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Employer search: who gives the long-term unemployed a chance?

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1. Introduction

This paper analyses deadweight loss incidence in wage subsidy schemes. More precisely we compare general wage subsidies to training subsidies. In a general wage subsidy the destination of the subsidy is unrestricted, whereas in a training subsidy the employer must spend the subsidy on training the participating long-term unemployed. Comparing the recruitment behaviour of employers participating in both kinds of wage subsidies delivers insights which are relevant for at least two distinct reasons.

First, in analysing the matching process of unemployed to jobs, both search behaviour of employers and that of unemployed are important elements. It is remarkable, however, that while unemployed job search has been studied extensively (for recent contributions see Mortensen and Pissarides 1999; Black et al. 2003; Van den Berg et al. 2004; Shimer 2005), much less attention has been paid to employer recruitment behaviour as a determinant of the job find probability of unemployed, though employer behaviour does affect job find chances of job searchers (Holzer 1998; Holzer and Neumark 2000) and the long-term career path (Holzer et al. 2004). Employer search research is mainly of an empirical nature (Holzer 1990; Barron et al. 1997; Burdett and Cunningham 1998; Barron et al. 1999). Our analysis fits in that tradition and adds new insights to the determinants of employer search behaviour.

Second, these insights can be used to counter the considerable inefficiency of wage subsidy schemes. Shares of 50% deadweight loss of wage subsidy schemes when hiring long-term unemployed are rule rather than exception (Calmfors et al. 2001; Worldbank 1999). This indicates that a high share of participants in a wage subsidy scheme would have found a job even in the absence of the subsidy. To improve the effectiveness of these schemes it is highly relevant to analyse the incidence of deadweight loss

In Welters and Muysken (2006a, 2006b) we analyse the incidence of deadweight loss for a general wage subsidy, using Dutch and British data, respectively. This paper focuses on a (British) training subsidy, the New Deal for Young People (NDYP). The training requirement affects the theoretical model underlying our previous analysis and subsequently affects some of the hypotheses we derived for deadweight loss under a general wage subsidy. Using British firm data on the NDYP, we find empirical support for the revised hypotheses under compulsory training. Our further understanding of employer recruitment behaviour also yields insights which are relevant for improving the design of wage subsidies or labour market policies aimed at reintegrating (long-term) unemployed in general.

The paper is organized as follows. Section 2 summarizes the theoretical model developed in Welters (2005), its predictions and the empirical results arising from analysing wage subsidies. In section 3 we extend this model to include the effects of compulsory training and develop several hypotheses on the expected deadweight loss pattern in a training subsidy scheme. Section 4 discusses the NDYP data set on a survey of British firms from 1999 that we use to test our hypotheses in Section 5. Section 6 concludes.

2. Employer search and general wage subsidies

Since the burden of (long-term) unemployment and subsequently the use of wage subsidies predominantly devolves on lower or non-educated, we apply sequential search in our model (Van Ours and Ridder 1992; Gorter *et al.* 1996). The employer posts a vacancy in a recruitment channel, *r*, which draws a periodical arrival rate of job seekers. We assume the firm chooses from two recruitment channels: advertisements or the labor exchange office. The latter is cheaper than the former, however the advertisement channel yields both more, and more productive applicants than the labor exchange office (Gorter *et al.* 1996; Lindeboom *et al*. 1994; Russo *et al*. 1997, 2000).

The firm applies a minimum productivity standard, p^s. Think of an assembly line working environment in which the least productive worker determines the speed of the assembly line and subsequently the productivity of all other employees. To fill a vacancy, the firm searches for an applicant who is as productive as the least productive incumbent employee. Her productivity is p^s.

Imperfect information prevents the firm from observing the applicant's productivity level free of costs. To screen applicants the firm uses unemployment duration, t^s, as a screening device (Lynch 1985, 1989; Omori 1997) – both skill obsolescence and heterogeneity arguments explain why unemployment duration is linked (negatively) to productivity and subsequently why the former is an effective proxy of the latter. If the job candidate experiences an unemployment spell shorter than the screening device standard t^s, the employer decides to assess the job candidate. Otherwise the job candidate is rejected. During the assessment the – otherwise hidden – applicant's productivity level, p_j is revealed. If the job candidate meets the productivity standard ($p_j \geq p^s$) she is hired and the search process closes; if not, the employer waits for the next applicant to arrive.

The firm operates in a competitive labor market and subsequently tries to minimize hiring costs. Equation (1) summarizes total hiring costs.[3]

$$HC(t^s, r; \theta) = \chi(\underset{+}{t^s}, \underset{-}{r})\left[\; b + \varphi(\underset{-}{t^s}, \underset{-}{r}; \underset{+}{\theta})c \;\right] + \zeta(\underset{+}{r})e \tag{1}$$

Equation (1) contains three sources of hiring costs: costs per assessment (*b*), periodical costs of foregone production (*c*), and costs of operating the cheapest recruitment channel (*e*). Total assessment costs incurred during filling the vacancy depend on the average number of assessments, χ, needed to find a qualified candidate who meets the productivity standard p^s. Since extending the threshold duration t^s decreases the average productivity level of assessable applicants, the expected number of assessments needed to find a qualified applicant increases in t^s, hence $\chi_t > 0$. A switch from the labor exchange office as a recruitment channel to advertisements increases the average productivity level of applicants and consequently reduces χ, which explains $\chi_r < 0$.

Total costs of foregone production depend on the number of periods it takes the firm to fill the vacancy. The period between two job seekers, φ (*i.e.* the inverse of the arrival rate of job seekers) plays a key role here. Partially, φ is determined exogenously by labor market tightness, θ, hence $\varphi_\theta > 0$. Partially, the firm can influence φ. Extending the screening device standard implies that more job seekers survive the first screening test, therefore $\varphi_t < 0$.[4] Switching towards the advertisement channel increases the arrival rate of jobseekers, subsequently $\varphi_r < 0$.

