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Recruiting long-term unemployed: lessons from wage subsidies

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1. Introduction

In analysing the matching process of workers to jobs, both search behaviour of employers and that of employees are important elements. It is remarkable, however, that while employee job search has been studied extensively only scant attention has been paid to employer search behaviour.[3] Research in the latter field is mainly of an empirical nature – see for example Holzer (1990), Barron *et al*. (1997) and Burdett and Cunningham (1998). Our analysis fits in that tradition and aims to add new insights to the determinants of employer search behaviour, using a novel approach by identifying search behaviour through the incidence of deadweight loss in case of wage subsidies.

The literature on employer search distinguishes between intensive employer search, which refers to the intensity with which firms assess candidates, and extensive search, which refers to the number of candidates the firm assesses per job offer. Both types of search influence the vacancy duration and the matching process of workers to jobs and subsequently the likelihood of (long-term) unemployed to be considered and selected for a job. To identify intensive and extensive search, the empirical literature links various job characteristics to time or expenditures devoted per applicant (to proxy intensive search) or to the number of assessed applicants per job offer. While this type of research usually is based on direct measures of employer search behaviour, we propose an indirect measure based on the notion developed in Welters (2005) that the incidence of deadweight loss in case of wage subsidies – *i.e.* the share of subsidized employees the firm would have hired in the absence of subsidy – depends on the nature of employer search.

In this study we exploit a British dataset on firms participating in the New Deal for Long-Term Unemployed (NDLTU) to shed light on the determinants of employer search. Throughout the last two decades many OECD countries have experimented with wage subsidy schemes similar to the NDLTU – see Dar and Tzannatos (1999). A better understanding of employer search behaviour will enable governments to fine-tune their labour market policies targeted at long-term unemployed.

The article is organised as follows. We summarize the existing empirical literature on employer search in Section 2. In Section 3 we present some hypotheses linking deadweight loss incidence within a wage subsidy scheme to the firm's recruitment strategy. In Section 4 we describe the data set, which we use to test our employer search hypotheses in Section 5. We also present some new findings on employer search in Section 5. Section 6 concludes.

2. Empirical results from the employer search literature

The empirical employer search literature covers several issues in recruitment of which two have our immediate interest. One important topic is the firm's recruitment behaviour when it is filling a vacancy which has a large impact on its further operations. This generally leads to intensive search. Another relevant topic concerns the search behaviour of an employer when costs of not filling a vacancy are considerable. This leads to less extensive search. We discuss both topics separately.

2.1 Intensive search behaviour

The empirical employer search literature surmises that firms will make a more intensive effort in hiring decisions when: a) the job task is complicated (*e.g.* training

or experience is required), b) it is costly to fire employees (*e.g*. employees on a fixed contract) or c) the costs of monitoring employees are high (*e.g.* in large firms). Since in such conditions a hiring mistake is expensive, careful assessment of candidates is necessary, which induces the firm to search more intensively.

The empirical findings are largely in line with the theoretical expectations. Barron and Bishop (1985), Barron *et al.* (1997) and Burdett and Cunningham (1998) find a significant positive effect of job complexity on intensive search effort. Barron and Bishop (1985) and Barron *et al.* (1987) find a significant positive effect of firing costs on intensive search effort. The empirical results on the impact of firm size are inconclusive and, if any, predict a negative effect. Barron *et al.* (1987) argue that firms, applying assessments on a regular basis, experience economies of scale and employ an internal assessment centre, which is a cost saving activity. This argument would suggest that large firms could economize on costs of intensive search, which offsets the notion that monitoring costs are high in large firms.[4] Findings by Barron and Bishop (1985) and Burdett and Cunningham (1998) support this view. We show in the next section that our alternative approach can be used to shed more light on this issue.

2.2 Extensive search behaviour

According to the empirical employer search literature firms will be more eager to fill a vacancy when costs of not filling it are considerable. The production loss of assessing a candidate is equivalent to the product of the per period production loss of a vacancy and the number of periods between applicants determined by the arrival rate of jobseekers. Both elements of the product have been exploited in the empirical literature to explore extensive search behaviour.

Barron and Bishop (1985), Barron *et al*. (1997), and Burdett and Cunningham (1998) use 'advance notice' as a proxy for per period production loss. That is, a firm that knows in advance that a job will be broken up and hence needs to be filled at a future date can search for a new employee while the job is still productive. In such circumstances (per period) production loss is absent. The three papers find supportive evidence advance notice reduces the urgency of employers to fill a vacancy, where Barron *et al*. (1997) and Burdett and Cunningham (1997) use vacancy duration as a proxy for the firm's urgency to fill a vacancy.

