established and employment in the same firm may stretch along multiple generations. A reciprocal commitment is established between the working population and the firm; then other firms willing to settle in the same area may find it difficult to hire personnel. On the other hand, the drawback of an EILM is that this behaviour may create strong solidarity between workers which might interfere with management decisions; thus only firms with sufficient local labour market power can afford an EILM. For instance, it is likely that big firms with monopoly power in the product's market will be able to handle such an EILM. It is thus clear that institutional factors affect the choice of the recruitment channels; for example, firms with a strong internal labour market (see Lindbeck and Snower 1989) may be obliged to rely on internal channels rather than on external ones.

The preference employers attach to **internal** sources stems from the extensive pre-screening these candidates undergo before showing up. Applicants referred by employees are pre-screened by the

employees themselves.

While **informal** sources provide a greater percentage of quality applicants, it may be susceptible to inquiries for discriminations against protected groups and minorities.

In any case, it is evident that by using only internal channels large parts of the productive working population are precluded from access to job-related information. According to Kirman et al. (1989), two major theories may explain the fact that **informal/internal sources** provide better employees: 1) the **pre-screening hypothesis** and 2) the **realistic job information hypothesis**. The first theory claims that applicants using this channel have been pre-screened by the referent (usually a current employee) who has the advantage of knowing both the job demands and the applicant's attitudes; thus he is able to judge whether the applicant is suitable for the job, and he will refer only those applicants who are in his opinion suitable for the job concerned. Moreover, current employees perceive that their reputation is at stake with a referral, so that they are encouraged to refer only the best applicants.

The realistic job information hypothesis states that individuals who are provided with realistic job information are more likely to stay on the job because their expectations are more likely to be met. In this way the risk of dissatisfaction is reduced.

2.4. Selection and Self-Selection

Selection has become more and more important for firms, since reduced job mobility means that selection errors are likely to stay within the organization for longer. The importance of selection has also been stressed by Van Ours and Ridder (1993); they suggest in their empirical work that the vacancy duration is mainly due to a long selection procedure, and that it is not the search for candidates that lengthens the recruitment procedure. Selection can be seen as a two-way process; the stages of the selection process would affect both parties' behaviour. In fact, while it is true that the applicants' answers will affect the interviewer's decision whether or not to hire them, it is simultaneously true that recruiters' practices will affect applicants' decisions whether or not to seek for employment in the same organization. Throughout the selection process applicants choose between firms by evaluating the on-going relationship between them and their possible future employer. Selection is the last phase of the recruitment activity and it is intimately connected with the initial job analysis.

According to Torrington and Hall (1991) selection criteria can be subdivided into two broad categories: **organizational** and **individual** job criteria.

The first class, organizational criteria, refers to those attributes that may be valuable for the candidate's success within the firm. For example, if the firm is expanding, it may require particularly flexible and adaptable employees. These criteria are seldom made explicit and are often used in an intuitive way.

The second group, individual job criteria, refers to those attributes that may guarantee a satisfactory applicant's performance on that job: the hiring standards. A number of factors affect the choice of the most effective selection technique; among those one: costs, accuracy, time, type of job, ability of the staff, or economies of scale (sequential or non-sequential approach). Common selection techniques are: application forms, psychological tests, interviews, references, assessment centres, consultants. In many cases two or more methods are used in combination.

Nevertheless, the cheapest way to select personnel seems to be the applicants' **self-selection**. In order to fully exploit this feature, realistic job-related information must be provided to the applicants. It may be important to note that self-selection can be triggered by two factors: either by a realistic job-preview or by a seemingly non-professional recruitment procedure (for instance, a long waiting time between successive steps, or delays in replying to candidates). The first factor tends to screen out from the pool all potential applicants who are not suitable for the job, thus enhancing the quality of applicants; the second one has the effect of eliminating good applicants who in the meantime have found a suitable job elsewhere or who perceive a poor professionalism in the firm, thus lowering the average quality of the applicants. Rynes et al. (1991) found empirical evidence supporting this view. In fact, timing and delays are important factors in the applicants'

impressions and decisions. In regard to delays, Rynes et al. found that i) long delays between steps in the recruitment procedure are common; ii) delays give rise to negative perceptions; iii) regardless of previous interviews, applicants take other offers if delays are too long. Another point made by them is that, since the job choice is made under imperfect information, recruitment procedures convey signals about unobservable firm's characteristics (such as professionalism). Similar evidence may also hold for self-initiated applications. Kirnan et al. (1989) found that self-initiated recruits are of higher quality, possibly because candidates spend time and resources in investigating the job on their own. Thus these applicants are highly motivated and have, compared to other applicants, a better knowledge regarding the job.