Finally, we proceed on the assumption that the cost of the cheapest recruitment channel is *e*, while we treat the recruitment channel *r* as a continuous variable starting at ($r = 0$) for the labor exchange office. The mark-up factor, ζ, on the costs of the cheapest recruitment channel of the channel r chosen is then positive in r, hence $\zeta(0) = 1$ and $\zeta_r > 0$. The firm sets optimal values for its instruments t^s and r to minimize hiring costs (1).

Before turning to the comparative statics of the model, we first link the firm's choice of t^s to the incidence of deadweight loss. To keep the design of the wage subsidy simple, governments usually apply a uniform subsidy start value, t^{sg}, entitling every employer who wants to participate, regardless of, for example, labor market, and sector or job characteristics. That is, an employer is subsidy entitled if he hires a job seeker who is out of employment for more than t^{sg} periods. Consequently, deadweight loss might arise when the firm sets $t^s > t^{sg}$, since in such conditions the firm's recruitment behavior (recruiting up to t^s) overlaps the government's subsidy granting.

Since firms may experience different exogenous values of the variables, b, c, θ and e in equation (1), t^s is essentially sector, firm or even job specific. To analyze the incidence of deadweight loss, the relationship between the screening device standard t^s and these exogenous variables should therefore be scrutinized. To that end we derive four hypotheses concerning deadweight loss incidence following minimizing equation (1):[5]

The *assessment cost* hypothesis ($\partial t^s / \partial b < 0$): If assessment costs are high, firms are reluctant to weaken the screening device standard, as that would increase the average number of assessments needed to find a qualified candidate. This reluctance reduces the probability that those firms hire subsidized unemployed they would have hired in the absence of the subsidy. Alternatively, the firm could raise r to reduce the number of necessary assessments, which – through HC_{tr} (< 0) – raises the firm's choice of t^s.[6] Since the direct effects dominate the indirect effects, $\partial t^s / \partial b$ remains negative.

The *foregone production* hypothesis ($\partial t^s / \partial c > 0$): If per period foregone production costs are high, firms are more willing to weaken the screening device standard to speed up the recruitment procedure, which increases the probability that such firms hire subsidized unemployed they would have hired in the absence of the subsidy. Another option for the firm is to increase r to speed up the recruitment procedure, which through HC_{tr} (< 0) raises the firm's choice of t^s. This indirect effect reinforces the direct effect.

The *recruitment channel cost* hypothesis ($\partial t^s / \partial e < 0$): Since the cost of using advertisements as a recruitment channel is modelled as a mark-up on the costs, e, of using the labour exchange office, an increase in costs e widens the recruitment channel cost gap between advertisements and the labour exchange office. Hence, if e increases, advertisements become a relatively more expensive recruitment channel and subsequently the firm will avoid using it. This reduces the quality of applicants, which through HC_{tr} (< 0), induces firms to set a strict t^s. This subsequently reduces the risk of deadweight loss incidence.

The *tightness* hypothesis ($\partial t^s / \partial \theta > 0$): If tightness increases, the period between two applicants increases, which leads to higher total foregone production costs. Firms weaken the screening device standard in tight conditions to offset the increase in the period between applicants, which also raises the likelihood of causing deadweight loss. The firm could also increase r to reduce the period between two applicants, which – through HC_{tr} (< 0) – raises the firm's choice of t^s. This indirect effect reinforces the direct effect. Table 1 replicates the main findings.

Table 1 Comparative statics in a general wage subsidy scheme[a]

	partial derivative	comparative statics	DWL incidence
assessment costs	$\frac{\partial t^s}{\partial b} = \frac{\chi_r HC_{tr} - \chi_t HC_{rr}}{HC_{tt} HC_{rr} - \left(HC_{tr}\right)^2}$	$\frac{\partial t^s}{\partial b} < 0$	–
production loss[b]	$\frac{\partial t^s}{\partial c} = \frac{\varphi_r^* HC_{tr} - \varphi_t^* HC_{rr}}{HC_{tt} HC_{rr} - \left(HC_{tr}\right)^2}$	$\frac{\partial t^s}{\partial c} > 0$	+
recruitment channel costs	$\frac{\partial t^s}{\partial e} = \frac{\xi_r HC_{tr}}{HC_{tt} HC_{rr} - \left(HC_{tr}\right)^2}$	$\frac{\partial t^s}{\partial e} < 0$	–
labour market tightness[b]	$\frac{\partial t^s}{\partial \theta} = c\,\frac{\varphi_{r\theta}^* HC_{tr} - \varphi_{t\theta}^* HC_{rr}}{HC_{tt} HC_{rr} - \left(HC_{tr}\right)^2}$	$\frac{\partial t^s}{\partial \theta} > 0$	+

[a] The conditions for a relative minimum ensure that the denominator of all partial derivates is positive, and that HC_{tt} and HC_{rr} are positive.[b] In note 5 above we defined $\varphi^* = \chi\varphi$.

We test the first two hypotheses in Welters and Muysken (2006b) using data on the British general wage subsidy scheme New Deal for Long-Term Unemployed (NDLTU). The data sets on the NDLTU and the NDYP do not contain information that relate recruitment channel costs or labour market tightness to firm, sector and/or job characteristics; hence we leave costs *e* and θ out of the empirical analysis. Moreover, since we cannot observe assessment costs *b* and costs of foregone production *c* directly, we use an indirect approach.

