

Pellizzari, Michele

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## Employers' search and the efficiency of matching

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## Employers' Search and the Efficiency of Matching

Michele Pellizzari

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**Michele Pellizzari**

*IGIER-Bocconi University, fRDB  
and IZA Bonn*

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IZA

P.O. Box 7240  
53072 Bonn  
Germany

Phone: +49-228-3894-0  
Fax: +49-228-3894-180  
Email: [iza@iza.org](mailto:iza@iza.org)

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## ABSTRACT

### **Employers' Search and the Efficiency of Matching\***

Unskilled workers in low productivity jobs typically experience higher labour turnover. This paper shows how this empirical finding is related to variation in the efficiency of the matching process across occupations. A simple theoretical model of employers' search shows that firms find it optimal to invest relatively little in advertisement and screening when recruiting for low productivity jobs. This generates more separations and higher turnover at the bottom than at the top of the jobs' distribution. The analysis of a unique sample of British hirings, containing detailed information about employers' recruitment practices, shows that more intensive recruitment leads to matches of better quality that pay higher wages, last longer and make employers more satisfied with the person taken on.

JEL Classification: J63, J64, M51

Keywords: labour turnover, matching, recruitment, hiring

Corresponding author:

Michele Pellizzari  
IGIER-Bocconi  
Via Salasco 5  
20136 Milan  
Italy  
Email: [michele.pellizzari@unibocconi.it](mailto:michele.pellizzari@unibocconi.it)

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# 1 Introduction

Labour turnover is usually higher in manual than in managerial jobs. For example, in the United Kingdom, between December 1992 and November 2004, quarterly labour turnover<sup>1</sup> was about 11% for workers in elementary occupations and only about 4% among managers.

This finding is not peculiar to the United Kingdom. Using the National Longitudinal Survey of Youth it is possible to construct similar figures for the United States<sup>2</sup>. For example, between 1998 and 2000, approximately 29% of professionals had experienced a job change compared to almost 40% of labourers. Data for the pre-enlargement EU-15 countries between 1994 and 2001 also show a similar pattern, with about 25% of workers in routine/unskilled jobs experiencing (at least) one job change from one year to the next, compared to about 17% of managers<sup>3</sup>. Similar results can be obtained for each European country and for each year separately, confirming that this pattern is not peculiar to a specific country nor to a particular phase of the cycle. The Australian Bureau of Statistics (2004) and Earle and Sabirianova (2002) document the same regularity for Australia and Russia respectively.

Despite the robustness of this stylized fact across many industrialised countries and years, the vast literature on labour turnover has devoted little attention to understanding this particular distribution across jobs' types. This paper takes the suggestion in Jovanovic and Moffitt (1990) that mismatch is likely to be the main cause of labour turnover and shows that the matching process is less efficient for low productivity jobs, which will consequently be more prone to separation (both voluntary and involuntary).

The theoretical section of the paper formalizes the simple intuition that firms find it optimal to invest relatively little in recruitment and screening activities for low productivity jobs, while they are much more careful in the hiring of top level workers. Hence, matches of unskilled workers in low productivity jobs are more likely to be "bad", in the sense that the same worker (job) can be paired with another job (worker) into a more productive match.

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<sup>1</sup>The fraction of employed workers who experience a job change, i.e. they move to a different job or to unemployment or to inactivity, between two adjacent quarters.

<sup>2</sup>Notice, however, that the NLSY, being a representative sample of a cohort of young persons (born in 1979), is likely to over-estimate labour mobility (Topel and Ward [1992]).

<sup>3</sup>These numbers have been produced using the European Community Household Panel (1994-2201) but similar findings can be obtained also from the European Labour Force Survey over a comparable time period.

This leads to more separations and more job instability for unskilled workers in lower level occupations.

The empirical implementation of this simple theory is carried out exploiting a unique dataset of recruiting establishments in Britain. Using these data it is possible to construct measures of recruitment intensity at the level of the single hiring. Various econometric estimates show that employers indeed invest more in recruitment for top level jobs and relatively little at the bottom of the occupations' distribution. Empirical measures of recruitment intensity are then correlated with various indicators of the quality of the match, such as satisfaction of the employer with the recruit, initial wages and tenure. Results support the motivating idea of this paper that matches created through more intensive screening last longer, pay higher wages and make employers more satisfied with the person taken on.

Besides contributing to the general literature on labour turnover, this paper is also linked to another small but growing, strand of studies: the analysis of employers' search. The widely accepted search and matching approach to the study of the labour market has fostered an enormous amount of empirical work on the search behaviour of workers. Mainly due to the scarcity of data, however, very little is known about the corresponding behaviour of employers. In fact, micro level data on recruitment activities are extremely rare. A few exceptions are Brown et al. (1999) and Manning (2000) on British data, Barron et al. (1987) and Holzer (1994) using US data, van Ours et al. (1991, 1992) and Gorter et al. (1999, 2003) using Dutch data. These papers address important issues, like the cyclical behaviour of the vacancy rate, the shape of the hazard of vacancy filling and the optimal recruitment strategies of employers, all issues that can only be explored with detailed data at the vacancy level. This paper is another example of how a better knowledge of the firm's side of the matching process can contribute to our understanding of the functioning of the labour market.

The paper is organised as follows: section 2 describes the distribution of labour turnover across occupations in the United Kingdom, section 3 presents a simple model of optimal employers' search, section 4 describes the data which will be used in section 5 to test empirically the implications of the model. Section 6 concludes.

## 2 The distribution of labour turnover across occupations

Since December 1992, the British labour force surveys allow to follow a subsample of interviewed persons across quarters. Using these data it is possible to construct measures of labour turnover by occupation in the initial job. The left panel of Figure 1 shows the fraction of employed workers who experienced a job change (i.e. moved to a different job or to unemployment or to inactivity) between two adjacent quarters from December 1992 and November 2004 by occupation in the starting job. These figures show an almost monotonic trend towards higher turnover at the bottom than at the top of the jobs' distribution. About 11% of workers in elementary occupations change job or move into non-employment between two adjacent quarters, while this fraction is only about 4% for managers.

Few explanations have been explicitly put forward for this empirical regularity. A popular one suggests that people try to climb up the jobs' ladder, moving from lower level, lower paying jobs up to better ones. It has also been argued that young workers, who normally occupy jobs at a lower occupational level, change employment frequently during their first years in the labour market in an attempt to explore their capabilities and to find jobs that meet their tastes (Topel and Ward [1992]).

However, these explanations don't seem to satisfactorily conform with some additional evidence. In fact, if workers at the bottom of the occupations' distribution would leave their jobs more often to look for better ones, we should observe more job-to-job than job-to-unemployment transitions at the bottom than at the top. As the first column of Table 1 illustrates, this is not at all clear in the data. Although the numbers show some variation across occupations, it is hard to argue that there exists a clear trend towards a lower incidence of job-to-unemployment transitions at the bottom than at the top of the jobs' distribution.

Moreover, the same explanations would also suggest that workers from the lowest occupational groups would move more frequently to another, possibly higher, group. Once again, the data (column 2 of Table 1) do not show any particular trend in the fraction of job-to-job movers who also change occupational group. In the quarterly data of the UK labour force surveys, this figure ranges between 16% and 44% with unclear patterns across occupations.

Oi (1962) and McCall (1990) find similar results for the US during the early 30s and early 80s respectively.

Other explanations can be indirectly extrapolated from the work of the many authors that contributed to the literature on labour turnover. For example, Moscarini (2001) argues that the wedge of productivity over the opportunity cost of labour is larger for skilled than unskilled workers, thus reducing their incentives to change jobs. Also, the observed negative correlation between tenure and mobility is often explained by match-specific training: with tenure one acquires a knowledge (of the environment, familiarity with co-workers, with the procedures, etc.) which makes that specific match more valuable to both the worker and the firm than the average alternative (Mortensen [1978]). As a consequence, longer tenure is associated with a lower probability of job ending (Farber [1999]). This result, together with the suggestion (Parsons [1972]) that the incidence of match-specific training is higher in top, managerial jobs, would be sufficient to generate higher turnover in lower occupations.

Furthermore, women are more prone to change labour market status due to family reasons. Hence, female dominated occupations are likely to show higher levels of turnover.

However, Figure 2 shows that, even when one controls for all these effects, labour turnover still differs substantially across occupations. The dots in Figure 2, in fact, represent the coefficients on the occupational dummies obtained from either a probit or an OLS model of the probability of experiencing a job change between two adjacent quarters between December 1992 and November 2004 in the United Kingdom. The bars represent 95% confidence intervals. The set of conditioning variables includes: gender, age, tenure, type of contract, an indicator for training, public sector, industry, region and year dummies. The visual inspection of Figure 2 already indicates that the probability of a job separation is still substantially higher in lower occupations. Tests of the hypothesis of all identical coefficients are rejected for both models.

### **3 Employer's search: a simple theoretical framework**

This section formalizes in a simple model the very intuitive idea that employers find it optimal to invest more in recruitment activities when hiring for highly productivity jobs.



The starting point is a simple matching model in which firms with unfilled vacancies and workers who need a job (or want to change job) look for each other. The presence of frictions in the labour market prevents them from meeting instantaneously and leads to positive rents associated with formed matches. For simplicity and clarity, the model is developed in partial equilibrium and formalised in discrete time.

The first departure from the standard matching model consists in the introduction of heterogeneity in the market, a crucial ingredient to make recruitment play a meaningful role. Jobs differ along observable and unobservable (to the worker) characteristics. Observationally, jobs differ in the tasks they involve, i.e. the occupational group: managers, secretaries, salesmen, assembly workers, etc. These occupations differ in their level of productivity ( $p$ ), higher for managers, lower for assembly workers. Within each of these occupations, jobs differ along some characteristics that are unobservable to the jobseekers, i.e. the work environment, the specific organisation of work within the firm, the importance of skills like leadership and motivation, etc.