3. A Search Theory Approach to Recruitment

3.1 Introduction

A promising approach to the recruitment of employees from an economic point of view is the use of the well known search theory. It has originally been developed to simulate the behaviour of a buyer in search for the lowest price (see Stigler 1961, 1962). At a later stage, Lippman and McCall (1976) extended the model to encompass also both the behaviour of job-seekers in the labour market and employers' search activity. However, most of the literature in this stream addressed the effects of several variables (such as the amount of unemployment benefits and the cost of search) on the duration of unemployment (see Blau and Robins 1990, Narendranathan and Nickell 1985, Mortensen 1986, and for a review Devine and Kiefer 1993). Only recently some authors have made use of the search theory to investigate employers' recruitment behaviour (see Barron et al. 1985, Barron and Bishop 1985, Gorter et al. 1992 and Van Ours and Ridder 1992). In the next section a simple model of search will be presented by way of illustration.

3.2. A Simple Model of Employer Search

The basic employer search model is a model of sequential decision-making under uncertainty. Peculiar features of the model are that search requires time and resources, and that investment in search activities has uncertain returns in the future.

Let us now assume a stationary environment and one offer per period at fixed search costs c . We take for granted that the offer is a random drawing from a known constant productivity distribution which has a density function $f(\cdot)$ and cumulative distribution $F(\cdot)$. The entrepreneur is assumed to be risk neutral, while the productivity of the individual is constant. Based on these conditions, the firm maximizes total expected discounted future income less search costs. The optimal strategy in such a model will be based on the firm's reservation productivity rule η ; that is: if the productivity $Pr < \eta$, then he/she will keep searching; otherwise, he/she will accept the candidate and stop searching. Let $V(\eta)$ be the total expected discounted future income less search costs, under the reservation productivity rule η . Then

$$V(\eta) = [\beta/(1-\beta)] E(Pr/Pr > \eta)P(Pr > \eta) + \beta V(\eta)P(Pr < \eta) - c \quad (1)$$

We will now consider the three right hand side terms separately. The first term concerns the arrival of a candidate with a productivity higher than the reservation productivity, weighted with the probability that such a candidate would show up. The second term says that if the candidate does not have the right productivity the offer is rejected and the value function in the next period is again $V(\eta)$ (discounted, at the present value it is $\beta V(\eta)$). The third term is the search cost of getting a candidate.

Rearranging (1), we obtain:

$$[1 - \beta F(\eta)]V(\eta) = [\beta/(1-\beta)] \int_{\eta}^{\infty} Pr dF(Pr) - c \quad (2)$$

By differentiating (1) and putting $V'(\eta)$ to zero (i.e. stationary environment), we get the equation for the optimal reservation productivity η^* :

$$\eta^* = [\beta/(1-\beta)] \int_{\eta^*}^{\infty} (Pr - \eta^*) dF(Pr) - c \quad (3)$$

Clearly, there are some drawbacks in this model (besides stationarity); one is that the cost of search is held constant, whereas it is likely that different search strategies involve different costs; another point is that the productivity is assumed to be unchangeable, thus ruling out on-the-job or formal training. These aspects can however, be incorporated without great difficulties.

3.3. Search Channels

The core part of the search strategy to be analyzed in our paper is the choice of the appropriate search channel(s) with regard to the vacancy concerned. There are many recruitment channels available to employers for a particular job; employers often use more than one recruitment channel (either at the same time or sequentially). For example, Saunders and Flowerdew (1987) found that the mean number of media used for unskilled and skilled manual jobs were 2.9 and 3.1, respectively. In contrast, a larger range of media was used for non-manual jobs without (3.6) and with (5.0) professional qualifications required. The choice of the channel appears to depend on a number of items, such as the part of the working population employers are trying to reach (hiring standards), the condition on the labour market, vacancy characteristics, search effort, spatial dimensions of search and so forth. It is likely that the choice between the available recruitment channels is based on a comparison between expected costs and benefits related to the use of channels (Gorter et al. 1993b). One plausible hypothesis is that employers activate different search channels depending on the vacancy characteristics.

Recruitment channels differ according to:

- the effectiveness in reaching the part of the working population that satisfies the hiring standards; in other words the quality of the potential applicants;
- the number of potential (desired) applicants the channel is able to reach;
- the speed at which both previous tasks are accomplished.