We know from the literature that large firms experience economies of scale in hiring employees, which reduces costs *b* (Barron and Bishop 1985; Burdett and Cunningham 1998) and that firms intensify their assessment if the job task is complicated or it is costly to fire the entrant (Barron *et al.* 1987; Barron *et al.* 1997). We employ the first argument, but add firm structure to it. That is, small firms that are part of a larger conglomerate are able to borrow screening expertise from its partners and therefore also enjoy low costs *b*. The type of job matches we are looking at do not allow us to apply the second argument. That is, these subsidized employees have non-complex jobs and do not immediately obtain a permanent contract. Nonetheless, the data set also offers an opportunity, since firms unorthodoxly aiming at filling a high occupational level job with a subsidized long-term unemployed will have to search carefully, which implies they face high assessment costs. The three variables are reproduced in Table 2.

To proxy costs of foregone production *c*, the literature uses advance notice (Barron *et al.* 1997; Burdett and Cunningham 1998). A firm that has advance notice of an upcoming job separation has time to find a replacement while the job is still productive. In similar vain we use three proxies for costs *c* – see Table 2. First, since a vacancy for a part-time job only leads to limited production loss, foregone production costs increase with the size of the job in terms of hours worked per week. Second, vacancies can arise for two reasons: filling a vacant position or extending the work force. In the case of the former, costs *c* are low since the firm has advance notice of that particular job opening. However, when expanding this need not be the case. As firms experiencing expansion of activities, have relatively more often extension vacancies, activity growth is correlated positively with costs of foregone production. Third, not filling a job which contains supervisory tasks, not only leads to foregone production for that particular job but also for the jobs that need supervision, which implies that costs *c* are high.

Since our hypotheses imply that firms having low assessment costs and high costs of foregone production are more likely to cause deadweight loss in a wage subsidy or are more likely to recruit from long-term unemployed in general, we can derive the implied impact of the variables in Table 2 on deadweight loss – this is presented in the table as the ‘predicted impact’. Our estimation results from Welters and Muysken (2006b), summarized in Table 2 under the heading ‘estimated DWL’, are consistent with the predicted results. These findings enhance the plausibility of our hypotheses.

Table 2 Summary of results from analysing NDLTU

dependent variables / independent variables	predicted DWL	estimated DWL[a]
Variables related to cost *b*:		
Firm size (number of employees)	+	+***
Autonomic firm	–	–*
High occupational level	–	–***
Variables related to cost *c*:		
Overtime work	+	+***
Activity expansion	+	–
Supervision	+	+

[a] See Table 6 below, column (4) for full results.
*10% significance, ** 5% significance, *** 1% significance

3. Employer search and training subsidies

In discussing general wage subsidies, we have so far excluded the possibility to use the subsidy to train employees. The training subsidy scheme requires that the firm spends the subsidy on training. This also allows firms to reduce the productivity standard as a means to reduce hiring costs. Endogenising the productivity standard implies that we have to incorporate training costs in equation (1), which leads to two extensions. On the one hand, training leads to an additional source of hiring costs: training costs. On the other hand, changing the productivity standard affects the success rate of an assessment and subsequently the vacancy duration, which has consequences for total assessment costs and total foregone production costs respectively. Equation (2) contains the implications of introducing training in equation (1):

$$HC(t^s, p^s, r) = \chi(\underset{+}{t^s}, \underset{+}{p^s}, \underset{-}{r})\left[\ b + \varphi(\underset{-}{t^s}, \underset{-}{r}, \underset{+}{\theta})c\ \right] + \eta(\underset{+}{t^s}, \underset{-}{p^s}, \underset{-}{r})d + \zeta(\underset{+}{r})e \qquad (2)$$

Using $\varphi^* = \chi\varphi$, and assuming $\varphi^*_t < 0$ – see also note 5 above, we can rewrite equation (2) as:

$$HC(t^s, p^s, r) = \chi(\underset{+}{t^s}, \underset{+}{p^s}, \underset{-}{r})b + \varphi^*(\underset{-}{t^s}, \underset{+}{p^s}, \underset{-}{r}, \underset{+}{\theta})c + \eta(\underset{+}{t^s}, \underset{-}{p^s}, \underset{-}{r})d + \zeta(\underset{+}{r})e \tag{3}$$

Though reducing the productivity standard p^s in recruitment decisions now is allowed, the productivity of a chosen candidate has to be upgraded to p^*, the minimum productivity level to be as productive on the job as the least productive incumbent employee (so far we assumed $p^s = p^*$). This upgrading is captured by the third term on the right hand side of equation (3). Costs d represent the costs of upgrading the productivity level of a chosen candidate, p_j, with one unit of productivity. Function η measures the productivity distance between p_j and p^*. This is a function of the screening device standard, the productivity standard and the recruitment channel choice, hence η (t^s, p^s, r). The negative relationship between productivity and unemployment duration ensures that extending t^s leads to a lower expected productivity level of an assessed candidate, $\eta_t > 0$. Raising p^s obviously augments the expected productivity of an assessed candidate, hence: $\eta_p < 0$; the same holds for switching from recruitment channel towards advertisements, because a better channel is preferred when job requirements increase, as we discussed in the previous section. This implies $\eta_r < 0$.

Table 3 Comparative statics in a trainings subsidy scheme[a]

	partial derivative	comparative statics	DWL incidence
assessment costs	$\frac{\partial t^S}{\partial b} = \frac{1}{\Omega}\left(-\chi_t A + \chi_r B + \chi_p C\right)$	$\frac{\partial t^S}{\partial b} < 0$	–
production loss	$\frac{\partial t^S}{\partial b} = \frac{1}{\Omega}\left(-\varphi^*_t A + \varphi^*_r B + \varphi^*_p C\right)$	$\frac{\partial t^S}{\partial c} > 0$	+
recruitment channel costs	$\frac{\partial t^S}{\partial e} = \frac{1}{\Omega}\left(\zeta_r B\right)$	$\frac{\partial t^S}{\partial e} < 0$	–
labour market tightness	$\frac{\partial t^S}{\partial \theta} = \frac{c}{\Omega}\left(-\varphi^*_{t\theta} A + \varphi^*_{r\theta} B + \varphi^*_{p\theta} C\right)$	$\frac{\partial t^S}{\partial \theta} > 0$	+
Training costs	$\frac{\partial t^S}{\partial d} = \frac{1}{\Omega}\left(-\eta_t A + \eta_r B + \eta_p C\right)$	$\frac{\partial t^S}{\partial d} < 0$	–

[a]The conditions for a relative minimum ensure that Ω is positive, and that HC_{tt}, HC_{rr} and HC_{pp} are positive. We assume $HC_{pr} < 0$, $HC_{pt} > 0$, and $HC_{rt} < 0$ – see Welters (2005). In line with the analysis in Table 1 we continue to assume that direct effects on t^s dominate indirect effects via r or p^s on t^s, which implies $A > 0$, $B < 0$, and $C > 0$.