Barron and Bishop (1985) use the number of applicants who came by looking for work and Barron *et al*. (1985) use the annual rate of applicants per 100 employees as a proxy for the arrival rate of applicants. Both papers found the expected effect. If many applicants visited the firm, the firm could interpret that as evidence for a high arrival rate, which would reduce the urgency of firms to fill the vacancy.

In the next section we show that our alternative approach allows us to identify more variables that affect extensive search behaviour.

3. Employer search and wage subsidies

3.1 A model of search and wage subsidy

A decade ago, Calmfors (1994) summarised the potential relevance of wage subsidies – which focus on temporarily subsidising employers who hire long-term unemployed – to fight long-term involuntary unemployment. A few years later Friedlander *et al*.

(1997) and Calmfors *et al.* (2001) reviewed wage subsidies employed in OECD countries and found disappointing results: the subsidy wastage is immense. Hence the optimism to fight unemployment using wage subsidies in the early nineties was moderated considerably within a few years after its widespread introduction.

One of the main sources of subsidy wastage is deadweight loss – see Fay (1996) or Dar and Tzannatos (1999) for a descriptive overview of the efficiency of wage subsidy schemes. This loss measures the share of subsidised employees that the firm would have hired in absence of the subsidy. If this loss is high within a wage subsidy scheme, the effectiveness of the subsidy instrument to improve the labour market position of (long-term) unemployed is limited. Unfortunately, the deadweight loss is substantial. Dar and Tzannatos (1999) show that shares of deadweight loss ranging from 50 to 75 percent are rule rather than an exception.

To explain deadweight loss incidence within a wage subsidy scheme, Welters (2005) developed a (sequential) employer search model.[5] We use a stripped down version of that model. The employer posts a vacancy, which draws an arrival rate of applicants. Imperfect information prevents the employer from observing the productivity of applicants free of costs. However, both worker heterogeneity and skill deterioration induce a negative link between productivity and unemployment duration – see Devine and Kiefer (1991) and De Grip and Van Loo (2002), respectively, which might induce firms to use unemployment duration to screen the pool of applicants.[6] This notion is corroborated by empirical research of Lynch (1985, 1989) and Omori (1997).

We assume the employer uses unemployment duration, t, as a screening device. If the applicant experiences an unemployment spell shorter than the screening device standard t^s, the employer decides to assess the applicant. Otherwise the applicant is rejected. During the assessment the – otherwise hidden – applicant's productivity level, p_j is revealed. The employer employs a minimum productivity standard, p^s. If the applicant meets the productivity standard ($p_j \geq p^s$) she is hired and the search process ends; if not, the employer waits for the next applicant to arrive.

The employer search model contains three impact variables that influence the firm's eventual choice of the screening device standard t^s: the cost of assessing the productivity level of an applicant, A, the per period production loss of an unfilled vacancy, B, and labour market tightness, θ. The number of assessments needed to find a qualified candidate, α, is linked positively to the firm's choice of t^s. Increasing t^s raises the average unemployment duration of the pool of applicants. This raises the failure rate (a failure occurs when $p_j \leq p^s$) of an assessment, which increases the expected number of assessments needed to find a qualified candidate. Put differently, weakening t^s increases the incidence of type I errors: retaining unqualified applicants in the assessment procedure. The arrival rate of applicants, $1 / \beta$, – and subsequently the speed at which the vacancy will be filled – depends positively on t^s. That is, if the firm weakens the screening device standard, it allows more applicants to enter the assessment procedure, which reduces the incidence of type II errors: excluding qualified applicants from the selection process.[7] Weakening the screening device standard is productive when per period production loss is high, or when the labour market is tight.[8] Consequently, to minimize the sum of total assessment costs needed to find a qualified candidate and total production loss incurred during the period the vacancy remained unfilled, the firm has to trade off type I and type II errors. The firm chooses t^s to optimize this trade off (and minimize hiring costs, HC). Equation 1 summarises the stripped down hiring cost function, the firm tries to minimize.

$$HC = \underset{+}{\alpha}(t^s)\left[A + \underset{-}{\underset{+}{\beta}}(t^s, \theta)B \right] \quad (1)$$