Recruitment channels differ also in regard to **costs**. Generally speaking, there are two main cost categories, **direct** costs (out-of-pocket) and **indirect** costs (time elapsed in undertaking the activity to be performed; note that time delays mean loss of production, as long as the vacancy is open). A further distinction may be made by taking into account a **fixed** and a **variable** component in these costs (cf. Yoon 1981). Consider, for example, advertisement; it costs almost the same amount of money to advertise for one compared to more than one similar vacancy (fixed direct cost), but as the number of vacancies to fill increases it is likely that the employer has to maintain the advertisement longer (variable direct cost).

The cost element is also affected by the **amount of information** conveyed by the channel (level of intensive search). Generally, the more information the higher the cost. However, in the latter case there is a higher average quality in the applicants' responses (due to applicants' self-selection), and thus they are now easier to screen, thus diminishing the duration of the vacancy concerned (trade-off between direct and indirect costs). On the other hand, it must be borne in mind that certain channels have a comparative advantage in carrying determinate information. For some channels employers can have control on information (for instance, they design advertisements), but on other channels this may not be possible; this is, for example, the case for informal channels and specifically for employee referrals; then employers cannot control the kind of information their employees are giving to potential applicants.

There is a vast amount of literature on search procedures, which will not be discussed here at length. We have summarized various interesting findings and characteristics on various relevant studies of the relative use and performance of channels in Table 1.

The general conclusion that can be drawn from this table is that from a socio-economic perspective there is evidence that informal/internal channels are more efficient than formal/external channels in filling vacancies. In this respect the two approaches to the recruitment process, the economic one and the personnel management one, seem to point at the same direction. This convergence will be tested in the empirical part of the paper, by looking at two aspects of the recruitment strategy: the choice of the first search channel and the way this choice affects the vacancy duration. Clearly, there is a need for further empirical work particularly in the timing and sequencing of search channels.

Table 1: Recruitment channels, a literature survey

Author	Main Results								Data
Dunnel, and Head (1973) manual workers	friend and relatives %	rank	direct application %	rank	advert. %	rank	job centre %	rank	supply side ¹
	20	3	23	2	32	1	20	3	
Courtenay, and Hedges (1976-77) manual workers	25	2	26	1	20	4	22	3	supply side
Brown et al. (1977-78) unskilled semi-skilled skilled		57 %	2 (rank)	52 3	83 1			²	supply side
		57	3	69 2	81 1				
		54	3	87 1	77 2				
Barron and Mellow (1982)	Stigma attached on applicants from employment offices								demand side
Adnett (1987)	Informal ranked 1, job centre 2, employment offices 4. Reduce recruitment expenses by substituting informal channel for more expensive formal ones. Low penetration rate of employment offices interpreted as reflecting employers' perception of the low calibre of the applicants attracted by this channel								demand side
Holzer (1987-88)	Informal channel is the most productive in terms of: - number of job offers - number of accepted jobs								supply side
Roper (1988)	Informal method is the fastest in vacancy filling National newspaper advertisement is the slowest and slower than local newspaper								demand side
Blau and Robins (1990)	Informal channel is the most productive in term of speed								supply side

¹ Supply side stands for supply side user, that is job seekers. Demand side stands for demand side user, that is employers search.

² Summation does not add up to 100% because agents are allowed to use more than one channel at time.

Gorter (1991)	Advertisement gives rise to a pool of applicants; private employment offices are most effective for temporary jobs; advertisement is most effective for high skill jobs; usually it results in the hiring of an already employed applicant; the use of the informal channel has a negative effect on the probability that an unemployed applicant is hired.	supply and demand side
Lindeboom et al. (1990)	Advertisement and informal channels are effective in terms of speed in matching already employed job seeker; the employment offices are ineffective in matching employed job seekers, but are very effective in matching unemployed ones; the same holds true for advertisements	supply side
Gorter et al. (1992)	Informal channel is faster; the use of advertisement and employment offices has a positive effect on vacancy's expected duration; a negative effect is due to the use of the informal channel	demand side
Van Ours and Ridder (1992)	Advertisement in more than one newspaper in order to create the pool of applicant from which to select, but at the same time also employment office and labour exchange agencies are activated	demand side
Gorter et al. (1993a)	The most effective channel for unemployed job seekers is the employment office. In case a vacancy with high requirements is posted on a newspaper it usually leads to hiring an already employed job seeker.	supply side
Gorter et al. (1993b)	The informal channel and the residual category either are immediately successful or are almost ineffective in filling vacancies. Advertisement and Labour Exchange Office have an initial waiting time, after which they proved to be highly effective. Advertisement is chosen when experience and specific age are required. Generally, firms operating in the quaternary sector prefer advertisement.	demand side

4. Formulation of the Model

In order to get a deeper insight into employers' preferences with respect to both the choice of the first search channel and its impact on the vacancy duration, a set of statements on individual recruitment practices will be used; they are expected to incorporate differences in personnel management within firms. In the next section a logit model for the choice of the first search channel will be introduced and estimated, then a duration model will be used in order to assess the impact of this choice on the search duration via different channels.