Where $A = \left[HC_{pp}HC_{rr} - (HC_{pr})^2\right]$, $B = \left[HC_{pp}HC_{rt} - HC_{rp}HC_{pt}\right]$,

$C = \left[HC_{rr}HC_{pt} - HC_{pr}HC_{rt}\right]$ and $\Omega = \left[HC_{tt}A - HC_{rt}B - HC_{pt}C\right]$.

While reducing the productivity standard leads to additional hiring costs in terms of required productivity upgrading, it might still pay off to decrease the productivity standard as it also yields revenues. These revenues are twofold. Reducing p^s decreases the failure rate of assessments, which reduces the average number of assessments needed to find a qualified candidate ($\chi_p > 0$). Moreover, this reduction in necessary assessments speeds up the recruitment procedure ($\varphi^*_p > 0$), which saves hiring costs in terms of foregone production.

Introducing training in our model complicates the derivation of partial derivatives needed to predict firm behaviour. Analogous to the analysis in Section 2, the expressions for $\partial t^s/\partial c$, $\partial t^s/\partial b$, $\partial t^s/\partial \theta$, $\partial t^s/\partial e$, and $\partial t^s/\partial d$ are found from minimizing the hiring cost function (3), using the implicit function theorem. The results are presented in Table 3, which is analogous to Table 1 above. Comparison of the results from both tables shows that our model also enables us to explore the differences between training subsidy schemes (tss) and general wage subsidy schemes (wss) in terms of deadweight loss incidence. It turns out that we expect the same results to hold for a training subsidy, though the introduction of training influences the magnitude of expected effects.

The signs of the partial derivatives still can be interpreted in an intuitively appealing way and lead to the following hypotheses.

The *modified assessment cost* hypothesis ($\partial t^s/\partial b|_{\text{wss}} < \partial t^s/\partial b|_{\text{tss}} \leq 0$): If assessment costs are high the effectiveness of using the screening device standard to manipulate hiring costs is low, as an increase in t^s triggers additional assessments. The alternative in a training subsidy scheme (lower p^s to reduce the failure rate of an assessment directly) indirectly improves the effectiveness of t^s to reduce hiring costs, since $HC_{pt} > 0$.[7] Therefore we expect that assessment costs have less impact in predicting the incidence of deadweight loss under a training subsidy scheme (tss) than under a general wage subsidy scheme (wss).

The *modified foregone production* hypothesis ($0 < \partial t^s/\partial c|_{\text{wss}} < \partial t^s/\partial c|_{\text{tss}}$): If costs of foregone production are high, the firm tries to fill the vacancy as quickly as possible. The effectiveness of shifting the screening device standard to manipulate hiring costs is high under such circumstances. The alternative in a training subsidy (lower p^s to speed up the recruitment process) indirectly improves the effectiveness of t^s to reduce hiring costs since $HC_{pt} > 0$. Therefore we expect that costs of foregone production have a stronger effect in predicting the incidence of deadweight loss under a training subsidy scheme than under a general wage subsidy scheme.

The *modified recruitment channel cost* hypothesis ($\partial t^s/\partial e|_{\text{wss}} = \partial t^s/\partial e|_{\text{tss}} < 0$): Since the mark-up function ζ is independent of p^s, introducing p^s as a recruitment instrument does not alter the firm's reaction in terms of changing r following a change in e. Consequently, a change in e does also not affect t^s differently in a training subsidy than in a general wage subsidy. Therefore we expect that the recruitment channel cost difference is equally important in predicting the incidence of deadweight loss under a training subsidy scheme as under a general wage subsidy scheme.

The *modified tightness* hypothesis ($0 < \partial t^s/\partial \theta|_{\text{wss}} < \partial t^s/\partial \theta|_{\text{tss}}$): If labour market tightness is high, the firm tries to augment the arrival rate of job seekers. The effectiveness of shifting the screening device standard to manipulate hiring costs is high under such circumstances ($\varphi_{t\theta} < 0$). The alternative under a training subsidy scheme (lower p^s to reduce the need to have a sufficiently large arrival rate) indirectly improves the effectiveness of t^s to reduce hiring costs since $HC_{pt} > 0$. Therefore we expect that the level of labour market tightness has a higher impact in predicting the incidence of deadweight loss under a training subsidy scheme than under a general wage subsidy scheme.

The *training cost* hypotheses ($\partial t^s/\partial d < 0$): if training costs increase, firms are reluctant to increase the screening device standard, which reduces the probability that such firms hire subsidized unemployed they would have hired in the absence of the subsidy. The indirect effects through r and p^s counteract each other and their net outcome is therefore not expected to dominate the direct effect.

4. British training subsidy

To test the hypotheses formulated in Section 3 we employ a British data set on firms participating in the NDYP. Like the NDLTU, the NDYP was established in Great Britain in 1997 and it focuses on the integration of unemployed into the labour market. The NDYP aims at improving labour market conditions for young people (aged between 18 and 25 years), who have been out of employment for at least six months. Unlike the NDLTU, the NDYP explicitly focuses on training. That is, a firm can only obtain the NDYP subsidy when it offers at least a six-month contract to an unemployed youngster for whom it develops a training plan aimed at an approved qualification. The subsidy is worth £750. Part of the subsidy is contingent on the development of the training plan; another part is contingent on the achievement of the qualification.[8]

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 NDYP and 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 1,538 employers were interviewed who had made use of the NDYP subsidy, who together provided subsidized employment for 3,330 long-term unemployed (more subsidies per employer was allowed). Missing data reduce the sample size we use to test our hypotheses to 2,848.

