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ABSTRACT

Effort-Based Career Opportunities and Working Time*

In this paper we describe the hypothesis of effort-based career opportunities as a situation in which profit maximizing firms create incentives for employees to work longer hours than the bargained ones, by making career prospects dependent on working hours. When effort-based career opportunities are effective, they raise working time and output per worker reducing workers' utility. A first attempt is made to empirically estimate the relationship between hours worked and the expected opportunities of promotion using the British Household Panel Survey data set. Our analysis shows that the perceived probability of promotion increases with working time and that this result is robust to various econometric specifications.

JEL Classification: J22, J23, J50, M12

Keywords: bargaining, career, personnel management, promotion, welfare, working time

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1 Introduction

In a recent paper Bell and Freeman (2001) explain the differences in hours worked between the US and Germany by the different levels of earnings inequality of the two countries. The authors, using cross-section data, find a positive correlation between earnings inequality at the occupational level and hours worked. Using longitudinal data, they also find that hours worked raise both future wages and actual (in the US) or perceived (in Germany) promotion prospects. As Bell and Freeman (2001) note there might be several competing explanations for the work hours-future earnings relationship that is found at the empirical level: 1) human capital theory, according to which hours worked are an investment in future earnings (on the job training, see Becker 1963); 2) tournament/incentive models (see for instance Lazear and Rosen, 1981, Nalebuff and Stiglitz, 1983, and Landers, Rebitzer and Taylor, 1996); 3) some underlying 'third' factor, such as unobserved individual ability or effort, which simultaneously affects both working hours and future earnings. The authors also maintain that the positive relationship between working hours and the probability of promotion is not necessarily a prediction of human capital models and is more in line with tournament/incentive models, even though it might still be subject to the third explanation above.

In the present paper, we build on the hypothesis advanced by Bell and Freeman (2001), in the following way:

1. we present a simple theoretical model that provides a possible reason why firms might prefer longer working hours than those bargained or desired by workers and use effort-based career opportunities to incentivate employees to work longer hours. In such schemes employees' probability of promotion is directly linked to the number of hours worked;

2. we use longitudinal UK data to empirically investigate the relationship between hours worked and the probability of promotion as perceived by employees. With respect to Bell and Freeman (2001), who analyzed Germany and the US, we focus on UK data and use panel data

estimators.

2 The model

We assume that workers live for two periods.[1] In the first period they are hired by a firm in a low skilled position, whereas in the second period they may be promoted to a high skilled position or remain in the same position.[2] In what follows, we shall often refer to jobs and positions interchangeably. We shall also refer to skilled workers and unskilled workers, referring to workers filling skilled and unskilled positions, respectively.

We make the following assumptions:

1. unions and firms bargain over hourly wages (and working hours) both for unskilled and skilled workers;

2. workers cannot change the workplace without incurring costs because of specific human capital, mobility costs, absence of a continuum of jobs;

3. because of a perfect complementarity between low and high skilled jobs, only a fixed proportion $\overline{p}$ of low skilled workers is promoted to the high level position;

4. high skilled workers' productivity is higher than low skilled workers' productivity;

5. workers' utility function is additively separable into labor income and working time.

[1] Considering an infinite time horizon we obtain qualitatively the same results, but with more complex algebra.

[2] We make this assumption since here we are mainly interested in internal labor markets, i.e. markets where workers are hired in entry level jobs and higher levels are filled from within. A possible reason is reported in Siow (1994): firms might have high hiring costs for recruiting skilled workers and they offer promotion opportunities in internal labor markets. Other possible reasons for the emergence of internal labor markets are reviewed in Lazear and Oyer (2004).

2.1 Bargaining

We assume a utility function of the type: $U_j = R(w_j \cdot h_j) - g(h_j)$, where w_j is hourly wage and h_j are working hours, $R(w_j \cdot h_j)$ the utility of labor income and $g(h_j)$ the disutility of work. The index j is used to indicate the two positions that a worker can fill: the unskilled job ($j = U$) and the skilled one ($j = S$).[3]

Firms' profits are given by: $\pi_j = z_j y(h_j) - w_j h_j$, where $z_j y(h_j)$ is the total revenue function.[4] Thereafter, we shall not indicate the index j unless necessary. We obtain immediately the hours demand function $w = zy'(h)$ and the hours supply function $wR'(w \cdot h) = g'(h)$, where x' indicates the first derivative of the variable x with respect to its argument and x'' the second derivative. The intersection between the two functions gives the competitive market equilibrium ($zy'(h) = \frac{g'(h)}{R'(w \cdot h)}$). In what follows we assume risk neutral or risk adverse individuals and increasing marginal disutility of working hours.

Bargaining may give rise to different outcomes, whose 'extreme' cases are those in which one of the social parts (firms or workers) acts as a Stackelberg leader, incorporating the reaction function of the other.