4.1. A Model for the Choice of the First Search Channel

Following Gorter (1993b), we will assume that recruiters choose the first recruitment channel on the basis of a comparison of expected costs and expected benefits.

There are two types of expected costs: direct out-of-pocket costs such as the money spent to place an advertisement in a newspaper, and indirect costs due to the loss of production induced by the open vacancy. Expected benefits depend on the quality of the candidates that the activated channel

can reach. In order to pursue the above evaluation, employers must know the distribution of the time elapsed to fill a given vacancy via the chosen channel; the out-of-pocket cost of each channel; and the distribution of the number of suitable candidates that are likely to arrive in the time period considered, as well as their productivity.

Under these assumptions the following expressions hold true:

$$EC_{ch} = \int_0^{\infty} [LP(t) + D_{ch}(t) + \sum_{n=1}^{\infty} q_{ch}(n,t)S_{ch}(n)] f_{ch}(t) dt \quad (4)$$

where EC_{ch} is the expected cost equation, in which $LP(t)$ is the loss of production up to time t ; $D_{ch}(t)$ is the direct cost of the channel activated, $q_{ch}(n,t)$ is the probability that n suitable candidates will arrive within time t ; $S_{ch}(n)$ is the cost of selecting n candidates; and $f_{ch}(t)$ is the distribution of the vacancy duration when the channel ch is used.

The expected benefit equation has the following form:

$$EB_{ch} = [\beta/(1-\beta)] \left\{ \int_0^{\infty} \left[\sum_{n=1}^{\infty} q_{ch}(n,t) \int_{\eta}^{\infty} Pr dF_{ch}(Pr,n) \right] f_{ch}(t) dt \right\} \quad (5)$$

where η is the reservation productivity (that is the minimum acceptable level of productivity); $F_{ch}(Pr,n)$ the probability distribution of the productivity (Pr) in the pool of n suitable applicants; and β the discount factor.

The difference U between expected costs and expected benefits can now be determined as follows:

$$U_{ch} = EB_{ch} - EC_{ch} \quad (6)$$

This expression states that the employer will choose the channel ch from the set C of all the available channels that has the highest value of U . It is easy to see that the value of U is determined by both vacancy-specific characteristics and channel-specific variables. Among these channel-specific variables are measures of effectiveness, efficiency and speed (reliability). Recruitment channels differ in many respects, but three important economic criteria besides costs are: **efficiency**, **effectiveness** and **speed**.

Effectiveness is the ability of the channel to reach the part of the working population with the desired attributes. It covers two desirable aspects; the first refers to a formal aspect of recruitment, viz. the compliance with the hiring standards, while the second refers to non-measurable dimensions such as "ability" and "motivation". An effective channel would require only some basic selection, as it should generate suitable applicants in terms of both standards and ability, thus increasing its utility.

Speed is the time elapsed to gather the pool of applicants; it is the reaction time. A quick channel will reduce the loss of production related to the hiring procedure, thus lowering the expected costs of the procedure.

Efficiency is the ability of the channel to reach a set of good applicants, among which to find a suitable one. It is the channel-specific rate of arrival. In fact, different channels may have different attitudes towards the size of the pool they can provide. Some of them can provide a large pool of normal candidates, while others provide only a few but motivated candidates. The choice for any of these strategies depends very much on the vacancy's characteristics and on the firm's organization. The measure of U will also be affected by both vacancy specific and firm specific variables. Among the vacancy specific features there are characteristics such as the hiring standards; the position in the firm; task and responsibility attached to the job; working environment (both social and physical); etc.. Among the firm specific variables that may affect the search strategy - viz. the presence of a personnel department; the economic sector - there is a subset of covariates used to account for different personnel management strategies in recruitment.

By adopting a reduced form model all these variables can be integrated in a vector (z) of variables that may explain the choice of the first channel to be used.

We will deal here only with the choice of the first search channel, since it is important to understand which factors are determinant in this choice that in turn will affect the whole recruitment procedure. Note that when choosing the first channel we should take into account the possibility that at a later stage one or more other channels are employed: this is not taken into account in the present model. We intend to investigate this topic at a later stage³. When we use a stochastic formulation our model takes the form:

$$U_{ch} = U_{ch}(z) + \varepsilon_{ch} \quad (7)$$

where ε_{ch} is an error term with density function $p(\varepsilon_{ch})$. If we now specify $p(c=ch|z)$ in the following way:

$$p(c=ch|z) = \frac{\exp(U_{ch})}{\sum_{c \in C} \exp(U_c)} \quad (8)$$

where C is the set of all possible search channels and if the cumulative distribution of ε_{ch} is logistic, we have a multinomial logit model.