The firm can only cause deadweight loss if its choice of t^s (recruiting up to t^s) exceeds the government's subsidy criterion. To keep the design of the wage subsidy scheme simple, governments usually apply a uniform subsidy start value, which entitles firms to obtain a subsidy for any unemployed whose current unemployment spell exceeds a certain threshold value, t^{sg}.[9] Consequently, deadweight loss might arise when the firm sets $t^s \geq t^{sg}$, since in such conditions the firm's recruitment behaviour overlaps with the government's subsidy coverage. Given the inflexibility of t^{sg}, the firm's choice of t^s determines the likelihood of deadweight loss incidence.

3.2 Hypotheses on the incidence of deadweight loss

By choosing t^s to minimize hiring costs, we can derive for each of the three impact variables of the model a hypothesis about deadweight loss incidence:

The assessment cost hypothesis: there exists a negative relationship between assessment costs and deadweight loss. The reason is that if a vacancy requires intensive search (*i.e.* it involves high assessment costs), the firm wants to keep the quality level of the applicant pool high, to prevent putting intensive effort into assessing low quality applicants. This implies that firms are more reluctant to weaken the screening device standard, in order to prevent long-term unemployed – whose qualities are questionable – from entering the assessment procedure. This in turn, reduces the probability that such firms hire subsidized unemployed they would have hired in the absence of the subsidy, *i.e.* cause deadweight loss.

The production loss hypothesis: there exists a positive relationship between per period production loss and deadweight loss. If per period production loss is high, firms are more eager to fill the vacancy quickly, which implies firms are more willing to weaken the screening device standard, which increases the arrival rate of applicants. This in turn, increases the probability that such firms hire subsidized unemployed they would have hired in the absence of the subsidy, *i.e.* cause deadweight loss.

The tightness hypothesis: there is a positive relationship between labour market tightness and deadweight loss. Since tight labour market conditions cause a low arrival rate of applicants, the expected total production loss of the vacancy increases. This implies that firms are more eager to weaken the screening device in order to offset the low 'exogenous' arrival rate of applicants. This in turn, increases the probability that such firms hire subsidised unemployed they would have hired in the absence of the subsidy, *i.e.* cause deadweight loss.

These three hypotheses allow us to infer characteristics of employer search behaviour from the observed incidence of deadweight loss. The assessment cost hypothesis provides an explanation for intensive search behaviour, since intensive search leads to high assessment costs. Or to highlight the policy relevance, if intensive search costs are substantial, firms are unlikely to recruit from long-term unemployed, as their chances to meet the firm's criteria are limited. From a firm's point of view, this would not justify assessing them. Hence any relationship between deadweight loss and variables related to intensive search costs can be interpreted as relevant for intensive search behaviour.

In a similar way, the other two hypotheses are related to extensive search[10]: that is, both high per period production loss and tight labour market conditions lead to more

extensive search costs and subsequently increase the urgency to fill a vacancy. In policy terms, this implies that firms are more likely to assess long-term unemployed once the costs of not filling the vacancy are substantial. Either, because the periodical production loss is high, or, because the time span between applicants is large. The relationship between variables related to the urgency to fill a vacancy and deadweight loss suggests extensive search behaviour.

4. New deal for long term unemployed

To test our hypotheses and subsequently our predictions as to the conditions that maximise the long-term unemployed's job find probability, we use data on firms participating in the British New Deal for Long-Term Unemployed. The NDLTU is part of The New Deal program which was launched in 1997 under the Blair government to fight (long-term) unemployment. The NDLTU aims at increasing the employment opportunities of long-term unemployed.

The National Centre for Social Research (NCSR) conducted a study of firm behaviour within the New Deal program – see Hales *et al*. (2000). The NCSR used the data to explore the attitudes, beliefs and practices among employers involved in the NDLTU and also tried to understand why firms want to participate in such a scheme. Participating employers were interviewed in 1999, about 6 months after the subsidized employee had started working for the employer. This time spell allows studying retention rates. In total 1,243 employers were interviewed, who together provided subsidized employment for 1,518 long-term unemployed (more subsidies per employer was allowed).

Missing data reduces the sample size we use to test our hypotheses to 1,202. There are no employers in our sample that employed more than one long-term unemployed.[11]

4.1 Description of the data

Table 1 summarises the independent variables that we use in the regression analysis to identify intensive and extensive search behaviour.