4.1 Description of the NDYP data

Table 4 summarizes the variables that we use in our analysis. Half of the firms that participate in the NDYP employ less than 10 employees. Firms employing more than 50 employees constitute 15% of participating firms. Most firms are single, independent firms. Though 1% is part of a larger international entity, but the single firm of that entity in the UK; 22% is part of a larger entity, which operates several firms in the UK. 60% of the firms experienced an increase in activities in the last twelve months. We distinguish twelve sectors (based on the Standard Industrial Classification 1992); sectors 'Retail, wholesale and hotels' and 'Public sector' together cover 42% of all subsidized employees.

Turning to the jobs, we observe that most subsidized jobs positions are classified as a medium or low occupational level job. To make this classification we rely on the Standard Occupational Classification 2000 (SOC2000).[9] Four out of five jobs are full time jobs (classified as 30 to 40 hours a week); nearly 10% of the jobs require more than 40 hours of work a week, which we consider overtime employment. Less than 6% of the jobs entail supervisory tasks. In 40% of all cases, the provided training origins from an existing training facility. Another 40% of the employers have never recruited a NDYP employee or an employee in general previous to the current hiring.

Table 4 Descriptive statistics NDYP data

Description / ind. variables	Description	Mean
Intensive search related variables		
Small firm	1=if a firm has 10 or less employees	0.46
Medium firm	1=if a firm has more than 10 but less than 51 employees	0.35
Large firm	1=if a firm has more than 50 employees	0.19
Autonomic firm	1= if a firm is not part of a larger entity	0.77
Autonomic firm in UK	1= if a firm is not part of a larger UK based entity	0.01
Firm being part of a larger UK entity	1= if a firm is part of a larger UK based entity	0.22
High occupational level	1= if required occupation is ‘managers and senior officials’, ‘professional occupations’ or ‘associate professionals and technical occupations’	0.06
Medium occupational level	1= if required occupation is ‘administrative and secretarial occupations’, ‘skilled trades occupations’ and ‘personal service occupations’	0.57
Low occupational level	1= if required occupation is ‘sales and customer service occupations’, ‘process, plant and machine operatives’ and ‘elementary occupations’	0.38
Extensive search related variables		
Supervision	1= if the job requires supervisory tasks	0.06
Part-time	1= if required hours worked for the vacancy are 30 per week or less	0.12
Full-time	1= if required hours worked for the vacancy are more than 30 but no more than 40	0.80
Overtime	1= if required hours worked for the vacancy are more than 40	0.09
Fast expansion	1= if the firm experiences fast expansion of activities	0.30
Slow expansion	1= if the firm experiences slow expansion of activities	0.30
Stable	1= if the firm experiences no expansion/decline of activities	0.32
Slow decline	1= if the firm experiences a slow decline of activities	0.06
Fast decline	1= if the firm experiences a fast decline of activities	0.02
Training related variables		

existing training	1= if NDYP employee was enrolled in an existing training scheme	0.39
modified existing training	1= if NDYP employee was enrolled in an existing, but modified, training scheme	0.07
new training	1= if NDYP employee was enrolled in a new training scheme	0.10
First NDYP recruit	1= if NDYP employee was the firm's first recruit in the scope of NDYP	0.23
First recruit in general	1= if NDYP employee was the firm's first recruit in general	0.20

Control variables

Gender	1= if NDLTU employee is male	0.76
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'	0.02
Wood, pulp and publishing	1= if firm sector is 'Wood, pulp and publishing'	0.04
Chemicals and rubber	1= if firm sector is 'Chemicals and rubber'	0.05
Metal products and machinery	1= if firm sector is 'Metal products and machinery'	0.06
Electrical machinery and motor vehicles	1= if firm sector is 'Electrical machinery and motor vehicles'	0.06
Construction and utilities	1= if firm sector is 'Construction and utilities'	0.14
Retail, whole-sale and hotels	1= if firm sector is 'Retail, wholesale and hotels'	0.21
Transport and communication	1= if firm sector is 'Transport and communication'	0.04
Banking and finance, and property	1= if firm sector is 'Banking and finance, and property'	0.10
Public sector	1= if firm sector is 'Public sector'	0.21

Variables related to socially desired answering

Contact with jobcentre	1= if employer had had contact with job centre about NDLTU participant	0.42

Availability of mentor	1= if employer appointed a mentor for the NDLTU employee	0.74

4.2 Deadweight loss construct

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 5, 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.[10] If yes, we obtain four degrees of deadweight loss. Table 5 shows that two third out 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 5 shows that the threat of deadweight loss is considerable within the NDYP.