Workers also differ along both observable and unobservable (to the firm) characteristics. Their observables allow employers to identify potential candidates for each occupational category but their unobservables determine whether they will match with the unobservable characteristics of the job. For example, an employer who advertises a managerial (observable) job in a friendly (unobservable) organisation can easily identify job seekers who hold a degree in management (observable) as potential candidates but needs to invest time and resources in interviewing them in order to identify those who have the necessary charismatic (unobservable) skills to motivate co-workers without spoiling the friendly atmosphere of the firm.

Thus, observationally identical workers could be either *suitable* or *unsuitable* for the specific job offered. Let us make the simplifying assumption that a job filled with a suitable worker is productive, i.e. produces  $p$ , but it becomes totally unproductive with an unsuitable worker. The type of the match, productive or unproductive, is unknown to both the worker and the firm until production takes place and output can be observed.

In each period, a firm with an unfilled vacancy meets a jobseeker with probability  $q(\theta)$ , where  $\theta$  represents labour market tightness, i.e. the ratio of vacancies (of the same observable

type) to the unemployed who search for that particular job,  $\theta = \frac{v}{u}$ . According to the standard matching literature,  $q(\theta)$  is assumed to be decreasing in  $\theta$ :  $\frac{\partial q(\theta)}{\partial \theta} < 0$ .

In order to focus on the choice of the recruitment strategy by the employer, the supply side of the market - the search behaviour of workers - and the wage negotiation process are taken as exogenous and modelled as follows: all firms offer wages equal to a constant fraction  $\beta$  of expected productivity in the first period of work. If the worker turns out to be suitable for the job, wages in the following periods are updated to the same fraction  $\beta$  of actual productivity  $p$ , otherwise the match is destroyed (by either of the two parties) and the vacancy re-opened. If the match is continued, a separation will only occur due to exogenous shocks with per-period probability  $\lambda$ .

Recruitment ( $R$ ) is modelled here only as the set of activities performed by the employer to improve her knowledge about the worker's unobservable type<sup>4</sup>. These actions include interviewing and screening candidates but also advertising the vacancy more accurately or in more specialized (and costly) outlets in order to attract the applications of the most suitable candidates.

Formally, intensive recruitment is modelled as follows: upon meeting a candidate the employer receives a signal about the unobservable type of the worker. The signal can take two values, "suitable" or "unsuitable", and it is correct with probability  $\zeta(R)$ . In other words, if the signal is "suitable" the candidate is suitable with probability  $\zeta(R)$  and unsuitable with probability  $1 - \zeta(R)$ . Similarly if the signal is "unsuitable". The function  $\zeta(R)$  needs to be increasing and concave in  $R$ . Moreover, when  $R = 0$  the signal is totally uninformative and  $\zeta(0) = 1/2$ . The cost of  $R$  is linear and equal to  $cR$  and it is paid as soon as the vacancy is opened<sup>5</sup>.

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<sup>4</sup>This is sometimes called "intensive" recruitment as opposed to "extensive" recruitment, which, instead, concerns all the actions taken by the employer to improve the probability of meeting a candidate (or to increase the number of applications received). Extensive recruitment includes mostly advertisement but also asking current employees, holding career events at colleges and professional schools, etc. Including extensive recruitment in the model is straightforward but it does not influence the implications for labour turnover.

<sup>5</sup>Alternatively one could assume that the cost of  $R$  is only paid upon meeting the candidate. In this case labour market tightness would have no effect on investment in recruitment. However, it is sufficient to have part of the cost paid before the meeting in order to obtain a positive effect of  $\theta$  on  $R$ , as in this version of

For each occupation there exists an exogenous fraction  $\pi$  of suitable jobseekers in the economy. Under these assumptions, only two hiring strategies are possible: hiring when the signal is "suitable" and rejecting otherwise or hiring anyone regardless of the signal received. The latter strategy obviously leads to a corner solution with  $R = 0$  and becomes optimal only in uninteresting cases, such as when  $\pi = 1$ : when all candidates are equally good for the job, investing in screening is useless and employers simply hire the first available candidate. In all other cases, employers find it optimal to hire only candidates who are signalled to be "suitable" for the job. We will then focus on this hiring strategy only, even if this restricts the range of parameter values within which the following analysis is valid.

Given the above assumptions, the value of an unfilled vacancy for a representative firm can be written as follows:

$$V = -cR + \frac{q(\theta)}{1+r} [\pi\zeta(R)J_p + (1-\pi)(1-\zeta(R))J_0 + (1-\pi)\zeta(R)V + \pi(1-\zeta(R))V] + \frac{1-q(\theta)}{1+r}V \quad (1)$$

where  $J_p$  and  $J_0$  are the value of a vacancy filled with a suitable (who produces  $p$ ) and an unsuitable (who produces 0) candidate and can be written as:

$$J_p = p - w^e + \frac{1}{1+r}J \quad (2)$$

$$J_0 = -w^e + \frac{1}{1+r}V \quad (3)$$

where  $w^e$  is the initial wage, paid as a fraction of expected productivity given that the signal is "suitable"<sup>6</sup>:

$$w^e = \frac{\pi\zeta(R)}{\pi\zeta(R) + (1-\pi)(1-\zeta(R))} \beta p \quad (4)$$

and  $J$  is the continuation value of a job filled with a suitable candidate:

$$\left(\frac{r+\lambda}{1+r}\right)J = (1-\beta)p + \lambda V \quad (5)$$

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the model.

<sup>6</sup>Only in this case the match would be actually formed.

Substituting (5) and (4) into (2) and (3) and then everything into (1), one obtains:

$$V \left[ r + q(\theta) - \frac{\pi\lambda}{\lambda+r} \frac{q(\theta)}{1+r} \zeta(R) - q(\theta)(1-\pi) \frac{1+r\zeta(R)}{1+r} - \pi q(\theta)(1-\zeta(R)) \right] =$$

$$= -c(1+r)R + \pi \frac{1+r+\lambda}{r+\lambda} q(\theta) \zeta(R) (1-\beta)p \quad (6)$$

The first order condition for the optimal choice of  $R$  is greatly simplified by imposing the usual free-entry equilibrium condition  $V = 0$ :

$$\pi q(\theta) \frac{1+r+\lambda}{r+\lambda} \zeta'(R) (1-\beta)p = \frac{c}{1+r} \quad (7)$$

where  $\zeta'(R) = \frac{\partial \zeta(R)}{\partial R}$ .

Differentiating equation (7) immediately yields the effects of the exogenous parameters of the model on  $R$ . As expected, and perhaps not very surprisingly, higher productivity ( $p$ ) leads to higher investment in recruitment. In other words, employers invest more in screening applicants when recruiting for highly productive jobs. In this case, in fact, failing to hire the right worker is very costly: not only does it require paying a high wage without getting any output in return, but it also means re-opening the vacancy later on with high losses in terms of forgone output.

The degree of labour market tightness ( $\theta$ ) also affects investment in recruitment. From equation (7) it is easy to show that in tighter labour markets employers screen applicants more accurately, i.e.  $R$  increases. This is also a very intuitive result: when  $\theta$  is high, i.e. there are few job seekers per vacancy, the cost of having a vacant job is high since it takes very long to fill it. Employers will then want to make sure they hire the right worker not to run the risk of having to re-open the position.

As for the fraction of suitable workers ( $\pi$ ), an increase in this parameter also increases the marginal benefit of intensive recruitment and therefore leads to more expenditure in screening activities. Note, however, that this argument holds only for values of  $\pi$  that are consistent with the optimal hiring strategy assumed so far, i.e. hiring when the signal is good and rejecting otherwise.

So far we have discussed the implications regarding the determinants of recruitment. However, the model also allows to draw empirically testable implications on various measures

of match quality as well. For example, equation (4) shows that more intensive recruitment and a higher fraction of suitable workers both have a positive impact on initial wages,  $w^e$ .

More interesting for the initial motivation of this paper is the effect on the separation rate. The model contains two separation processes, one endogenous and one exogenous. The latter one (exogenous) hits "good" matches (i.e. jobs filled with suitable workers) with exogenous probability  $\lambda$  every period and it is unaffected by the endogenous variables of the model. This process can be seen as the effect of exogenous changes in consumers' preferences and firms' technologies. The endogenous separation process refers to "bad" matches (jobs filled with unsuitable candidates) being immediately destroyed as soon as production is observed.

The probability that a newly created match is endogenously destroyed corresponds to the probability of its being a "bad" match:

$$\Pr \{\text{endogenous separation}\} = \frac{(1 - \pi) [1 - \zeta(R)]}{\pi \zeta(R) + (1 - \pi) [1 - \zeta(R)]} \quad (8)$$

Empirically, equation (8) suggests that the probability of a separation occurring close to the engagement decreases with investment in recruitment.

To summarise, the model delivers two sets of empirical implications. First, it allows to identify the determinants of recruitment investment, which should be positively correlated with productivity, the availability of good candidates and labour market tightness. Second, it indicates that recruitment effort increases initial wages and the overall quality of the match, reducing the probability of separation.

In the remaining of the paper, after describing the data in the next section, these implications will be tested empirically.

## 4 The data: the 1992 Survey of Employers' Recruitment Practices (SERP)

The data used for the empirical implementation of the model come from an original survey conducted in the United Kingdom in 1992, the Survey of Employers' Recruitment Practices (SERP). This study was carried out by the British Social and Community Planning Research

(SCPR) on behalf of the Public Employment Service. It was mainly aimed at investigating the use of public employment services by private employers compared to alternative recruitment methods<sup>7</sup>.

To this end, one would ideally like to have information about a representative sample of engagements occurred in a determined time window. However, since the total population of all engagements is not easily recorded anywhere, it is rather difficult to extract such a sample. The approach taken by researchers at SCPR consisted in drawing a sample of 10,000 establishments from the 1989 Census of Employment, where an establishment is defined as "*the activities of a single employer at a single set of premises*". The 1989 Census covered all existing establishments with 25 or more employees and was supplemented by a random sample of smaller establishments.

The subsample of 10,000 establishments extracted from the Census was designed to contain enough observations to conduct statistical analyses by region and establishment size. A purely random sample would have led to too many establishments located in London and the South East and too few establishments of small size (below 20-25 employees). For this reason, small firms and firms outside London and the South East were oversampled. Moreover, since the purpose of the study was the analysis of recruitment practices, which are usually similar across establishments belonging to the same organisation, another sampling adjustment was made in order to limit the number of units belonging to the same large firm (e.g. large food stores, etc.).