In our sample, nearly nine out of ten participants are male. Two thirds of all participants work 30 to 40 hours a week, which we consider a full-time job. Only one in ten participants has supervisory tasks. Most participants hold a job classified as a medium (43%) or low (47%) occupational level job. To make this classification we rely on the Standard Occupational Classification 2000 (SOC2000). We narrow the nine standard categories down to three. High occupational level jobs contain 'managers and senior officials', 'professional occupations' and 'associate professionals and technical occupations'. Medium occupational level jobs contain 'administrative and secretarial occupations', 'skilled trades occupations' and 'personal service occupations'. Low occupational level jobs contain 'sales and customer service occupations', 'process, plant and machine operatives' and 'elementary occupations'. Small firms (64%) offer the majority of subsidized jobs. Most firms are single, independent firms. Though 17% is part of a larger entity, which operates several firms in the UK. Finally we include a sector variable, based on the Standard Industrial Classification 1992 (SIC92). We distinguish twelve sectors; the sector 'Retail, wholesale and hotels' covers one quarter of all subsidized employees.

Table 1 Descriptive statistics NDLTU data

Variables	Description	Mean
	Intensive search related variables	
Small firm	1=if a firm has 10 or less employees	0.64
Medium firm	1=if a firm has more than 10 but less than 51 employees	0.24
Large firm	1=if a firm has more than 50 employees	0.12
Autonomic firm	1= if a firm is not part of a larger entity	0.83
Autonomic firm in UK	1= if a firm is not part of a larger UK based entity	0.00
Firm being part of a larger UK entity	1= if a firm is part of a larger UK based entity	0.16
High occupational level	1= if required occupation is 'managers and senior officials', 'professional occupations' or 'associate professionals and technical occupations'	0.10
Medium occupational level	1= if required occupation is 'administrative and secretarial occupations', 'skilled trades occupations' and 'personal service occupations'	0.43
Low occupational level	1= if required occupation is 'sales and customer service occupations', 'process, plant and machine operatives' and 'elementary occupations'	0.47
	Extensive search related variables	
Supervision	1= if the job requires supervisory tasks	0.11
Part-time	1= if required hours worked for the vacancy are 30 per week or less	0.23
Full-time	1= if required hours worked for the vacancy are more than 30 but no more than 40	0.66
Overtime	1= if required hours worked for the vacancy are more than 40	0.10
	Control variables	
Gender	1= if NDLTU employee is male	0.87
Agriculture, forestry and fishing	1= if firm sector is 'Agriculture, forestry and fishing'	0.04
Food, tobacco and beverages	1= if firm sector is 'Food, tobacco and beverages'	0.02
Textile, wearing apparel and leather	1= if firm sector is 'Textile, wearing apparel and leather'	0.01
Wood, pulp and publishing	1= if firm sector is 'Wood, pulp and publishing'	0.03
Chemicals and rubber	1= if firm sector is 'Chemicals and rubber'	0.02

Metal products and machinery	1= if firm sector is 'Metal products and machinery'	0.05
Electrical machinery and motor vehicles	1= if firm sector is 'Electrical machinery and motor vehicles'	0.04
Construction and utilities	1= if firm sector is 'Construction and utilities'	0.15
Retail, whole- sale and hotels	1= if firm sector is 'Retail, wholesale and hotels'	0.28
Transport and communication	1= if firm sector is 'Transport and communication'	0.06
Banking and finance, and property	1= if firm sector is 'Banking and finance, and property'	0.12
Public sector	1= if firm sector is 'Public sector'	0.17
Variables related to socially desired answering		
Contact with jobcentre	1= if employer had had contact with job centre about NDLTU participant	0.37
Management training	1= if employer had provided training to those employees inside the firm responsible for managing NDLTU employees	0.04
Availability of mentor	1= if employer appointed a mentor for the NDLTU employee	0.58

To test for intensive search behaviour we use 'firm size', 'firm structure' and 'occupational level'. We expect – like the existing empirical literature – large firms to enjoy economies of scale in hiring decisions, which reduces their assessment costs. To distinguish the economies of scale argument from the monitoring argument, we include 'firm structure' in the analysis. We assume that firms that are part of a larger conglomerate can borrow screening expertise from their partners, which means that they can exploit economies of scale regardless of their size. This is not the case with autonomic firms. Additionally, we introduce the 'occupational level' of the vacancy as a measure for intensive search costs. It is unlikely that the pool of applicants contains many qualified candidates for higher occupational vacancies.[12] If the firm nonetheless aims at filling such a vacancy from that pool of applicants, the firm will have to search intensively.