The four degrees of deadweight loss allow for several configurations on how to define deadweight loss in the regression analysis. To ensure comparability to the NDLTU analysis in Welters and Muysken (2006b) we have selected the same configuration as we did in that paper. This configuration is a three-category ordinal construct, which is presented in brackets in Table 5, we label the three categories according to the likelihood of deadweight loss incidence: ‘none’, ‘potentially’, and ‘surely’.[11]

Table 5 Deadweight loss construction, NDYP

<table>
<tr><td></td><td colspan="6">Would the vacancy have existed in absence of the subsidy?</td></tr>
<tr><td rowspan="4">Would the same applicant have been recruited without the subsidy?</td><td>non-additional
applicant type</td><td>very likely</td><td>fairly likely</td><td>fairly unlikely</td><td>very unlikely</td><td>total (row)</td></tr>
<tr><td>same applicant</td><td>59.9%(2)</td><td>11.7%(1)</td><td>2.5%(1)</td><td>3.1%(1)</td><td>77,2%</td></tr>
<tr><td>different applicant</td><td>7.1%(0)</td><td>1.7%(0)</td><td>5.2%(0)</td><td>9.0%(0)</td><td>22.8%</td></tr>
<tr><td>total (column)</td><td>67.0%</td><td>13.4%</td><td>7.7%</td><td>12.1%</td><td>100.0 %</td></tr>
</table>

5. Empirical results on British training subsidy data

The ordinal structure of the dependent variable suggests we adopt ordered probit models in our analysis (McCullagh 1980). The ordered-probit model is

$$DWL_i^* = X_i \beta + \varepsilon_i \tag{4}$$

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

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 ordinal estimate of DWL incidence described in Table 5 for firm *i*; X_i is a vector of explanatory variables described in Table 4 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 5. Following Greene (2003), we present marginal effects. 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.

Finally, we control for socially desirable answering. 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 two explanatory variables in vector X_i, which are – like the deadweight loss estimate – vulnerable to socially desired answering. The two (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 and (2) had appointed a mentor who guided the subsidized employee. We conduct a t-test of the coefficients of both dummy variables, β_{mentor} and $\beta_{jobcentre}$, where we accept socially desired answering if $\beta_{mentor} < 0$ and / or $\beta_{jobcentre} < 0$.

Table 6 contains the marginal effects of the ordered probit regression. Since both the regressions for the NDYP and the NDLTU have the same structure, we present the marginal effects for every dummy variable for both schemes separately in a row (YP versus LTU). We can reject that $\beta_{mentor} < 0$ and / or $\beta_{jobcentre} < 0$ for NDLTU, which means that socially desired answering plays no major role in our analysis there. This is confirmed by the LR-test. We do find a positive effect of ‘contacts with the job centre’ on deadweight loss incidence. However, socially desired answering predicts a negative effect, which is at odds with our finding. Therefore we conclude that ‘socially desired answering’ does not play a role in the NDYP neither.

5.1 Modified assessment costs hypothesis

The modified assessment cost hypothesis predicts that assessment costs play a more important role in determining deadweight loss incidence in the general wage subsidy (NDLTU) than in the training subsidy (NDYP). The results show clear support for this hypothesis. For the NDLTU we find that large and medium sized firms end up significantly more often in the ‘surely’ deadweight loss incidence category than small firms. This pattern is not observed in the NDYP and the standard errors are small enough to confirm that firm size affects deadweight loss incidence in a general wage subsidy differently as compared to a training subsidy. We find a similar effect for firms being part of a larger UK entity. Such firms are more likely to cause deadweight loss in the NDLTU, but such patterns are not present in the NDYP.

The pattern does not hold for the third independent variable related to assessment costs: the occupational level of the job. Contrary to our expectations the impact on deadweight loss in a training subsidy is comparable to that in the case of a wage subsidy – this is not consistent with the modified assessment cost hypothesis. Possibly there is interference between the cost of training and the occupational level. If costs of training are higher for high occupational level jobs than for low occupational level jobs, the attractiveness to reduce the productivity standard for high occupational level vacancies is limited as that would lead to substantial training costs. Unfortunately – as will appear when analysing the training hypothesis – we do not have a proxy for the level of training costs that links these costs to occupational level and therefore we are not able to control for interference between occupational level and training costs.

5.2 Modified foregone production costs hypothesis

The modified foregone production hypothesis claims that the effect of foregone production on deadweight loss incidence should be more pronounced in a training subsidy than in a general wage subsidy. The 'hours worked' variable provides evidence to support the foregone production hypothesis in the NDYP. Part time employment leads to less and overtime employment to significantly more deadweight loss incidence in the NDYP. In the NDLTU these effects are less pronounced, as in this scheme only overtime leads to significant differences; not part time employment. This can be interpreted as weak evidence for the modified foregone production hypothesis. However, the standard errors are too large to draw any firm conclusions as to the validity of this hypothesis with respect to the difference between NYPD and NDLTU.

The same holds for the dummy variables 'supervision' and 'employment expansion'. Firms trying to fill a vacancy that includes supervisory tasks have a higher incidence of deadweight loss in the NDYP compared to firms participating in the NDLTU than firms filling vacancies without supervisory tasks. This is also found for firms experiencing fast activity growth compared to firms that are stable. However, the differences in the marginal effects are not large enough to reject the possibility that this a sample size effect instead of a true difference between the schemes.

5.3 The training hypothesis

To test the training hypothesis we need proxies for training costs. Costs *d* represent the costs of upgrading the productivity level of a chosen candidate, p_j, by one unit of productivity. In Table 6 we included the variable 'training provided' which indicates whether the firm enrolled the subsidized employee in an existing training programme, whether the firm modified an existing programme or developed a completely new training programme. The latter two options are more expensive than the first. We find evidence for the expected negative link between the incidence of deadweight loss and training costs. We expect training costs to be more substantial for firms who design a new training scheme than for firms who enrol the subsidized employee in an existing scheme. Consequently we expect the latter to cause more deadweight loss than the former two categories, which is what we find.