These 10,000 establishments were first contacted in Autumn 1991 via a brief preliminary telephone interview to collect the information necessary to categorize them along two dimensions: *in-scope* versus *out-of-scope* and *recruiting* versus *non-recruiting* establishments. Out-of-scope establishments were firms that had closed down or moved between the census in 1989 and the date of the telephone interview. They were excluded from the study. Recruiting establishments were defined as establishments that either had recruited one or more employees in the previous 12 months or had unfilled vacancies at the time of the interview. A recruit or engagement was defined as "*recruiting an employee, where a new contract of employment is involved*".

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<sup>7</sup>An earlier survey was conducted in 1978 but the study has not been replicated after 1992.

All in-scope recruiting establishments were then contacted for a longer face-to-face interview, which constitutes the main source of information for the final survey. For budgetary reasons, only about half of the non-recruiting firms were contacted for a second short telephone interview. Eventually, the final survey contains information about 5,635 recruiting and 614 non-recruiting establishments. The interviews took place between May and November 1992. Within each establishment, the respondents were selected to be the main person responsible for the recruitment process. They were either personnel specialists (16%), general managers (27%), branch-depot managers (20%) or professional staff (9%).

Only the sample of recruiting establishments is needed for the purpose of this paper. Few observations have been dropped due to missing or incorrect values, leading to 5,343 valid establishments, which, corrected for the weights provided by the SCPR to recover the representativeness for the entire population, represent 6083 firms.

The questionnaire is divided into 10 sections. The initial 3 sections (A, B and C) provide information regarding the establishment. The first one contains general enquires about the type of firm and activity as well as questions about the role of the respondent. The second section asks about the characteristics of the workforce, including information about current vacancies and recruits that were hired in the previous 12 months. The third section includes detailed questions about the recruitment practices usually adopted by the firm. The descriptive statistics for the sample of establishments are reported in Table 2.

A sample of engagements was then constructed from the 5,635 recruiting establishments according to the following rules. The total number of engagements that took place in the 12 months prior to the interview was recorded and divided into the 9 major groups of the Standard Occupational Classification (SOC). If there had been engagements in more than 5 occupational groups, the most recent one in each of the 5 groups in which the largest number of engagements had been made were selected. Otherwise, if recruitment only occurred in fewer than 5 occupational groups but in total more than 5 new recruits were taken on, the most recent in each group was selected, then, the second most recent starting with the most numerous group and so on until 5 engagements were selected. Finally, if fewer than 5 engagements were made in the previous 12 months, all of them were selected, regardless of the occupational group.

The following 5 sections of the questionnaire (D to H) contain a set of detailed questions for each of the selected engagements, including the characteristics of the job that was offered, those of the successful applicant, accurate information about the duration of the vacancy, the recruitment methods activated and their sequence, whether the recruit was still employed at the firm and how satisfied the employer was with him/her. In order to limit the length of the interview and not to discourage employers' participation in the survey, not all questions were asked for all engagements. The most completed set of information was collected for the most recent engagement in each establishment.

The last two sections of the questionnaire are not used in this paper and they include questions on special needs, such as equality of opportunity, older workers, etc., and on the relationships with the public employment service.

For this paper some observations had to be dropped from the original sample due to missing or incorrect values, resulting in a valid sample of 14,609 engagements, which, rescaled using the weights provided by SCPR to recover the representativeness of all engagements, represent 10,980 new employment contracts. The descriptive statistics for the sample of engagements used in this paper are reported in Table 3.

## 5 Testing the empirical implications of the model

Before testing the implications of the simple theory of section 3, one needs to construct empirical measures of the variables that appear there. Productivity will simply be identified by the occupational group: jobs in higher occupations are associated with higher  $p$ . Additionally, I will also look at other indicators such as the type of contract and whether the job requires supervising co-workers.

The composition of workers' types in the economy ( $\pi$ ) is very difficult to observe. In fact,  $\pi$  should be a measure of the composition of labour supply by unobservable types. Therefore, estimating the effect of  $\pi$  on  $R$  is extremely problematic and the empirical analysis of this section pursues the less ambitious goal to control for its effect in order not to have it confounding the role of the other variables. This is done by introducing regional, occupational and industry dummies in all estimable equations, assuming that  $\pi$  would only vary within



cells defined by these variables. Additionally, the estimates that follow are also conditioned on a measure of the composition of labour supply by observable types. Specifically, this is an estimate of the fraction of all jobseekers (both unemployed and on-the-job searchers) whose characteristics and qualifications correspond to those of recently (less than three months) hired workers by region-industry-occupation cells<sup>8</sup>.

Constructing empirically measurable indicators of recruitment intensity is also complicated and, rather than relying on one single measure, I will use three different ones and replicate results for each of them. The distributions of these measures are shown in Figure 3 and below is a brief description of how they are constructed.

The first indicator is the length of the screening process, measured as the number of days between contact with the successful applicant is first made and his/her first day of work (Figure 3, upper-left panel). This measure has a couple of shortcomings. First, it could be affected by a number of factors, others than mere screening time, like the need for the selected applicant to give notice to a previous employer or to complete an educational course. In order to avoid these problems, when the length of the screening process is used as a measure of recruitment, additional controls are introduced for the employment status of the successful applicant (employed, unemployed, in full-time education) and the situation of the vacancy (whether the previous person was still working in the post, whether it was a new position, etc.) at the time of recruitment. Moreover, the information on vacancy duration is only asked for the most recent engagement in each establishment, therefore this measure is only available for one hiring per firm.

As expected, the distribution of this variable is skewed to the left, with approximately 80% of new recruits taking up their duties after less than 20 days since first contact with the employer. The average length of the screening process is 18 days with a few outliers (about 2.5%) with screening times longer than 100 days.

The second indicator of recruitment is computed as the number of screening procedures normally adopted at the firm. The establishment section of the questionnaire, in fact, contains questions about how recruitment normally takes place. In this occasion, the respon-

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<sup>8</sup>These estimates are obtained with a set of multinomial models of 45 industry-occupation cells estimated on the quarterly LFS of 1991 and 1992, conditioning on education, age and gender.

dents indicate whether formal screening procedures are used and, if the answer is positive, what they cover from the following list: definition of job requirements, requirement to use particular recruitment channels, use of application forms, short-listing procedures, interview procedures, selection procedures (tests, medical checks, etc.), other procedures. The number of procedures normally used at each establishment is our second measure of recruitment (Figure 3, upper-right panel). The drawback of this variable is that it only varies at the establishment level (i.e. it is identical for all engagements taking place at the same establishment).

The distribution of this second indicator suggests that most firms apply multiple screening procedures. About 68% of employers normally make job applicants pass through 4 procedures, although there is substantial variation in the actual types of these practices. Almost all firms use application forms, short listing rules and predetermined formats for interviews. Some also use medical and aptitudinal tests and fewer have pre-determined channels and job requirements.

The last indicator of  $R$  is constructed using a question about the importance of attracting only good applicants in the choice of the recruitment method which reads as follows: "*...how important a factor in your use of the recruitment method(s) was attracting only the most suitable candidates?*" The answers are ordered on a scale from 1 (not at all important) to 7 (very important). Each method can then be ranked by its accuracy measured by the average answer to this question given by respondents who activated it. This question is only asked for one engagement but the ranking of channels created using only the available answers can be associated to all other engagements. In fact, even when the evaluation question is not asked, the survey reports the sequence of recruitment channels activated for each single hiring. Thus, this third indicator of recruitment intensity is available for all engagements and varies both between and within establishments.

The distribution of this variable is described in the lower panel of Figure 3. Advertising on specialised trade press, fee-charging agencies, approaching a candidate directly and reemploying a previous employee are among the most "accurate" recruitment methods, while advertising on local free sheets, posting notices on the streets and using the Jobcentres (the British Public Employment Service) rank very poorly.

This variable too has one serious drawback. The subjective evaluation of the accuracy of recruitment could be endogenous to the quality of the match, i.e. one indicates that a recruitment method is very accurate precisely because he/she observes that the worker taken on is a good match. The averaging of the answers and then the association of these averages to engagements outside the sample over which they are computed should already mitigate this endogeneity.

However, the problem will be particularly important when trying to identify the causal effect of recruitment effort on the quality of job matches. In this case I will make use of instrumental variables. A relatively good instrument for recruitment effort is a measure of urgency of filling the vacancy. For the two most recent hirings the survey asks whether a delay of one month in the new recruit starting his/her duties would have created problems to the firm. Conditional on all observable characteristics of the candidate, the job, the firm and the economic conditions<sup>9</sup>, it is fair to assume that urgency is determined only by exogenous shocks such as sudden and unexpected changes in the workforce (e.g. other employees leaving or being sick) or in demand (e.g. a competitor going bankrupt, a series of big orders to be processed). In these situations it is plausible to expect employers to rely on less accurate but faster recruitment methods. Urgency should then be negatively correlated with recruitment intensity and affect match quality only through it.

To summarise and fix ideas, recruitment will be measured by three indicators - the length of the screening process, the number of formal screening procedures normally applied at the establishment and the accuracy of the method that led to contact with the successful applicant. The first indicator is only available for the most recent engagement in each establishment, the second one is available for all engagements but it only varies at the establishment level, the third is available for all engagements and varies both by establishment and by engagement within the same establishment. Furthermore, a measure of urgency of vacancy filling will be used as an instrumental variable for recruitment intensity to identify its causal effect on match quality.

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<sup>9</sup>The estimates in Tables 6, 7 and 8 include indicators of whether the activities of the firm are expanding or contracting and whether the firm is operating below or above capacity. These controls are obviously dropped when firm's fixed-effects are included in the estimation.

In the following subsections these measures are used to test the two main implications of the model of section 3, namely the fact that recruitment intensity is higher in top occupations and, second, that higher recruitment intensity leads to matches of better quality.