To test for extensive search behaviour we use 'hours worked' and 'supervision' as a proxy for costs of foregone production. We include 'hours worked' in the analysis, since a vacancy for a part-time job only leads to limited production loss, we expect production loss to increase with the size of the job in terms of hours worked per week. We include 'supervision' since not filling a job, which contains supervisory tasks, not only leads to production loss for that particular job but also for the jobs that need supervision, which implies that per period production loss is high. Unfortunately, we do not have variables which measure labour market tightness and hence cannot test the third hypothesis.

To construct the dependent variable (deadweight loss) we combine two questions in the questionnaire. The first question comprises the additional nature of the job. That is, would the vacancy have been available in the absence of the subsidy. If yes, the subsidy does not lead to an increase in overall employment, which opens up the possibility of deadweight loss. If the job had not been available in the absence of the subsidy, the subsidized job must be considered additional and deadweight loss can be ruled out. Respondents had four answer categories, as outlined in Table 2, which produces four degrees from additional to non-additional. The majority of employers indicate that the job would have existed in absence of the subsidy which implies that the majority of jobs do not lead to an increase in employment. To verify whether a non-additional job leads to deadweight loss we use a second question, which asks the employer whether he would have hired the subsidized candidate, if there had been no subsidy available. If no, there can be no deadweight loss. If yes, we obtain four degrees of deadweight loss. Table 2 shows that nine out of ten employers indicate they would have hired the same candidate in absence of the subsidy (conditional on the vacancy being available in absence of the subsidy). Consequently, Table 2 shows that the incidence of deadweight loss is considerable within the NDLTU.

The four degrees of deadweight loss allow for several configurations on how to define deadweight loss in the regression analysis. The elements in the second row have to be categorized as 'no deadweight loss incidence', because these are additional jobs and therefore cannot lead to deadweight loss. This leaves the first row. Here we decided to keep the large group of employers who admitted to have surely taken on the subsidized employee without the subsidy as one separate category and merge the other three smaller groups into one intermediate category. Leaving the ordered ranking of the first row in tact and subsequently create five deadweight loss categories, does not alter the results significantly. We therefore end up with a three-category ordered construct with 8.7% of the firms indicating no deadweight loss ('none'), 59.6% indicating full deadweight loss ('surely') and the remaining 31.7% indicating some deadweight loss ('potentially').

Table 2 Deadweight loss construction

		Would the vacancy have existed in absence of the subsidy?			
Would the same applicant have been recruited without the subsidy?	non-additional applicant type	very likely	fairly likely	fairly unlikely	very unlikely
	same applicant	59.6% (2)	10.8% (1)	7.7% (1)	13.2% (1)
	different applicant	6.0% (0)	1.2% (0)	0.4% (0)	1.1% (0)

5. Empirical results

The ordered structure of the dependent variable suggests we adopt ordered probit models in our analysis – *cf.* McCullagh (1980).[13] The ordered probit model is

$$DWL_i^* = X_i\beta + \varepsilon_i \quad (2)$$

$$DWL_i = \begin{cases} 0 & if \quad DWL_i^* \le \mu_0 \\ 1 & if \quad \mu_0 < DWL_i^* \le \mu_1 \\ 2 & if \quad DWL_i^* > \mu_1 \end{cases}$$

where, DWL^*_i is an unobserved continuous variable representing the likelihood that a firm, *i*, would have hired the subsidized employee in absence of the subsidy; DWL_i is the observed ordered estimate of DWL incidence described in Table 2 for firm *i*; X_i is a vector of explanatory variables described in Table 1 for firm *i*; β is a vector of coefficients; ε_i is a standard normal random error term and μ_i are threshold parameters as discussed in Table 2. Since it is unclear how coefficients in the ordered probit model should be interpreted, we present marginal effects in Table 3 – see Greene (2003). All independent variables are dummy variables. The marginal effects of the dummy variables are evaluated at the discrete change (0,1). The presented marginal effects sum to zero, which follows from the requirement that the probabilities add to unity.