Table 6 Ordered probit regressions of deadweight loss in NDYP and NDLTU (marginal effects)

dependent variables / independent variables		Deadweight Loss Incidence None	Potentially	Surely
Assessment cost related variables:				
Large firm	YP	–0.01(0.02)	–0.00 (0.01)	0.01 (0.03)
	LTU	–0.11 (0.03)***	–0.03 (0.01)***	0.14 (0.04)***
Medium firm	YP	–0.03 (0.02)**	–0.01 (0.01)**	0.05 (0.02)**
	LTU	–0.12 (0.02)***	–0.03 (0.01)***	0.16 (0.03)***
Small firm		Reference	Reference	Reference
Firm being part of a larger UK entity	YP	0.02 (0.02)	0.01 (0.01)	–0.03 (0.02)
	LTU	–0.06 (0.03)*	–0.01 (0.01)*	0.07 (0.04)*
Autonomic firm in the UK	YP	–0.06 (0.07)	–0.02 (0.03)	0.08 (0.10)
	LTU	0.12 (0.18)	0.02 (0.01)	–0.13 (0.19)
Autonomic firm		Reference	Reference	Reference
High occupational level	YP	0.07 (0.03)*	0.02 (0.01)**	–0.08 (0.04)**
	LTU	0.10 (0.04)**	0.01 (0.00)***	–0.11 (0.05)**
Medium occupational level		Reference	Reference	Reference
Low occupational level	YP	–0.02 (0.02)**	–0.01 (0.00)**	0.05 (0.02)**
	LTU	0.01 (0.02)	0.00 (0.01)	–0.01 (0.03)
Foregone production related variables:				
Part time	YP	0.06 (0.02)**	0.02 (0.00)***	–0.08 (0.03)**
	LTU	0.02 (0.03)	0.00 (0.01)	–0.02 (0.03)
Full time		Reference	Reference	reference
Overtime	YP	–0.06 (0.02)***	–0.02 (0.01)**	0.08 (0.03)**
	LTU	–0.09 (0.03)***	–0.03 (0.01)**	0.12 (0.04)***
No supervision		reference	Reference	reference
Supervision	YP	–0.07 (0.02)***	–0.02 (0.01)**	0.09 (0.04)**
	LTU	–0.05 (0.03)	–0.01 (0.01)	0.06 (0.04)
Activities: fast expansion	YP	–0.06 (0.02)***	–0.02 (0.01)***	0.08 (0.02)***
	LTU	–0.02 (0.03)	–0.00 (0.01)	0.02 (0.04)
slow expansion	YP	–0.02 (0.02)	–0.01 (0.01)	0.03 (0.02)

		LTU	0.02 (0.03)	0.00 (0.01)	–0.03 (0.03)
	stable		reference	Reference	Reference
	slow decline	YP	0.01 (0.03)	0.00 (0.01)	–0.02 (0.04)
		LTU	–0.06 (0.04)	–0.02 (0.01)	0.07 (0.06)
	fast decline	YP	0.07 (0.05)	0.02 (0.01)*	–0.08 (0.06)
		LTU	0.10 (0.09)	–0.01 (0.01)**	–0.12 (0.09)
Training cost related variable:					
Provided existing training programme			Reference	Reference	reference
Modified existing training programme		YP	0.02 (0.03)	0.01 (0.01)	–0.03 (0.04)
Provided new training programme		YP	0.06 (0.03)**	0.01 (0.01)***	–0.08 (0.03)**
First recruit NDYP		YP	0.00 (0.02)	0.00 (0.01)	–0.00 (0.02)
First recruit in general		YP	–0.01 (0.02)	–0.00 (0.01)	0.01 (0.02)
Control variables:					
Male			reference	Reference	reference
Female		YP	0.03 (0.02)	0.01 (0.01)	–0.03 (0.02)
		LTU	0.05 (0.03)	0.01 (0.01)	–0.06 (0.04)
Agriculture, forestry and fishing		YP	–0.04 (0.04)	–0.01 (0.01)	0.05 (0.05)
		LTU	–0.05 (0.05)	–0.01 (0.02)	0.07 (0.07)
Food, beverages and tobacco		YP	–0.14 (0.03)***	–0.07 (0.02)***	0.21 (0.05)***
		LTU	0.12 (0.09)	0.02 (0.01)***	–0.14 (0.09)
Textile, wearing apparel and leather		YP	–0.09 (0.04)**	–0.04 (0.02)*	0.13 (0.05)
		LTU	–0.11 (0.07)	–0.03 (0.03)	0.14 (0.10)
Wood, pulp and publishing		YP	–0.07 (0.03)**	–0.03 (0.02)*	0.09 (0.05)**
		LTU	0.01 (0.06)	0.00 (0.01)	–0.01 (0.08)
Chemicals and rubber		YP	–0.06 (0.03)**	–0.02 (0.01)	0.09 (0.04)
		LTU	–0.06 (0.06)	–0.02 (0.02)	0.08 (0.08)
Metal products and machinery		YP	–0.03 (0.03)	–0.01 (0.01)	0.05 (0.04)
		LTU	–0.15 (0.04)***	–0.05 (0.02)***	0.21 (0.05)***
Electrical machinery and motor vehicles		YP	0.02 (0.03)	0.01 (0.01)	–0.02 (0.04)
		LTU	0.00 (0.06)	0.00 (0.01)	–0.00 (0.07)
Construction and utilities		YP	0.02 (0.02)	0.01 (0.01)	–0.03 (0.03)
		LTU	–0.00 (0.04)	–0.00 (0.01)	0.00 (0.04)
Retail, wholesale and hotels			reference	reference	Reference