## 5.1 The determinants of intensive recruitment

Equation (7) describes the determinants of investment in recruitment, in particular it predicts that  $R$  should be positively correlated with productivity ( $p$ ), the availability of good candidates ( $\pi$ ) and labour market tightness ( $\theta$ ).

This implication is tested in Table 4, where our three measures of recruitment are regressed on regional labour market tightness, our indicator of labour supply and a set of indicators for the productivity of the match, such as the occupational group, the type of contract and whether the job requires supervising other workers. A set of additional controls is also introduced in the regressions including regional dummies and all observable characteristics of the establishment and of the successful applicant.

The estimation method is linear in all columns but column 2, where the dependent variable is the number of formal screening procedures applied at the establishment and an ordered probit is used. Moreover, in this case the dependent variable only varies across firms and the estimation is performed on the sample of establishments rather than engagements. Here the occupational dummies are replaced by the fraction of employees in each occupational group over total employment at the firm.

In the last two columns the "accuracy" of recruitment is used as a measure of  $R$  and, since this measure varies also within establishments, this allows to introduce firm's fixed-effects in the estimation. Hence, column 3 reports results without fixed-effects (but with standard errors corrected to account for correlation between observations within the same establishment) while these are included in column 4.

Results strongly confirm the prediction that intensive recruitment effort is stronger when employers are filling high-productivity jobs. This is clearly indicated by the coefficients on the occupational dummies, which grow in size and significance moving from low to high occupations. These coefficients are also shown in Figure 4, where they visually confirm the presence of a statistically significant trend towards more intensive recruitment in top

occupations.

Additionally, jobs that require supervising co-workers are also associated with higher recruitment effort, although this effect does not appear to be statistically significant in column 1.

The results for our measures of labour supply and  $\theta$  are more confused. Notice, however, that conditional on regional, industry and occupation categories, these measures only vary over time at the quarterly and monthly frequency, respectively. In fact, reliable data on vacancies and unemployment during the years covered by the SERP exist only by region and month. A change in the occupational classification that occurred in the middle of 1992 makes it difficult to reconstruct data on vacancies by occupation for this period. This implies that our measure of  $\theta$  only varies by region and month. Moreover, due to the presence of regional dummies in all the equations, the effect of  $\theta$  is eventually identified only by the time-variation across months and, given the short time span of our analysis, this variation is often limited. A similar argument holds for our indicator of the composition of labour supply, with the additional problem that this variable varies only at a quarterly frequency.

It is also interesting to note the effect of the establishment's size: larger firms tend to exert more recruitment effort, a result that suggests the presence of economies of scale in the recruitment technology.

## 5.2 Recruitment effort and the quality of matches

The second and perhaps most interesting set of empirical implications relates recruitment effort to the quality of matches. The estimates reported in Tables 5, 6 and 7 apply our three measures of recruitment effort to three measures of match quality: initial wages, duration of the match and satisfaction of the employer with the recruit.

Table 5 looks at the correlation between initial wages and recruitment intensity using a variety of measures and methods. In all cases the estimates indicate a positive effect of recruitment on the level of wages. When using the accuracy of the recruitment channel it is possible to introduce firm's fixed-effect in these regressions as well as apply instrumental variables to account for potential endogeneity. The point estimate remain positive in all cases but the use of urgency as an instrument leads to insignificance. This is potentially due to the

limited variation in the instrument (which is a 0-1 dummy) compared to the instrumented variable (which is continuous). The first step regressions (which are all reported in Table A1 in the appendix) show that urgency is negatively and significantly correlated with the accuracy of the recruitment method chosen, with a t-statistics of around -4.64, but this effect becomes very weak once establishment fixed-effects are also included in the estimation. Perhaps, urgency should be considered a weak instrument for recruitment intensity, an issue that is discussed more in details towards the end of this section.

Table 6 explores the effect of intensive recruitment on tenure, i.e. on the probability of a separation occurring shortly after the creation of the match. This is the correct empirical counterpart of equation (8): separations occurring soon after hiring are more likely than later separations to be due to inefficient matching. Obviously, since the SERP includes only hiring made in the 12 months previous to the survey, matches that have already been destroyed only account to about 7% of the entire sample.

The estimates of Table 6 are produced using either a logit or a linear probability model but always conditioning on elapsed tenure, and other covariates. Uncompleted durations, i.e. tenure for continuing matches, can be computed in days using information about the date of the interview and the date when the recruit started his/her job. Completed durations, however, are recorded in intervals: when the person has already left the firm the respondent is only asked to indicate whether he/she had been employed at the establishment less than a week, between a week and a month, between 1 and 3 months, etc. For simplicity, we take the month as the basic time unit and elapsed tenure is recoded for all observations into 4 categories: less than 1 month, 1 to 3 months, 3 to 6 months and more than 6 months.

The results indicate that, while the length of the recruitment process appears to have no effect on the probability of job separation, the number of screening procedures and the accuracy of recruitment are both negatively and significantly correlated with it. This finding is robust to the introduction of firm's fixed-effects (columns 4, 6 and 8) and/or to the use urgency as an instrumental variable (columns 7 and 8). Notice that with firm's fixed-effects identification only comes from firms that made more than one hiring in the previous 12 months and this reduces the size of the sample, especially in column 4. Conditional logit models, in fact, require time variation in the dependent variable as well, thus the 620

establishments used in column 4 represent firms that have at least 2 hiring observations and in which some of the persons hired have left the job and others are still employed. In all cases, the estimated coefficient points towards a strong and significant effect of intensive recruitment in the direction of lowering the probability of a job separation.

Finally, Table 7 explores the correlation between recruitment intensity and another, perhaps partial, measure of match quality, i.e. satisfaction of the employer with the recruit. Obviously, this is not an ideal indicator of the quality of a job match, since satisfaction of the employer could very well co-exist with dissatisfaction of the worker. Nevertheless, the estimates of Table 7 provide interesting additional and complementary evidence when associated with the previous findings on wages and tenure.

Information on employer's satisfaction is available for all engagements, even for those that are already terminated at the time of the interview. However, in several cases (12%) the respondent could not answer the question because the recruit had been at the firm for a too short period. These observations have been dropped from the samples used in Table 7. The dependent variable is equal to one if the employer is "very satisfied" and the estimation method is either a logit model or a linear probability model.

The length of the screening process, used in column 1, appears to have no effect on satisfaction but all the other estimates show a positive and significant (except from column 8) effect of recruitment intensity on employer's satisfaction, even when conditioning on firm's fixed-effects (columns 4 and 6) and instrumental variables (column 7). Only when, in column 8, recruitment intensity is instrumented with urgency in a fixed-effect linear model the coefficient turns insignificant while the point estimate remains positive.

Overall, the results of Tables 5, 6 and 7 support the basic idea of this paper: more intensive recruitment leads to matches of better quality that pay higher wages, last longer and make employers more satisfied with the person taken on. These effects are also quantitatively important. To see this, notice that the difference in our measure of recruitment accuracy between Jobcentres and commercial fee-charging agencies is about 1 (see Figure 3).

Thus, the estimates of Table 5 suggest that recruiting through a private commercial agency is associated with initial wages that are between 8% to 10% higher than those paid to recruits contacted via the public employment service.

The results in Table 6 show large differences depending on the estimation method. The coefficient in column 4 indicate that using a private agency reduces the probability of separation by about 7 percentage points<sup>10</sup>. The same effect obtained using a linear model and instrumental variables is much larger, in the order of about 35 to 47 percentage points, depending on whether instrumental variables are used in combination with establishments fixed-effects. These large differences are likely to be due to the fact that, since the fraction of already destroyed matches is low, functional form assumptions are very important in this particular setting. Moreover, our instrumental variable should probably be considered a weak instrument since the t-statistics of the first stage regressions (see Table A1) are never larger than 5.

Finally, the coefficient in column 4 of Table 7 indicates that recruiting through private agencies increases the probability of being very satisfied with the person taken on by about 13 percentage points<sup>11</sup>. The same effect is equal to between 8 and 9 percentage points when estimating a linear probability model (columns 5 and 6) and jumps up to 88 percentage points when using instrumental variables (column 7).

## 6 Conclusions

The available evidence for the United Kingdom indicates that employment relationships are far less stable in low- than in high-productivity jobs. Similar or related findings have been documented for other industrialised countries as well. This empirical regularity remains robust even after controlling for a number of personal and job characteristics, making it an interesting theoretical and empirical puzzle. This paper offers an explanation for this finding based on the idea that employers find it less profitable to invest in search and screening activities when recruiting for low-productivity jobs. As a consequence, matches at the lower end of the jobs' distribution are more likely to be of poor quality, in the sense that the same worker (job) can be paired with another job (worker) into a more productive match, hence they are destroyed more frequently.

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<sup>10</sup>This effect is computed under the assumption of an establishment effect equal to zero.

<sup>11</sup>This effect is computed under the assumption of an establishment effect equal to zero.



This idea is formalised in a simple model in which employers optimally choose their investment in recruitment, and the effects of such investment on match quality can be analysed. A unique dataset of hirings that took place in the United Kingdom in 1992 is used to test the model empirically. Results show that (i) employers screen more intensively when recruiting for jobs in higher occupational groups and (ii) matches created through more intensive screening last longer, pay higher wages and make employers more satisfied with the person taken on.

Understanding the causes of differentials in labour turnover is important in itself, to improve our knowledge of the functioning of the labour market, but it is also interesting from a policy perspective. Unstable employment relationships for certain categories of workers and jobs can generate large inequalities both in income levels and in its variability. Most people spend their entire working life in the same occupation and industry and, if the quality of matches in these jobs is constantly low, they will experience higher job and earnings instability, leading to higher inequality and possibly higher poverty. Policies aimed at improving the quality of matching are, thus, likely to have positive effects on both equity and efficiency, particularly if they are focused on unskilled workers and elementary occupations.