4.2. A Model for the Duration of the Search with the First Recruitment Channel

In our approach to the duration of the search via the first recruitment channel a reduced form model will be used; more precisely, a hazard approach will be introduced. The dependent variable in this type of models is the hazard rate (θ), that is the probability to fill a given vacancy between time t and $t+dt$, given that the vacancy has lasted until t . The hazard rate represents the probability that someone is hired within a given time interval. In order to hire a person, two events must occur: first an applicant must show up, and second the applicant has to be acceptable for the employer. Thus the hazard rate is the product of two terms, viz. the rate of arrival of applicants and the employer's acceptance probability:

$$\theta(t) = \lambda(t)P(Pr > \eta_t) \quad (9)$$

where $\lambda(t)$ is the rate of arrival of applicants at time t , Pr is the applicant's productivity level and η_t is the employer's reservation productivity at time t (determined along the line of the search model presented in section 3.2)⁴.

In a partial equilibrium analysis, where only the employers' search behaviour is accounted for, both quantities are a function of an array of vacancy characteristics and the firm's manpower strategies (x). We will now model the rate of arrival λ and the acceptance probability in the following way:

$$\lambda(t) = \lambda(t, x); \quad (10)$$

$$P(\text{applicant is suitable}) = P(Pr > \eta_t(x))$$

³ A possible statistical method would be to use bivariate duration analysis (see Van Ommeren et al. 1993).

⁴ Equation 10 can be rewritten using the notation adopted in subsection 3.2:

$$\theta(t) = \lambda(t)F(\eta_t)$$

because of a lack of information about screening and selection at the firm level, the above model leads to the following reduced form model:

$$\theta(t) = \theta(t, x) \quad (11)$$

Several specifications can be used for the hazard function. Here we give two simple forms which will be used in the empirical part of the study. The first one uses an exponential distribution of durations for the hazard rate; so that the hazard rate is constant: the chances of leaving the state in a given period are constant and do not depend on the length of the spell.

The second model adopts a Weibull distribution for the hazard rate (equation 12), which allows for a monotonic time dependency (either positive or negative, caught by the parameter α ; positive time dependency means that the hazard rate increases with the length of the spell, whereas negative time dependency involves a decrease in the hazard rate as the spell increases. A possible interpretation for positive time dependency might be that during the spell there is an underlying process going on, for example, the gathering of a pool of suitable applicants, and the subsequent selection, thus involving a non-sequential approach.

The above mentioned variables affect both the choice of the first search channel and - via the

$$\begin{aligned} f(t) &= \alpha \omega^\alpha t^{\alpha-1} \exp[-(\omega t)^\alpha] \\ \theta(t) &= \frac{f(t)}{F(t)} \\ \theta(t) &= \alpha \omega^\alpha t^{\alpha-1} \end{aligned} \quad (12)$$

former choice - also the overall duration of the recruitment procedure.

5. Empirical Results

The data set used in our empirical work concerns micro data on vacancies and recruitment methods in the Netherlands. This data set is the result of a survey on employer's search behaviour carried out by I.L.B.O. in 1986 (for more detailed information on the characteristics of the data set, see Gorter et al. 1992); a number of firms was asked about the last vacancy that has been filled in the past six months. Questions were also asked on firm characteristics, vacancy characteristics and the number and the type of search channels used. The following channels are distinguished: **informal**, i.e. internal, personnel referrals, write-in's; **advertisement**; **labour exchange office**; **others**, i.e. temporary placement office, school placements, others. The survey, held in 1986, reported information on 759 filled vacancies.

In order to catch the effect of different manpower strategies, subjective a priori statements about the recruitment procedure have been used. These statements resulted in 5 dichotomous variables: effort; cost; speed of the arrival of applicants; motivation of the applicants and compliance with the required standards. Effort represents the firm's attitude towards recruitment; cost is used to capture the importance of the cost element in recruitment; the same holds true for motivation, compliance with the standards and speed of the procedure.