Transport and communications	YP	–0.02 (0.03)	–0.01 (0.01)	0.03 (0.05)
	LTU	–0.12 (0.04)***	–0.04 (0.02)**	0.16 (0.06)***
Banking and finance, and property	YP	–0.02 (0.03)	–0.01 (0.01)	0.03 (0.03)
	LTU	0.02 (0.04)	0.00 (0.01)	–0.02 (0.05)
Public sector	YP	0.02 (0.02)	0.00 (0.01)	–0.02 (0.03)
	LTU	0.06 (0.04)*	0.01 (0.01)**	–0.08 (0.04)*
Socially desirable answering:				
Contact with jobcentre	YP	–0.03 (0.01)**	–0.01 (0.00)**	0.04 (0.02)**
	LTU	–0.03 (0.02)	–0.01 (0.01)	0.04 (0.03)
No contact		Reference	Reference	Reference
Availability of a mentor	YP	0.01 (0.02)	0.00 (0.00)	–0.01 (0.02)
	LTU	0.01 (0.02)	0.00 (0.00)	–0.01 (0.03)
No mentor		reference	reference	reference
Model selection:		BM	BM + UFV	BM+UFV+IS
Base Model (BM)	YP	X	37.48***	59.34***
	LTU	X	17.27***	66.05***
BM + intensive search (IS)	YP	15.92***	X	43.42***
	LTU	49.19***	X	16.86**
BM + IS + urgency to fill a vacancy (UFV)	YP	59.34***	21.85***	X
	LTU	66.05***	48.78***	X
Training cost related variable	YP			8.24*
Socially desired answering	YP			4.66*
	LTU			1.92
LR chi-square (total model)	YP	126.89***		
	LTU	115.87***		
Log Likelihood	YP	–2,642		
	LTU	–1,214		
N	YP	2,848		
	LTU	1,353		

Standard errors in parentheses
*Statistically significant at the 0.10 level, ** at the 0.05 level, *** at the 0.01 level

Finally, Table 6 contains joint significance tests, to test the relevance of the assessment cost related variables and foregone production related variables as separate groups in both models, indicated by IS and UFV, respectively. The findings are indicative for our results. Assessment costs play a more important role in explaining deadweight loss incidence in a general wage subsidy than in a training subsidy. The reverse holds for costs of foregone production. Finally, training costs related variables are weakly significant in explaining DWL.

6. Conclusion

In this paper we have explored employer search behaviour in a training subsidy scheme (NDYP) and compared the results to employer behaviour in a general wage subsidy scheme (NDLTU). Our theoretical model suggests that the role assessment costs play in explaining the incidence of deadweight loss is more important in a wage subsidy scheme than in a training subsidy scheme. The training option persuades firms that are hesitant to recruit from long-term unemployed to overcome their reservations, as the risks of such a strategy (prolonged assessment procedures) are covered by the training option. This eliminates any expected difference in deadweight loss incidence between firms that face high (small, autonomous firms) or low assessment costs (small firms, part of a larger entity or large firms). The empirical results found in this paper confirm this view. Assessment costs explain the incidence of deadweight loss in a wage subsidy, and only marginally its incidence in a training subsidy.

Furthermore, our theoretical model predicts that costs of foregone production play a more important role in a training subsidy scheme than in a wage subsidy scheme. In a wage subsidy, costs of foregone production raise the urgency to fill that vacancy and hence firms take long-term unemployed into consideration. The drawback of a quick decision making process is prolonged assessment procedures because of recruitment failures. The availability of the training option covers this drawback, which makes firms more willing to recruit from long-term unemployed if foregone production is high (overtime vacancy, fast activity expansion). The empirical analysis provides some support for this prediction, but is not conclusive.

Finally, if training costs are high, firms are reluctant to recruit from job seekers who are likely to need training: the long-term unemployed. The empirical analysis supports this prediction. Firms having low training costs (firms that enrol long-term unemployed in existing internal training facilities) are more likely to recruit from long-term unemployed.

The comparison between the general wage and the training subsidy shows that the fear of prolonged and consequently expensive assessment procedures when recruiting from long-term unemployed plays a pivotal role in employers' hesitance to recruit from them. To improve the employment prospects of long-term unemployed, the employment offices' job search assistance programmes should be targeted at employers that are willing to employ from long-term unemployed. That is, the focus should be on firms that have low assessment cost (small firms which are part of a larger conglomerate, or large firms in general) if the vacancy requires little training, or on firms that have internal training facilities and simultaneously have some urgency in filling their vacancy (firms experiencing fast activity growth or overtime) if the vacancy requires substantial training.

If the government decides to augment its job search assistance with training or wage subsidies, these programmes should be focused at the remainder of the employer pool, i.e. small single firms and firms without training facilities, to avoid deadweight loss. Of course one has to balance between the costs of fine-tuning the subsidy targets and the costs of deadweight loss, but we hope that our analysis will help to make at least some specific targeting possible.

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[3] Signs below arguments indicate the sign of the (partial) derivative. Partial derivatives of a variable x with respect to t^s are for the sake of simplicity denoted by x_t.

[4] However, at the same time, the increase in 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 an increase in t^s, which is the result of a higher applicant arrival rate. Formally. $\varphi^*_t < 0$, where $\varphi^* = \chi\varphi$.

[5] The expressions for $\partial t^s/\partial c$, $\partial t^s/\partial b$, $\partial t^s/\partial \theta$ and $\partial t^s/\partial e$ are found from minimizing the hiring cost function (1) with respect to t^s and r, using the implicit function theorem.

[6] We assume $HC_{tr} < 0$, because a higher r increases the average quality of the applicants and as a result increases the success rate of the assessment. The negative effect of raising t^s on applicant's quality and subsequently on the success rate of the assessment therefore declines for a higher value of r, which makes raising t^s more effective to reduce hiring costs.

[7] We assume $HC_{pt} > 0$. Since the average productivity of arriving applicants reduces when the screening device standard is less strict, raising the productivity standard – at higher levels of t^s – leads to a higher increase in the number of assessment failures than for low levels of t^s.

[8] Next to the training subsidy, firms participating in the NDYP also receive a weekly subsidy (£60) for providing employment. This subsidization lasts 6 months.

[9] We narrow down the nine standard categories 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'.

[10] Though there can be no deadweight loss, substitution is quite possible. If the employer evinces that the job would have existed without the available subsidy, but would have been filled with a non-target group member, the subsidy leads to substitution of a target group member for a non-target group member. In this paper we concentrate on deadweight loss and leave the analysis of substitution effects aside.

[11] In Welters and Muysken (2006b) we found that using different configurations of DWL did not alter the empirical findings substantially.