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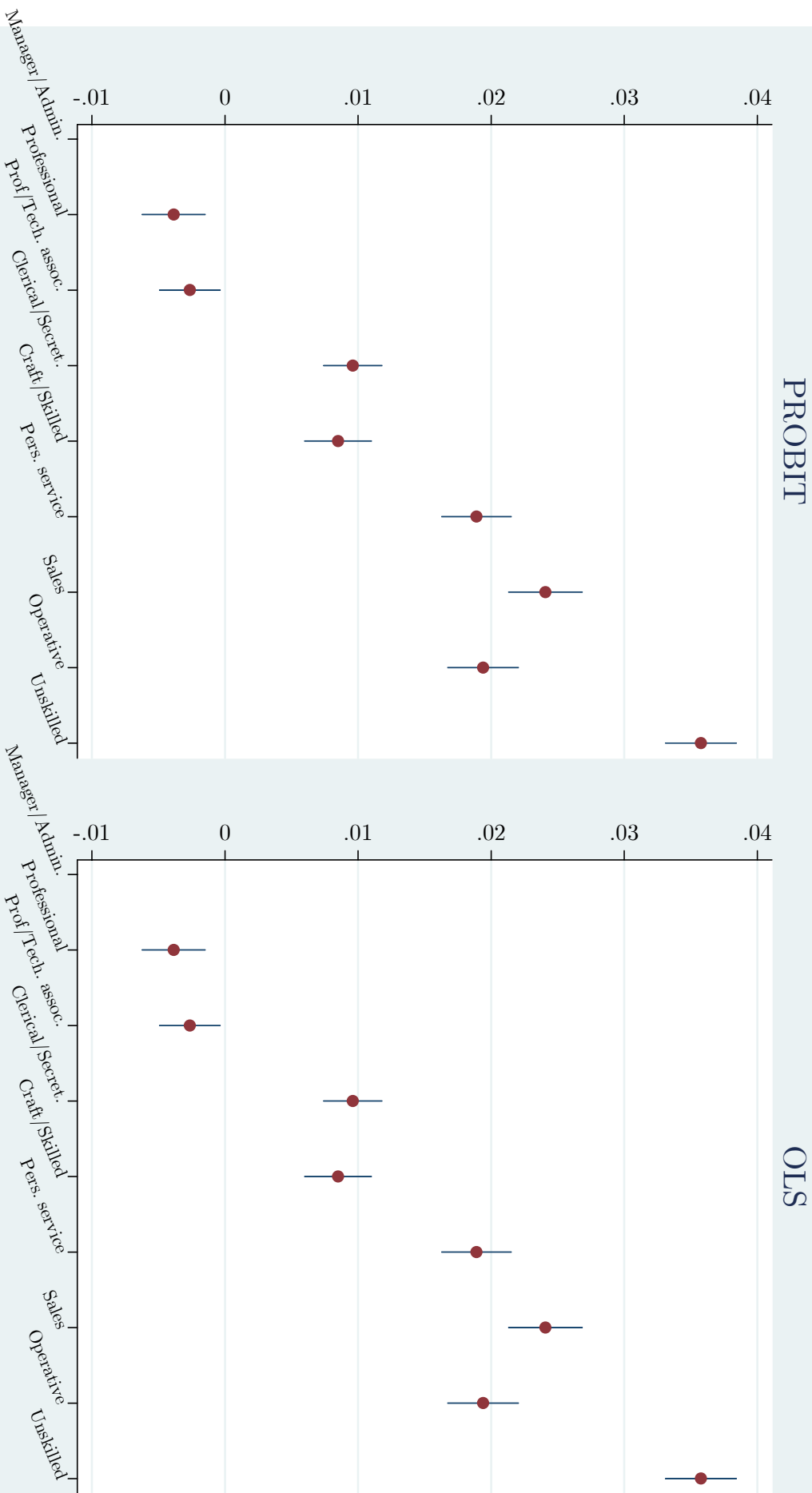
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Figure 1: Labour turnover by occupation  
United Kingdom  
Quarterly turnover, Dec1992-Nov2004



Figure 2: Conditional differences in labour turnover by occupation

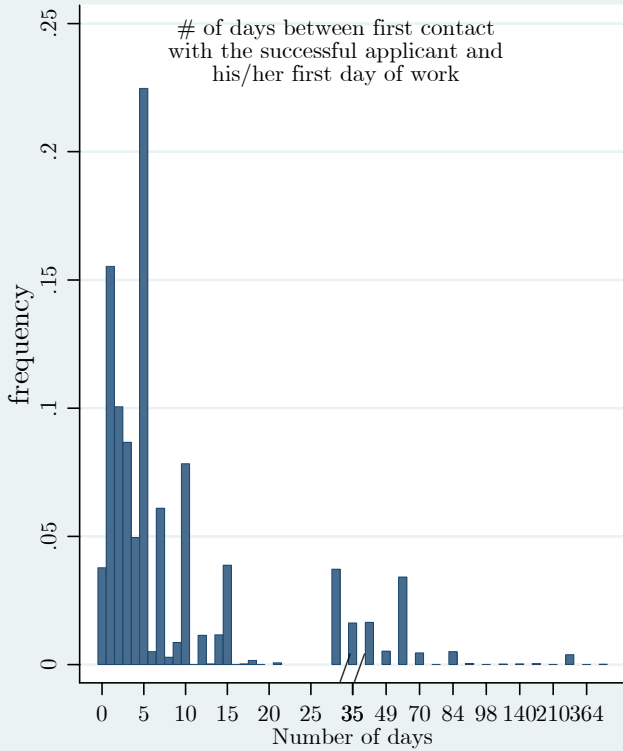
United Kingdom  
 quarterly data, Dec1992-Nov2004



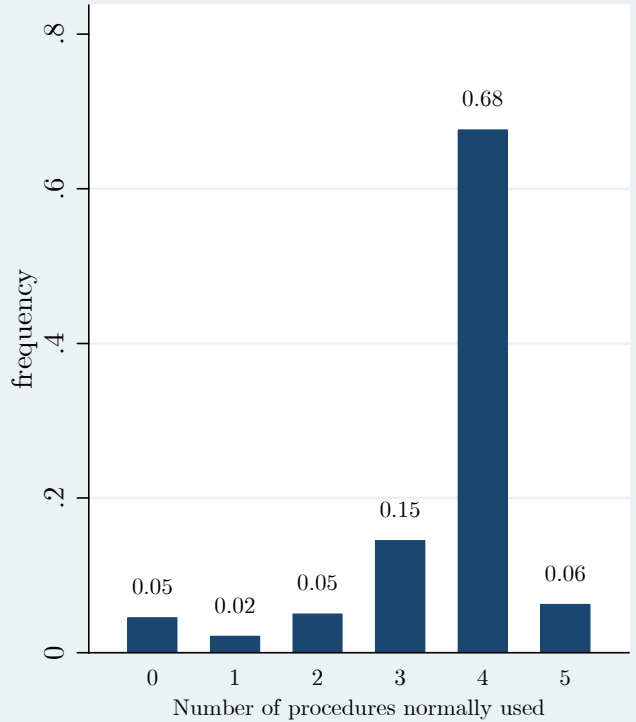
The bars represent 95% confidence intervals  
 The set of conditioning variables includes: gender, age, tenure, type of contract, training, public sector, industry, region and year dummies