1. Intensive search behaviour

We expect small and autonomous firms not to have access to hiring expertise that small firms that are part of a larger entity or large firms in general possess. This implies that small and autonomous firms have to search intensively which results in high assessment costs. From the assessment cost hypothesis we expect small and autonomous firms to cause less deadweight loss, which indeed follows from Table 3. The results confirm our hypothesis. Small and autonomic firms are significantly more likely to be found in the 'none' or 'potentially' categories of deadweight loss incidence than large firms and firms being part of a larger UK entity respectively. Firms unorthodoxly aiming at filling a high occupational level job with a subsidized long-term unemployed have to search intensively, leading to high assessment costs. The results in Table 3 are in line with the assessment cost hypothesis. Firms trying to fill a high occupational level job from long-term unemployed are significantly more (less) likely to be found in the 'none' or 'potentially' ('surely') deadweight loss categories. Finally we use a likelihood ratio (LR) test to test the joint value of the three variables related to intensive search. The LR test shows that the joint effect of assessment costs has a significant impact on the firm's search behaviour regardless whether the base model (all variables unrelated to intensive search, urgency to fill a vacancy and socially desired answering) includes variables related to the urgency to fill a vacancy, or not.

2. Extensive search behaviour

We expect the proposed hours worked attached to a vacancy to be positively related to per period production loss. Subsequently, the firm will exercise more urgency to fill the vacancy quickly if it requires full-time or overtime employment rather than part-

time employment. The results in Table 3 show that there is no difference in deadweight loss pattern between employers filling a part-time rather than a full-time vacancy. Though, we do find the expected pattern for vacancies requiring overtime employment. An employer recruiting for such a vacancy is significantly more likely to be in the 'surely' category, which still is in line with the per period production loss hypothesis, whereas the lack of a significant difference between full-time and part-time employment is not. Apparently, firms adapt their search behaviour more easily to the most perceived or most urgent type of production loss (*i.e.* the overtime vacancy).

Next, we include 'supervisory tasks' into the analysis. If the job description includes supervisory tasks, the firm will search more intensively to find a qualified applicant. On the other hand, one might claim that not filling a job, which contains supervisory tasks, not only leads to production loss for that particular job but also for the jobs that need supervision, which implies that per period production loss is high. This implies that the firm is more eager to fill a vacancy which contains supervisory tasks. Unfortunately, the former effect of supervisory tasks predicts a lower incidence of deadweight loss via the assessment cost hypothesis, while the latter predicts a higher incidence of deadweight loss via the per period production loss hypothesis. Our indirect analysis can only provide evidence for the dominating effect. The results in Table 3 show that employers offering vacancies with supervisory tasks are more likely to be found in the top category of deadweight loss incidence. We can interpret this as support for the thesis that the per period production loss of a vacancy containing supervisory tasks is larger than the per period production loss of that single vacancy. This induces firms to be more eager to fill such a vacancy. We use the LR test to test the joint effect of costs of forgone production on firm behaviour. The LR statistics show that the joint effect of costs of foregone production has a significant impact on the firm's search behaviour regardless whether the base model (all variables unrelated to intensive search, urgency to fill a vacancy and socially desired answering) includes variables related to the intensive search, or not.

Table 3 Ordered probit regressions of deadweight loss in NDLTU (marginal effects)

Dependent variables / Independent variables	Deadweight Loss Incidence		
	None	Potentially	Surely
Intensive search			
Small firm	0.14***	0.03***	–0.17***
	(0.04)	(0.01)	(0.05)
Medium firm	0.01	0.00	–0.01
	(0.05)	(0.01)	(0.05)
Large firm	reference		
Autonomic firm	0.06**	0.01*	–0.08*
	(0.03)	(0.01)	(0.04)
Autonomic firm in UK	0.43**	–0.02	–0.41***
	(0.20)	(0.05)	(0.15)