5.1. Logit Estimates for the Choice of the First Search Channel

The estimates of the logit model for the choice of the first search channel are given in Table 2. We start with a discussion of the results for the personnel management attitudes. It may be noticed that the signs of the parameters estimated are in most cases in agreement with our expectations. An interesting results arises from the analysis of the coefficients of the variable regarding the desired **speed** of the channel in gathering a suitable pool of applicants. A high priority attached to

Table 2: Logit estimates for the choice of the first search channel
 (** significant at 5%, * significant at 10%)

variables	choice of the first search channel, relative to "other channels"		
	informal	advertisement	labour office
constant	2.35 (1.25)	-1.44 (1.37)	1.05 (1.33)
Personnel management			
effort	0.24 (0.32)	0.25 (0.33)	0.29 (0.36)
motivated	-1.36 (1.07)	-1.07 (1.13)	-1.48 (1.12)
speed	0.12 (0.31)	0.76 (0.33)**	0.82 (0.37)**
cost	0.03 (0.30)	-0.50 (0.31)	-0.38 (0.34)
standards	-0.10 (0.53)	0.82 (0.64)	-0.30 (0.56)
Vacancy characteristics			
permanent position	0.05 (0.37)	0.87 (0.41)**	-0.11 (0.40)
full time job	-0.09 (0.40)	0.31 (0.42)	0.33 (0.47)
Required education			
extended vocational and high education secondary	-0.02 (0.65)	0.24 (0.68)	-0.03 (0.75)
low vocational educational restriction	0.52 (0.59)	0.78 (0.63)	0.53 (0.67)
	0.01 (0.50)	-0.05 (0.55)	0.42 (0.55)
	-0.76 (0.35)**	-0.52 (0.36)	-0.67 (0.40)*
Experience required			
specific	0.49 (0.31)	0.95 (0.33)**	-0.08 (0.35)
non-specific	0.96 (0.53)*	1.34 (0.56)**	0.94 (0.56)*
age restriction	-0.18 (0.29)	0.46 (0.30)	0.13 (0.32)
Firm's characteristics			
personnel department	-0.41 (0.33)	-0.80 (0.34)**	-0.42 (0.36)
large size	0.57 (0.42)	0.51 (0.44)	-0.06 (0.47)
medium size	-0.03 (0.36)	0.67 (0.37)*	-0.02 (0.39)
industrial sector	-0.22 (0.34)	-0.04 (0.36)	0.32 (0.39)
construction sector	0.89 (0.45)**	0.31 (0.48)	1.20 (0.49)**
quaternary sector	0.38 (0.42)	1.30 (0.42)**	0.52 (0.48)
-2 log likelihood for full model		-1730	
-2 log likelihood for the restricted model		1913	
percent correctly predicted		49.41	
# of observations		759	

Reference groups of the exogenous variables are given in brackets: required education (primary), size of the firm (small), sector of the firm (services), personnel department (no personnel department), required experience (no experience), age restriction (no age restriction), permanent job (temporary), full time job (part time job).

speed has a positive impact on the probability that advertisement and the labour office are chosen as a recruitment channel.

Turning now to the costs, it appears that the only significant coefficient points to the choice of advertisement. A cross comparison between advertisement and the informal channel shows that the second one is strongly preferred to the first one when this aspect is concerned.

Regarding the compliance with hiring standards, a cross comparison of the coefficients within the class shows a significant dominance of advertisement with respect to the informal channel and the labour office. A summary of the above results is given in Table 3.

After this discussion of the personnel management attitudes results, we will now turn to vacancy-specific features. In case of permanent jobs the main effect can be found for advertisement which

Table 3: The effect of personnel management variables on the choice of the first search channel.

Advertisement is chosen relative to "others" if: the speed in providing applicants and the compliance with standards are regarded as to be important features of recruiting. If costs are stated to be an important issue in recruitment then the probability that advertisement is chosen is lower. The same holds true in case providing motivated candidates is stated to be important.

The informal channel is chosen relative to "others" if: the compliance with standards is not considered to be important in recruiting motivated applicants and the cost element is considered important. There is no sign that the informal channel is less frequently used when the speed in providing applicants is stated to be relatively important.

The labour exchange office is chosen relative to "others" if: the cost element is not regarded as important and the speed in providing applicants is considered important. It is at a disadvantage whenever motivation and the compliance with the standards are believed to be important issues in recruitment.

dominates all other channels. The presence of the **personnel department** decreases the chance that advertisement is the first search channel used in respect of both the informal channel and the residual category. Next, the **economic sector** variables show that there exists a well defined manpower strategy in the **construction sector**. In this sector a high seasonal component exists, and hence there are cyclical hirings and firings. During the unemployment period the worker remains attached to the firm, thus in the expansion phase he will be rehired (via the informal network). A second remark concerns the fact that the educational requirements for these workers are usually low, and so are the skills required. Thus in this case the labour office is an efficient, fast and effective means of recruitment. The **quaternary sector** shows a different recruitment pattern: in this case advertisement is by far the dominant search channel. The **educational standards** do not seem to play an important role, but the opposite holds true for **experience requirements** (in line with Gorter 1993b). The requirement for **specific experience** gives rise to a kind of an ordering among the search channels, the most preferred one seems to be advertisement, followed by the informal channel, then the labour office and finally the residual channel. In case **non-specific experience** is required, the only result is that each search channel is preferred to the residual category.