# Figure 3: Measures of recruitment intensity

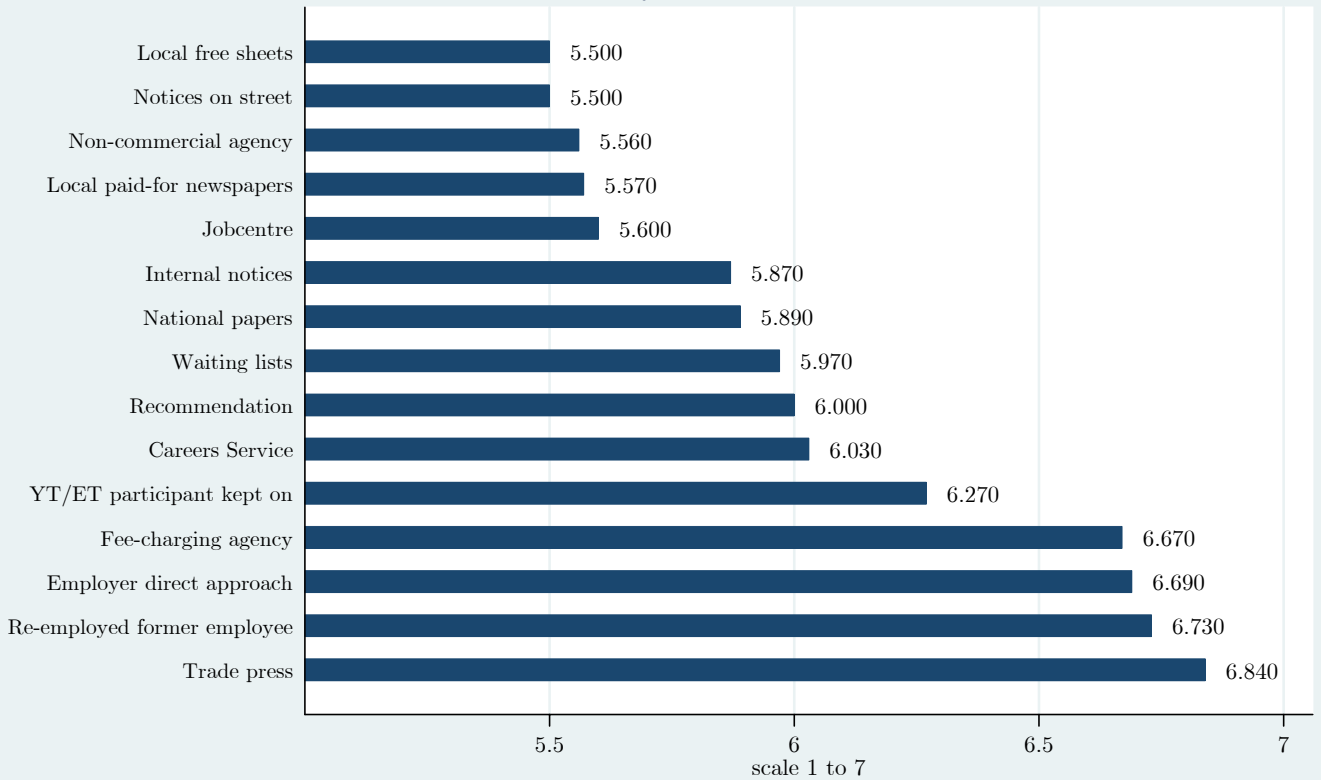
## 1. Length of the screening process\*



## 2. Number of recruitment methods used for the same vacancy



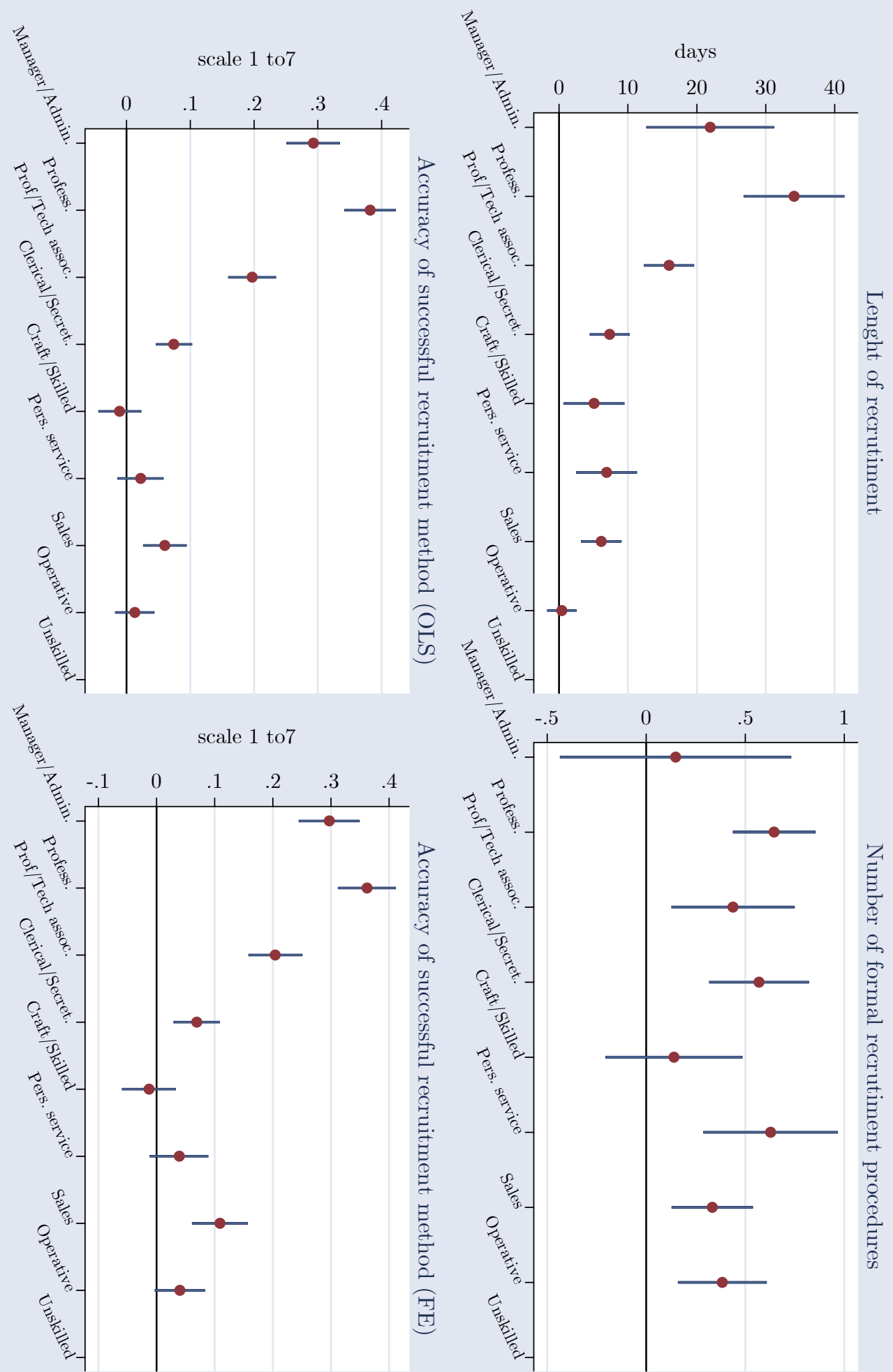
## 3. Accuracy of successful recruitment method\*\*



\*The sample is restricted to new or unfilled vacancies and to workers who, at the time of recruitment were either unemployed or inactive

\*\*See text for a description of how this variable is constructed

Figure 4: Conditional differences in Intensive recruitment by occupation



**Table 1: Anatomy of labour turnover by occupation in the United Kingdom**

Occupation	Quarterly Dec1992-Nov2004	
	% of movers into unemployment (over all movers)	% of industry changers (over all job-to-job transitions)
1 managers and senior officials	[1] 19.96	[2] 36.27
2 professional occupations	13.33	16.18
3 associate professional and technical	14.41	19.40
4 administrative and secretarial	15.6	31.36
5 skilled trades occupations	24.66	25.92
6 personal service occupations	15.36	26.94
7 sales and customer service occupations	14.6	44.03
8 process, plant and machine operatives	23.13	23.22
9 elementary occupations	19.31	38.53
Total	17.72	30.71

Note: turnover is computed as the fraction of dependent employees in a given quarter or year who experienced a job change (to another job, to unemployment or to inactivity) by the time they were re-interviewed the following quarter or year. Transitions to retirement are excluded.

The % of occupation stayers is computed as the fraction of dependent employees in a given quarter or year who are observed in another job but in the same occupation in the following quarter or year over the total number of employment-to-employment transitions.

Source: *UK Quarterly Labour Force Survey*.



**Table 2: Descriptive statistics for the sample of establishments**

	unweighted	weighted
Sample size	5343	6083
Variable	Mean	Mean
employment	314.83 (778.56)	40.53 (0.96)
<i>manual workers</i> <sup>1</sup>	0.30 (0.30)	0.21 (0.01)
<i>professionals</i> <sup>2</sup>	0.26 (0.24)	0.28 (0.01)
Labour intensity (labour costs as % of total costs)		
<i>less than 25%</i>	0.22 (0.41)	0.23 (0.01)
<i>25% to 50%</i>	0.29 (0.45)	0.31 (0.01)
<i>50% to 75%</i>	0.19 (0.39)	0.17 (0.01)
<i>more than 75%</i>	0.30 (0.46)	0.29 (0.01)
Industry		
<i>energy, water, etc.</i>	0.01 (0.11)	0.00 (0.00)
<i>metal, minerals, etc.</i>	0.04 (0.20)	0.02 (0.00)
<i>metal goods, engineering, etc.</i>	0.11 (0.32)	0.06 (0.01)
<i>other manufacturing</i>	0.13 (0.33)	0.06 (0.00)
<i>construction</i>	0.03 (0.18)	0.03 (0.00)
<i>distribution, catering, etc.</i>	0.22 (0.41)	0.33 (0.01)
<i>transport and communication</i>	0.04 (0.19)	0.05 (0.01)
<i>Banking, insurance, etc.</i>	0.15 (0.36)	0.17 (0.01)
<i>other services</i>	0.26 (0.44)	0.28 (0.01)
Trend in activity in the past 12 months		
<i>expanding</i>	0.41 (0.49)	0.43 (0.01)
<i>contracting</i>	0.20 (0.40)	0.16 (0.01)
Capital utilisation		
<i>below full capacity</i>	0.47 (0.50)	0.49 (0.01)
<i>overloaded</i>	0.01 (0.11)	0.02 (0.00)
1= change of ownership in the past 3 years	0.13 (0.33)	0.10 (0.01)
Region		
<i>London</i>	0.07 (0.25)	0.11 (0.01)
<i>rest of South East</i>	0.10 (0.30)	0.19 (0.01)
<i>East Anglia</i>	0.04 (0.19)	0.04 (0.00)
<i>South West</i>	0.10 (0.30)	0.09 (0.01)
<i>West Midlands</i>	0.11 (0.31)	0.09 (0.01)
<i>East Midlands</i>	0.07 (0.26)	0.07 (0.01)
<i>York/Humbershire</i>	0.10 (0.30)	0.09 (0.01)
<i>North West</i>	0.12 (0.32)	0.12 (0.01)
<i>North</i>	0.10 (0.29)	0.04 (0.00)
<i>Wales</i>	0.09 (0.29)	0.05 (0.00)
<i>Scotland</i>	0.10 (0.30)	0.09 (0.01)
Establishments by number of engagements		
One	0.15 (0.35)	0.29 (0.01)
Two	0.13 (0.34)	0.20 (0.01)
Three	0.14 (0.35)	0.14 (0.01)
Four	0.20 (0.40)	0.16 (0.01)
Five	0.38 (0.48)	0.21 (0.01)

Standard errors in parentheses

1. routine, unskilled, operatives and assembly workers

2. professional and technical associates, professionals, managers and administrators