Firm being part of larger UK entity	reference		
High occupational level	0.10**	0.01***	–0.12**
	(0.05)	(0.00)	(0.05)
Medium occupational level	–0.01	–0.00	0.01
	(0.03)	(0.00)	(0.03)
Low occupational level	reference		
Urgency to fill a vacancy			
Part-time	0.02	0.00	–0.02
	(0.03)	(0.01)	(0.03)
Full-time	reference		
Overtime	–0.08**	–0.02*	0.10**
	(0.04)	(0.01)	(0.05)
No supervision	–0.08**	–0.02*	0.09**
	(0.03)	(0.01)	(0.04)
Supervision	reference		
Control:			
Male	0.05	0.01	–0.06
	(0.03)	(0.01)	(0.04)
Female	reference		
Agriculture, forestry and fishing	–0.10*	–0.02	0.12*
	(0.05)	(0.02)	(0.07)
Food, beverages and tobacco	0.11	0.01**	–0.12
	(0.11)	(0.01)	(0.12)
Textile, wearing apparel and leather	–0.17***	–0.06*	0.22**
	(0.06)	(0.03)	(0.09)
Wood, pulp and publishing	–0.06	–0.01	0.08
	(0.06)	(0.02)	(0.08)
Chemicals and rubber	–0.06	–0.01	0.07
	(0.07)	(0.02)	(0.09)
Metal products and machinery	–0.20***	–0.07***	0.27***
	(0.03)	(0.02)	(0.05)
Electrical machinery and motor vehicles	–0.07	–0.02	0.09
	(0.06)	(0.02)	(0.07)
Construction and utilities	–0.05	–0.01	0.06
	(0.04)	(0.01)	(0.05)

Retail, wholesale and hotels	–0.05 (0.04)	–0.01 (0.01)	0.05 (0.04)
Transport and communications	–0.13*** (0.04)	–0.04** (0.02)	0.17*** (0.06)
Banking and finance, and property	–0.03 (0.04)	–0.01 (0.01)	0.04 (0.05)
Public sector	reference		
Socially desired answering:			
Contact with jobcentre	–0.04 (0.02)	–0.01 (0.01)	0.04 (0.03)
No contact	reference		
Management training	0.02 (0.06)	0.03 (0.01)	–0.03 (0.07)
No training	reference		
Availability of a mentor	0.00 (0.02)	0.00 (0.00)	–0.00 (0.03)
No mentor	reference		
N	1,202		

LR joint significance test (χ-square)

Model A \ Model B	BM	BM + UFV	BM+UFV+IS
Base model (BM)	X	14.52***	66.81***
BM + intensive search (IS)	56.28***	X	10.54**
BM + IS + urgency to fill a vacancy (UFV)	66.81***	52.29***	X
Socially desired answering			2.27

Standard errors in parentheses, *10% significance, ** 5% significance, *** 1% significance

Finally, we explore the potential role of 'socially desired answering' in our type of research. That is, firms might under report deadweight loss incidence as it is an unwanted side effect of wage subsidy schemes. To explore this notion we include three explanatory variables in vector X_i, which are – like the deadweight loss estimate – vulnerable to socially desired answering. The three (dummy) variables relate to the time and effort the firm spent on creating an environment which maximizes the success rate of its New Deal participation. The socially desired answer would be to spend as much time and effort into this process as possible, though there is no requirement to do so. The variables indicate whether the firm (1) had contact with the jobcentre during the subsidized stay, (2) had provided training to those inside the firm

responsible for managing the NDLTU participants, and (3) had appointed a mentor who guided the subsidized employee. We conduct a t-test of the marginal effects of all three dummy variables, $\beta_{jobcentre}$, $\beta_{training}$, and β_{mentor}, where we accept socially desired answering if $\beta_{mentor} < 0$, $\beta_{training} < 0$, and / or $\beta_{jobcentre} < 0$.

None of the three variables appears to be related to deadweight loss incidence in a statistically significant way (independently, nor as a group). Therefore we conclude that 'socially desired answering' does not bias our results.

6. Conclusions

In this paper we have used the incidence of deadweight loss in wage subsidy schemes to infer employer search behaviour, which influences the employment opportunities long-term unemployed get on the labour market. Using a data set on British firms that participated in a wage subsidy scheme, we have found indirect support for several findings arising from the existing employer search literature concerning intensive and extensive search. Moreover, we have added some new measures to identify both intensive and extensive search.

The existing empirical literature shows that firm size is linked negatively to intensive search costs. However, the existing literature cannot disentangle the positive monitoring effect from the negative economies of scale effect. We use firm structure (is the firm autonomous or part of a larger entity?) to distinguish the economies of scale effect from the monitoring effect of firm size and indeed find evidence that economies of scale in hiring decisions reduce intensive search costs. Consequently, large firms in general and small firms which are part of a larger entity are more likely to recruit from long-term unemployed than small independent firms. Additionally, we introduce the occupational level of the vacancy as a measure for intensive search costs. If it is unlikely that the pool of applicants contains many qualified candidates and the firm nonetheless aims at filling its vacancy from that pool of applicants, the firm will have to search intensively. Our empirical analysis supports this hypothesis. This leads to the trivial conclusion that long-term unemployed should not expect to be selected easily for high occupational level jobs. Though trivial, it underlines the validity of our analysis.