As a result of a cross-comparison between the coefficients, it may be concluded that **advertisement** is chosen instead of another channel when the speed in providing applicant and the compliance with hiring standards are considered important, a permanent position has to be offered, specific working experience is required, the firm is medium sized and operates in the quaternary sector.

5.2. Duration Model Estimates

The impact of the choice of the first search channel on the recruitment procedure can be measured in terms of the duration of the procedure itself. The purpose of this section is to shed more light on the influence of personnel management strategies on the vacancy duration, given the choice of the first search channel. This implies that, even if one uses the same search channel, different personnel management strategies may lead to different vacancy duration. In order to investigate the duration of the search via a given channel, we have estimated the following two duration models for each channel separately:

$$\begin{aligned}\theta(t, x) &= e^{\beta'x} \\ \theta(t, x) &= \alpha e^{\beta'x} t^{\alpha-1}\end{aligned}\quad (13)$$

where β is the vector of parameters to be estimated, and x is a vector of time invariant covariates. The estimation can be directly carried out when only one search channel has been used. When

more than one channel has been used the estimation has been implemented by right censoring the observation at the moment an additional channel has been activated. This approach has been adopted since by opening another search channel the nature of the search process itself is changed; it becomes a competing risk model and interaction between the competing channels must be taken into account (Edin 1989).

As a first remark, it appears that the results of the two models are similar: they yield the same signs, the same significant covariates. Switching from the exponential specification to the Weibull one, gives rise to a significant increase in the log likelihood, and hence only the second model will be discussed. The results of the estimates with the Weibull specification are given in Table 5. The first important remark concerns **duration dependency** of the process. In fact, α appears to be significantly different from 1; that means that there is a positive duration dependence - the longer the state has been occupied the more likely the transition to another state - for advertisement and L.E.O.. It may mean that there is an underlying process going on, may be selection. On the contrary, there is a negative duration dependence - the longer the state has been occupied the less likely the transition to another state - in case of the informal channel. This means that either the channel is successful rather soon or it is bound to fail. This is due to the channel's special way of working. In fact, informal channels mainly operate via the social network of the firm's personnel and internal labour market, none of which change rapidly. As far as the residual category is concerned, the coefficient for duration dependency does not seem to be significantly different from one. Thus the hazard rate behaves as in the exponential model, that is without duration dependency.

The second remark concerns **education**. The coefficients regarding the different required levels of education are highly significant, with negative signs when advertisement is used as the first search channel. This means that the higher the educational level required the longer the average vacancy duration. Similar patterns (though not always significant) are found for the informal channel and the L.E.O..

We will now turn to **personnel management**; here we will discuss the estimates separately on the basis of the first channel used. Before going into details some general remarks are in order. First, the variable **costs** is significant, thus it seems that when the cost element is regarded as important in recruitment, the duration of the search and hence the vacancy duration is shortened. This phenomenon may have two explanations. First, there may be an efficiency motive, that is since it is important to save on recruiting costs the procedure has already been pursued so as to be inexpensive. The other argument is based on inefficiency; in order to save on the recruitment expenses the selection procedure are made less stringent. This attitude to recruitment certainly leads to shorter durations, but the quality of the resulting long term match is endangered. Unfortunately, in our data set, there is no information on this issue, thus in order to decide between the two arguments, more information on the matches resulting from recruitment is needed. The second remark concerns the **compliance with the hiring standards**. Whenever this issue is believed to be an important feature in recruitment - that is, when the candidate's qualifications are considered to be a good proxies for individual productivity - the duration of the search via a given channel is lengthened and the opening of other search channels is delayed.

The first channel that will be discussed is the **informal channel**. As a first point one may notice that when importance is attached to the compliance with standards the duration of the search spell tends to lengthen. This is not surprising since the informal channel relies more on motivation than on formal standards. The second point refers to firm's size; it seems that if a large firm chooses this channel as the first search channel, the duration of the search is increased, thus delaying the activation of auxiliary channels. In big firms the I.L.M. is, by definition larger, so that it is no surprise that in small firms the informal sector leads to faster results than in large firms. If we now turn to **advertisement**; a clearly significant results are found for **educational requirements**. It appears that educational requirements lengthen the duration of the search via advertisement.