Source: Survey of Employers Recruitment Practices, 1992

**Table 3: Descriptive statistics for the sample of recruits**

		unweighted		weighted	
		Mean (sd)	valid obs.	Mean (sd)	valid obs.
<b>The vacancy</b>					
supervisory job		0.18 (0.38)	14609	0.16 (0.01)	10980
non permanent contract <sup>3</sup>		0.21 (0.41)	14609	0.35 (0.02)	10980
Occupation					
	<i>Routine, unskilled</i>	0.15 (0.35)	14609	0.15 (0.01)	10980
	<i>Operatives and assembly</i>	0.14 (0.34)	14609	0.21 (0.01)	10980
	<i>Sales</i>	0.11 (0.31)	14609	0.06 (0.01)	10980
	<i>Protective/Personal service</i>	0.07 (0.26)	14609	0.07 (0.01)	10980
	<i>Craft/Skilled service</i>	0.09 (0.29)	14609	0.06 (0.01)	10980
	<i>Clerical and secretarial</i>	0.20 (0.40)	14609	0.21 (0.01)	10980
	<i>Professional and technical associates</i>	0.09 (0.28)	14609	0.10 (0.01)	10980
	<i>Professional</i>	0.08 (0.27)	14609	0.10 (0.01)	10980
	<i>Management/administration</i>	0.08 (0.27)	14609	0.04 (0.00)	10980
<b>The successful applicant</b>					
female		0.50 (0.50)	14609	0.54 (0.02)	10980
Age					
	<i>16 - 18</i>	0.08 (0.27)	14609	0.06 (0.01)	10980
	<i>19 - 24</i>	0.25 (0.43)	14609	0.27 (0.02)	10980
	<i>25 - 34</i>	0.34 (0.47)	14609	0.39 (0.02)	10980
	<i>35 - 44</i>	0.21 (0.40)	14609	0.19 (0.01)	10980
	<i>45 - 54</i>	0.10 (0.30)	14609	0.07 (0.01)	10980
	<i>55 or over</i>	0.03 (0.16)	14609	0.01 (0.00)	10980
Ethnic group					
	<i>White</i>	0.96 (0.21)	14609	0.92 (0.01)	10980
	<i>Black, etc</i>	0.02 (0.12)	14609	0.03 (0.01)	10980
	<i>Asian</i>	0.02 (0.15)	14609	0.05 (0.01)	10980
	<i>Other</i>	0.01 (0.08)	14609	0.01 (0.00)	10980
disable		0.02 (0.13)	14609	0.02 (0.01)	10980
<b>Outcome variables</b>					
Hourly pay (gross)		5.31 (3.52)	14609	5.60 (0.11)	10980
Satisfaction					
	<i>not at all satisfied</i>	0.01 (0.11)	14609	0.01 (0.00)	10980
	<i>not very satisfied</i>	0.02 (0.15)	14609	0.01 (0.00)	10980
	<i>fairly satisfied</i>	0.26 (0.44)	14609	0.25 (0.01)	10980
	<i>very satisfied</i>	0.62 (0.49)	14609	0.47 (0.02)	10980
	<i>too early to say</i>	0.09 (0.29)	14609	0.26 (0.02)	10980
number of applications received <sup>2</sup>		43.75 (98.62)	1855	59.32 (9.81)	2338
<b>The labour market</b>					
Labour market tightness <sup>3</sup> (*100)		4.79 (1.80)	14609	4.68 (0.06)	10980

1. Temporary, casual, part-time contracts

2. This question is only asked for the most recent engagement and only when contact with the successful applicant was made through a formal recruitment method (i.e. newspaper advertisement, notices, agencies)

3. Ratio between unfilled vacancies and unemployment benefit claimants in the quarter in which the recruit started working. (Source: Nomis)

Source: Survey of Employers Recruitment Practices, 1992.

**Table 4: The determinants of recruitment intensity**

Dependent variable	length of recruitment (days) <sup>1</sup>	# of formal screening procedures <sup>2</sup>	“Accuracy” of successful method <sup>3</sup>	
Estimation method	OLS	Ordered probit	OLS	FE
Mean of dep. variable	19.3	2.9	6.0	6.0
	[1]	[2]	[3]	[4]
Occupational category <sup>4</sup>				
<i>operatives &amp; assembly</i>	0.653 (1.001)	0.395*** (0.112)	0.009 (0.016)	0.038* (0.022)
<i>sales</i>	6.717*** (1.411)	0.336*** (0.106)	0.050*** (0.018)	0.099*** (0.025)
<i>protective/personal services</i>	6.631*** (2.050)	0.633*** (0.175)	0.026 (0.018)	0.044* (0.026)
<i>craft/skilled service</i>	4.815** (2.002)	0.145 (0.181)	-0.007 (0.017)	-0.009 (0.024)
<i>clerical &amp; secretarial</i>	8.000*** (1.650)	0.576*** (0.127)	0.060*** (0.015)	0.051** (0.021)
<i>prof. ass. &amp; technical</i>	17.239*** (1.762)	0.419** (0.164)	0.174*** (0.021)	0.180*** (0.025)
<i>professional</i>	34.904*** (3.317)	0.646*** (0.110)	0.370*** (0.021)	0.349*** (0.026)
<i>management/administration</i>	22.283*** (4.108)	0.159 (0.230)	0.287*** (0.021)	0.290*** (0.027)
Type of job				
<i>supervisory</i>	0.472 (1.015)	-	0.066*** (0.013)	0.077*** (0.016)
<i>non-permanent</i>	-7.529*** (0.776)	-	0.061*** (0.011)	0.043*** (0.016)
(log) Labour supply <sup>5</sup>	0.358 (0.278)	-	-0.007*** (0.003)	-0.008** (0.003)
Regional labour market tightness (v/u) <sup>6</sup>	-176.736 (98.058)	-	-1.128* (0.604)	0.508 (0.800)
Establishment’s size				
<i># of employees</i>	0.745*** (0.194)	0.061*** (0.008)	0.003** (0.001)	-
<i># of employees ~2</i>	-0.008** (0.003)	-0.001*** (0.000)	-0.000 (0.000)	-
Recruit’s characteristics <sup>7</sup>	yes	no	yes	yes
Job’s characteristics <sup>8</sup>	yes	no	yes	yes
Establishment’s characteristics <sup>9</sup>	yes	yes	yes	no
Establishment’s fixed effects	no	no	no	yes
Regional dummies	yes	yes	yes	no
Additional controls <sup>10</sup>	yes	no	no	no
Observations	3435	-	14520	10489
Establishments	3435	3985	4658	3990
Log Likelihood	-16356.77	-4783.24	-8621.87	-2458.32

1. # of days between the first contact is made with the successful applicant and his/her first day of work.

2. Formal procedures include: use of application forms, short-listing procedures, interviews, selection procedures (medical, security checks, tests, references, trial periods, etc.), other procedures.

3. Average employers’ evaluation of the accuracy of recruitment methods (see text for details).

4. The reference group is *routine & unskilled workers*.

5. Number of jobseekers with suitable characteristics for jobs in the corresponding occupation-industry group (see text for details).

6 Ratio between unfilled vacancies and unemployment benefit claimants in the month in which the recruit started working. (Source: Nomis)

7 Gender dummy, age dummies, ethnic group dummies, disable dummy, employment status at the time of recruitment (employed, unemployed, inactive, student, etc.).

8 Dummies for supervisory and non-permanent jobs, status of the vacancy (vacant, filled by previous worker, etc.) at the time of recruitment.

9 Establishment’s size (linear and squared), occupational composition of the workforce, labour intensity (% of labour costs over total costs), capital utilization (below full capacity, overloaded), activity trend (expanding vs. contracting), a dummy for change of ownership in the past 3 years, dummies for company type (limited, partnership, charity, et.), dummies for establishment type (administrative vs. production, headquarter vs. non-headquarter), industry dummies.

10. These include a set of dummies for the employment status of the successful candidate (employed, unemployed, inactive, student, etc.) and for the status of the vacancy (vacant, filled by previous worker, etc.) at the time of recruitment.

Robust standard errors in parentheses (clustered by region in column [1] and by establishment in column [2], [3], [4]).

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 5: Recruitment intensity and initial wages**

Dependent variable Estimation method	(log) initial wage <sup>1</sup>					
	OLS	OLS	OLS	IV <sup>2</sup>	FE	FE+IV <sup>2</sup>
Mean of dep. Variable	1.47	1.50	1.52	1.50	1.53	1.53
	[1]	[2]	[3]	[4]	[5]	[6]
length of recruitment (days) <sup>3</sup>	0.001*** (0.000)	-	-	-	-	-
# of formal screening procedures <sup>4</sup>	-	0.013*** (0.003)	-	-	-	-
“Accuracy” of successful method <sup>5</sup>	-	-	0.103*** (0.007)	0.163 (0.157)	0.084*** (0.008)	0.538 (0.523)
(log) Labour supply <sup>6</sup>	-0.004 (0.004)	0.001 (0.002)	0.001 (0.002)	0.004 (0.003)	0.002 (0.002)	-0.003 (0.008)
Regional labour market tightness (v/u) <sup>7</sup>	-0.680 (0.671)	-0.920** (0.423)	-0.759* (0.417)	-0.413 (0.637)	-1.499*** (0.491)	-1.535 (2.221)
Occupational dummies	yes	yes	yes	yes	yes	yes
Recruit’s characteristics <sup>8</sup>	yes	yes	yes	yes	yes	yes
Job’s characteristics <sup>9</sup>	yes	yes	yes	yes	yes	yes
Establishment’s characteristics <sup>10</sup>	yes	yes	yes	yes	no	no
Establishment’s fixed effects	no	no	no	no	yes	yes
Regional dummies	yes	yes	yes	yes	no	no
Additional controls <sup>11</sup>	yes	no	no	no	no	no
Observations	3557	14520	14416	6341	10489	2124
Establishments	3557	4658	4644	4163	3990	1062

1. Gross and hourly.

2. The instrument is a dummy variable for whether a delay of the new recruit in taking up his/her new job would have been problematic for the firm.

3. # of days between the first contact is made with the successful applicant and his/her first day of work

4. Formal procedures include: use of application forms, short-listing procedures, interviews, selection procedures (medical, security checks, tests, references, trial periods, etc.), other procedures.

5. Average employers’ evaluation of the accuracy of recruitment methods (see text for details).

6. Number of jobseekers with suitable characteristics for jobs in the corresponding occupation-industry group (see text for details).

7 Ratio of unfilled vacancies and unemployment benefit claimants in the month in which the recruit started working. (Source: Nomis)

8. Gender dummy, age dummies, ethnic group dummies, disable dummy, employment status at the time of recruitment (employed, unemployed, inactive, student, etc.).

9. Dummies for supervisory and non-permanent jobs, status of the vacancy (vacant, filled by previous worker, etc.) at the time of recruitment.

10. Establishment’s size (linear and squared), occupational composition of the workforce, labour intensity (% of labour costs over total costs), capital utilization (below full capacity, overloaded), activity trend (expanding vs. contracting), a dummy for change of ownership in the past 3 years, dummies for company type (limited, partnership, charity, et.), dummies for establishment type (administrative vs. production, headquarter vs. non-headquarter), industry dummies.

11. These include a set of dummies for the employment status of the successful candidate (employed, unemployed, inactive, student, etc.) at the time of recruitment.