To test for extensive search we introduce two measures. First, the workload of the job in terms of hours worked per week matters for the production loss incurred due to an unfilled vacancy. We find that firms are more eager to fill an overtime vacancy than a part-time vacancy. Second, the production loss of vacancies that contain supervisory tasks exceeds the production loss of the vacancy itself. Also the production loss of jobs that need supervision should be included. We show that vacancies that contain supervisory tasks induce firms to search less extensively to fill the vacancy more quickly. Consequently, firms are more likely to take long-term unemployed into consideration for a vacancy if it needs quick filling, for example because it is an overtime vacancy or it includes supervisory tasks.

Analysing intensive and extensive employer search behaviour has considerable policy relevance since employer search affects the reemployment chances of (long-term) unemployed. Guiding long-term unemployed towards employers who are willing to recruit from long-term unemployed or targeting wage subsidy schemes towards employers who are hesitant to employ long-term unemployed (to avert the incidence of deadweight loss) seem valuable policy recommendations in a world dominated by supply side thinking. For instance, one might think of targeting wage subsidies

towards small autonomous firms and firms that employ part-time workers, but have a low incidence of overtime.

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[3] See for some pioneering theoretical contributions on employee / unemployed job search Diamond (1982), Mortensen (1982) or Pissarides (1985). Recent overviews of empirical research in this field are Mortensen and Pissarides (1999), Black *et al*. (2003), Van den Berg *et al*. (2004) and Shimer (2005).

[4] Bear in mind that the finding that large firms search less intensively does not imply that large firms make less thorough recruitment decisions. It means that economies of scale allow large firms to assess an applicant less intensively than a small firm to still make an equally thorough hiring decision than a small firm.

[5] Van Ours and Ridder (1992) and Gorter *et al*. (1996) show that recruitment from lower educated persons usually involves sequential recruitment. Since the burden of (long-term) unemployment and subsequently the use of wage subsidies predominantly involves lower or non-educated persons, we apply sequential search in our model.

[6] The theoretical pioneer work on the use of a screening device in recruitment decisions is from Spence (1973), Stiglitz (1975) and Riley (1976), who use educational attainment as a screening device. The former introduces the signalling role of education. That is, if applicants know that firms screen based on their educational attainments, applicants will invest in their educational attainment to signal their abilities.

[7] However, at the same time, weakening t^s will increase the number of assessments needed to find a qualified applicant, which increases vacancy duration. Welters (2005) shows that this effect does not outweigh the reduction in vacancy duration following a weakening of t^s, which is the result of a higher applicant arrival rate. Or mathematically: $\partial (\alpha\beta) / \partial t^s < 0$.

[8] If the labour market tightens, the number of periods between two applicants increases which increases total production loss of a vacancy.

[9] Generally, governments preserve entry to wage subsidy schemes to long-term unemployed. Hence the usual entry condition is a minimum spell of one year of unemployment.

[10] Our model is a sequential employer search model, which implies we cannot model extensive search. However, the eagerness to fill the vacancy, which follows from the firm's willingness to recruit from long-term unemployed (which subsequently leads to deadweight loss incidence), indicates the firm's urgency to fill the vacancy. Since the urgency to fill a vacancy is related negatively to extensive search, the findings of our model are useful to explain extensive search patterns.

[11] We did similar empirical research using a Dutch wage subsidy and found support for our hypotheses (Welters and Muysken, 2006). However, the low response rate, the limited sample size and the lack of a one-on-one relation between employer and employee in the Dutch data encouraged us to redo the analysis using a data set which is far better equipped in all three respects, like the British data set is. The richness of the data set also allows us to extend the empirical employer search literature beyond the current level.

[12] The data set does not contain information about the educational level of the NDLTU participants. Consequently we cannot check whether there is a clear positive relation between the occupational level of the job and the educational level of the participant. We assume this relation to exist, which implies that employers who try to fill a high occupational level vacancy are searching for high educated employees, who are relatively scarce among long-term unemployed.

[13] We also used an ordered logit regression to analyze the sensitivity of our results for potential outliers. The logit and probit specifications differ only marginally, which we interpret as evidence for the cogency of our results.