Since the residual category is formed by heterogeneous recruiting methods with a few observations, the last search channel discussed here will be the **labour exchange office**. If this last channel is chosen by recruiters who consider important both the compliance with the standards and the speed

Table 4: Duration models estimates (The coefficients give the impact of the independent variables on the hazard rate)

variables	informal	advertisement	labour office	others
alpha	0.80 (0.05)**	1.61 (0.08)**	1.41 (0.11)**	1.12 (0.12)
constant	-0.51 (0.55)	-1.60 (0.66)**	0.08 (0.72)	1.80 (1.64)
Personnel management				
effort	-0.12 (0.19)	-0.24 (0.18)	-0.32 (0.29)	0.51 (0.50)
motivated	-0.32 (0.33)	0.36 (0.44)	0.50 (0.64)	-3.24 (1.42)**
speed	0.24 (0.20)	0.17 (0.18)	-0.75 (0.31)**	1.02 (0.40)**
cost	0.32 (0.18)*	0.42 (0.16)**	0.66 (0.28)**	0.61 (0.43)
standards	-0.48 (0.28)*	0.25 (0.47)	-1.40 (0.40)**	-0.76 (0.63)
Vacancy characteristics				
permanent position	-0.18 (0.21)	-0.14 (0.28)	-1.31 (0.30)**	-0.53 (0.42)
full time job	0.31 (0.27)	-0.17 (0.20)	-0.26 (0.40)	-0.11 (0.56)
Required education				
extended vocational and high secondary	-0.40 (0.37)	-2.41 (0.41)**	-1.66 (0.79)**	-0.37 (0.72)
low vocational	-0.17 (0.32)	-1.59 (0.37)**	-0.28 (0.60)	-0.53 (0.77)
educational restriction	-0.18 (0.24)	-1.08 (0.33)**	0.53 (0.45)	-0.55 (0.58)
	-0.13 (0.22)	0.04 (0.21)**	0.22 (0.32)	0.60 (0.49)
Experience required				
specific	-0.17 (0.21)	-0.21 (0.20)	-0.20 (0.29)	-0.72 (0.43)*
non-specific	-0.27 (0.28)	0.05 (0.27)	-0.18 (0.30)	-0.70 (0.63)
age restriction	-0.44 (0.18)**	-0.02 (0.14)	0.21 (0.26)	0.49 (0.35)
Firm's characteristics				
personnel department	0.01 (0.08)	0.21 (0.17)	0.25 (0.33)	-0.43 (0.37)
large size	-0.50 (0.24)**	0.08 (0.22)	0.18 (0.40)	0.33 (0.46)
medium size	-0.03 (0.26)	0.04 (0.19)	0.03 (0.28)	-0.09 (0.45)
industrial sector	0.24 (0.24)	-0.43 (0.21)**	-0.20 (0.35)	0.65 (0.40)*
construction sector	0.69 (0.22)**	-0.28 (0.24)	-0.20 (0.35)	0.87 (0.55)*
quaternary sector	0.27 (0.27)	0.32 (0.19)*	-0.39 (0.44)	-0.05 (0.53)
mean log likelihood	-1.38	-2.38	-1.67	-2.50
# of observations	300	255	133	71

Reference groups of the exogenous variables are given in brackets: required education (primary), size of the firm (small), sector of the firm (services), personnel department (no personnel department), required experience (no experience), age restriction (no age restriction), permanent job (temporary), full time job (part time job).

of reactions, it appears that the search spell is lengthened, thus delaying the opening of auxiliary search channels.

6. Concluding Remarks

The conclusions from the present work leads to three main observations. First, personnel management strategies are indeed important in recruitment, particularly in the determination of the duration of the search spell. Clearly, this topic deserves further attention, possibly with an investigation on how recruitment strategies evolve over time. Secondly, one of the important features of recruitment - the spatial aspect of search - has been neglected. This issue needs definitely more attention, since it will greatly influence the application behaviour of job seekers and the cost of search of both the employers searching for applicants, and job seekers searching for a

job. Thirdly, the effort variable is not significant even though it is a key variable in recruitment. This phenomenon may be due to the fact that this variable induces quite a number of countervailing effects that in the end tend to offset one another. Finally, experience requirements and the sector in which the firm operates appear to be important factors in the choice of the first search channel. As far as the duration of the search spell is concerned, it seems that a key role is played by the educational requirements.

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