Robust standard errors in parentheses (clustered by region in column [1] and by firm in columns [2], [3] and [4]).

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 6: Recruitment intensity and the duration of matches**

Dependent variable	I=left job							
	logit	logit	logit	conditional logit	linear probability	linear probability FE	linear probability IV <sup>1</sup>	linear probability FE+IV <sup>1</sup>
Estimation method	logit	logit	logit	conditional logit	linear probability	linear probability FE	linear probability IV <sup>1</sup>	linear probability FE+IV <sup>1</sup>
Mean of dep. Variable	0.048 [1]	0.070 [2]	0.070 [3]	0.38 [4]	0.070 [5]	0.070 [6]	0.050 [7]	0.050 [8]
length of recruitment (days) <sup>2</sup>	0.004 (0.003)	-	-	-	-	-	-	-
# of formal screening procedures <sup>3</sup>	-	-0.069** (0.027)	-	-	-	-	-	-
“Accuracy” of successful method <sup>4</sup>	-	-	-0.185** (0.092)	-0.314** (0.132)	-0.011** (0.005)	-0.011** (0.006)	-0.340** (0.135)	-0.475** (0.222)
(log) Labour supply <sup>5</sup>	-0.042 (0.075)	0.003 (0.026)	0.003 (0.026)	-0.000 (0.038)	0.001 (0.001)	-0.001 (0.001)	-0.003 (0.003)	-0.007 (0.005)
Regional labour market tightness (v/n) <sup>6</sup>	4.389 (13.979)	14.343** (6.841)	13.630** (6.844)	11.307 (7.803)	0.935** (0.466)	0.655* (0.392)	0.295 (0.701)	1.304 (1.119)
Occupational dummies	yes	yes	yes	yes	yes	yes	yes	yes
Recruit’s characteristics <sup>7</sup>	yes	yes	yes	yes	yes	yes	yes	yes
Job’s characteristics <sup>8</sup>	yes	yes	yes	yes	yes	yes	yes	yes
Establishment’s characteristics <sup>9</sup>	yes	yes	yes	no	yes	no	yes	no
Establishment’s fixed effects	no	no	no	yes	no	yes	no	yes
Regional dummies	yes	yes	yes	no	yes	no	yes	no
Elapsed tenure dummies <sup>10</sup>	yes	yes	yes	yes	yes	yes	yes	yes
Observations	3265	14416	14416	2346	14416	13638	6341	5780
Establishments	3265	4644	4644	620	4644	3813	4163	3569
Log Likelihood	-520.50	-3215.95	-3217.85	-752.38	-227.46	3725.04	-	-

1. The instrument is a dummy variable for whether a delay of the new recruit in taking up his/her new job would have been problematic for the firm.  
2. # of days between the first contact is made with the successful applicant and his/her first day of work  
3. Formal procedures include: use of application forms, short-listing procedures, interviews, selection procedures (medical, security checks, tests, references, trial periods, etc.), other procedures.  
4. Average employers’ evaluation of the accuracy of recruitment methods (see text for details).  
5. Number of jobseekers with suitable characteristics for jobs in the corresponding occupation-industry group (see text for details).  
6. Ratio of unfilled vacancies and unemployment benefit claimants in the month in which the recruit started working. (Source: Nomis)  
7. Gender dummy, age dummies, ethnic group dummies, disable dummy, employment status at the time of recruitment (employed, unemployed, inactive, student, etc.).  
8. Dummies for supervisory and non-permanent jobs, status of the vacancy (vacant, filled by previous worker, etc.) at the time of recruitment.  
9. Establishment’s size (linear and squared), occupational composition of the workforce, labour intensity (% of labour costs over total costs), capital utilization (below full capacity, overloaded), activity trend (expanding vs. contracting), a dummy for change of ownership in the past 3 years, dummies for company type (limited, partnership, charity, et.), dummies for establishment type (administrative vs. production, headquarter vs. non-headquarter), industry dummies.  
10. Elapsed tenure is coded in 4 categories (less than 1 month, 1 to 3 months, 3 to 6 months and more than 6 months).  
Robust standard errors in parentheses (clustered by region in column [1] and by firm in columns [2], [3], [5] and [7]).  
\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 7: Recruitment intensity and satisfaction of the employer**

Dependent variable	1=very satisfied with the recruit									
	logit	logit	logit	conditional logit	linear probability	linear probability FE	linear probability IV <sup>1</sup>	linear probability FE+IV <sup>1</sup>		
Estimation method	logit	logit	logit	conditional logit	linear probability	linear probability FE	linear probability IV <sup>1</sup>	linear probability FE+IV <sup>1</sup>		
Mean of dep. Variable	0.67 [1]	0.68 [2]	0.68 [3]	0.69 [4]	0.68 [5]	0.68 [6]	0.68 [7]	0.67 [8]		
length of recruitment (days) <sup>2</sup>	-0.001 (0.001)	-	-	-	-	-	-	-		
# of formal screening procedures <sup>3</sup>	-	0.080*** (0.017)	-	-	-	-	-	-		
"Accuracy" of successful method <sup>4</sup>	-	-	0.484*** (0.051)	0.597*** (0.093)	0.095*** (0.010)	0.084*** (0.014)	0.879*** (0.283)	0.046 (0.386)		
(log) Labour supply <sup>5</sup>	0.020 (0.045)	-0.003 (0.013)	-0.000 (0.013)	0.041* (0.024)	0.000 (0.002)	0.006* (0.003)	0.012** (0.006)	-0.000 (0.009)		
Regional labour market tightness (v/n) <sup>6</sup>	0.370 (6.334)	1.579 (3.074)	2.226 (3.080)	2.104 (5.501)	0.491 (0.629)	0.429 (0.852)	2.217* (1.241)	2.579 (2.441)		
Occupational dummies	yes	yes	yes	yes	yes	yes	yes	yes		
Recruit's characteristics <sup>7</sup>	yes	yes	yes	yes	yes	yes	yes	yes		
Job's characteristics <sup>8</sup>	yes	yes	yes	yes	yes	yes	yes	yes		
Establishment's characteristics <sup>9</sup>	yes	yes	yes	no	yes	no	yes	no		
Establishment's fixed effects	no	no	no	yes	no	yes	no	yes		
Regional dummies	yes	yes	yes	no	yes	no	no	no		
Additional controls <sup>10</sup>	yes	no	no	no	no	no	no	no		
Observations	2910	13168	13066	9493	13066	8440	5606	3245		
Establishments	2910	4529	4513	3857	4513	2865	3838	2403		
Log Likelihood	-1714.56	-7867.12	-7771.52	-1390.99	-8157.28	-2324.47	-	-		

1. The instrument is a dummy variable for whether a delay of the new recruit in taking up his/her new job would have been problematic for the firm.  
2. # of days between the first contact is made with the successful applicant and his/her first day of work  
3. Formal procedures include: use of application forms, short-listing procedures, interviews, selection procedures (medical, security checks, tests, references, trial periods, etc.), other procedures.  
4. Average employers' evaluation of the accuracy of recruitment methods (see text for details).  
5. Number of jobseekers with suitable characteristics for jobs in the corresponding occupation-industry group (see text for details).  
6. Ratio between unfilled vacancies and unemployment benefit claimants in the month in which the recruit started working. (Source: Nomis)  
7. Gender dummy, age dummies, ethnic group dummies, disable dummy, employment status at the time of recruitment (employed, unemployed, inactive, student, etc.).  
8. Dummies for supervisory and non-permanent jobs, status of the vacancy (vacant, filled by previous worker, etc.) at the time of recruitment.  
9. Establishment's size (linear and squared), occupational composition of the workforce, labour intensity (% of labour costs over total costs), capital utilization (below full capacity, overloaded), activity trend (expanding vs. contracting), a dummy for change of ownership in the past 3 years, dummies for company type (limited, partnership, charity, etc.), dummies for establishment type (administrative vs. production, headquarter vs. non-headquarter), industry dummies.  
10. These include a set of dummies for the employment status of the successful candidate (employed, unemployed, inactive, student, etc.) at the time of recruitment.  
Robust standard errors in parentheses (clustered by region in column [1] and by firm in columns [2], [3], [5] and [7]).  
\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table A1: First-step regressions**

Dependent variable	“Accuracy” of successful method <sup>1</sup>					
	Table 5		Table 6		Table 7	
	column 4	column 6	column 7	column 8	column 7	column 8
Instrument: urgency <sup>2</sup>	-0.054*** (0.012)	-0.042 (0.029)	-0.055*** (0.012)	-0.063*** (0.020)	-0.058*** (0.012)	-0.086*** (0.033)
(log) Labour supply <sup>3</sup>	-0.012*** (0.004)	-0.011 (0.007)	-0.013*** (0.004)	-0.014*** (0.005)	-0.014*** (0.004)	-0.005 (0.009)
Regional labour market tightness (v/u) <sup>4</sup>	-1.832** (0.845)	2.928 (2.060)	-1.848** (0.916)	1.341 (1.528)	-1.638* (0.880)	1.948 (2.301)
Occupational dummies	yes	yes	yes	yes	yes	yes
Recruit’s characteristics <sup>7</sup>	yes	yes	yes	yes	yes	yes
Job’s characteristics <sup>8</sup>	yes	yes	yes	yes	yes	yes
Establishment’s characteristics <sup>9</sup>	yes	no	yes	no	yes	no
Establishment’s fixed effects	no	yes	no	yes	no	yes
Regional dummies	yes	no	yes	no	yes	no
Elapsed tenure dummies <sup>10</sup>	no	no	yes	yes	no	no
Observations	6341	2124	6341	5780	5606	3245
Number of group(serial)	4163	1062	4163	3569	3838	2403

1. Average employers’ evaluation of the accuracy of recruitment methods (see text for details).

2 The instrument is a dummy variable for whether a delay of the new recruit in taking up his/her new job would have been problematic for the firm.

3. Number of jobseekers with suitable characteristics for jobs in the corresponding occupation-industry group (see text for details).

4. Ratio of unfilled vacancies and unemployment benefit claimants in the month in which the recruit started working. (Source: Nomis)

Standard errors in parentheses

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%