If firms act as leaders, they maximize profits under the constraint of the labor supply function, $w = \frac{g'(h)}{R'(w \cdot h)}$, so that $\pi = zy(h) - \frac{g'(h)}{R'(w \cdot h)} h$. It is easy two show that the first order condition gives: $zy'(h) = w + \frac{g''(h)R'(wh) - R''(wh)g'(h)}{[R'(wh)]^2} h$. For $g''(h) > 0$ and risk adverse or neutral individuals, the marginal productivity of working time is higher than the hourly wage. Therefore profit maximizing firms would prefer longer working hours than the ones supplied by workers.

If workers act as leaders working hours will be chosen along the hours demand function. By definition, in this case the wage equates the marginal productivity of labor and there is no space for "constrained firms". This is a case where effort-based career opportunities are no longer required[5] and

[3] For the moment we exclude any form of heterogeneity across workers in the parameters of the utility or profit functions. However, workers' heterogeneity will be reintroduced in the empirical model.

[4] We are implicitly assuming that hourly wage is independent of working hours.

[5] Unless career opportunities represent also an incentivating device in a framework with

it will not be considered in the following paragraphs.

In order to reach more meaningful results, in the next section we analyze a bargaining process between social parts considering two different hypotheses on bargaining: the efficient bargaining model, where firms and workers bargain over both wages and hours worked, and a 'right to manage' model, where they bargain over wages whereas the working time is freely chosen by workers.

2.1.1 Efficient bargaining

Hourly wage and working hours are chosen following Nash bargaining. Hence, firms and workers maximize the following expression:

$$\underset{w,h}{max}\ \Lambda \equiv [zy(h) - wh]^{1-\mu}[R(w \cdot h) - g(h) - \Omega]^{\mu} \tag{1}$$

where μ is the contractual strength of workers and Ω indicates workers' reservation utility.

The first order conditions, respectively with respect to w and h, can be written as:

$$\frac{1-\mu}{\mu} \quad \frac{R(w \cdot h) - g(h) - \Omega}{zy(h) - wh} = R'(w \cdot h)$$

$$\frac{1-\mu}{\mu} \quad \frac{R(w \cdot h) - g(h) - \Omega}{zy(h) - wh} = \frac{g'(h) - wR'(w \cdot h)}{zy'(h) - w}$$

Equating the two right hand-sides of the FOCs we obtain the *contract curve*:

$$R'(w \cdot h) = \frac{g'(h)}{zy'(h)} \tag{2}$$

Wages and working hours must lie alongside the contract curve[6]. In order to obtain wages, we substitute the contract curve in the first FOC. Thereafter, we suppose that the functions $R(w \cdot h), y(h), g(h)$ have constant

imperfect monitoring on workers' effort; this possibility exists, but it requires a different approach from the bargaining one that we develop here.

[6] In the (w, h) space, the contract curve is downward sloping for risk adverse individuals. Indeed, by totally differentiating the contract curve we obtain $\frac{dw}{dh} = \frac{z[y''(h)R'(w \cdot h) + y'(h)R''(w \cdot h)w] - g''(h)}{zy'(h)R''(w \cdot h)h}$, which is obviously a vertical line for risk neutral workers (because R' becomes a constant parameter).

elasticities, ϵ_R, ϵ_y, ϵ_g, respectively, and that $\epsilon_g > \epsilon_y$. After some algebraic steps, the first FOC becomes:

$$w = \frac{\frac{1-\mu}{\mu}\frac{1}{\epsilon_g}\left(1+\frac{\Omega}{g(h)}\right)+\frac{1}{\epsilon_y}}{\frac{1-\mu}{\mu}\frac{1}{\epsilon_R}+1} zy'(h) \equiv \theta^{EB} zy'(h) \tag{3}$$

Let us call equation (3) the *wage curve* because it indicates the wage level emerging from bargaining for each level of working hours. The whole solution of the model is obviously given by equating equation (2) with (3) and can be obtained with some simplifying assumptions. Our main interest is not to solve the model, but to investigate the conditions which make firms "constrained" on working hours, that is the conditions which make the marginal productivity of working hours higher than the hourly wage, i.e. $zy'(h) > w$. From equation (3) this happens if $\theta^{EB} < 1$ which can be written as:

$$\frac{1-\mu}{\mu}\frac{1}{\epsilon_R \epsilon_g}\left[\epsilon_g - \epsilon_R\left(1+\frac{\Omega}{g(h)}\right)\right] > \frac{1-\epsilon_y}{\epsilon_y} \tag{4}$$

The term in square brackets is always positive if $zy'(h) > w$ holds.[7]

Therefore, solving for μ in equation (4), we can state that firms are "constrained" in working hours ($zy'(h) > w$) if workers bargaining power is lower than a critical value which, in turn, is lower than unity:

$$\mu < \left[1 + \frac{\frac{1-\epsilon_y}{\epsilon_y}}{\frac{1}{\epsilon_R} - \left(1+\frac{\Omega}{g(h)}\right)\frac{1}{\epsilon_g}}\right]^{-1} < 1 \tag{5}$$

In this case, firms prefer a higher working time than the bargained one and they could use effort-based promotion schemes in order to induce workers to work longer hours.[8]

[7] Indeed, this term is positive if $\frac{\epsilon_g}{\epsilon_R} > \frac{\Omega+g(h)}{g(h)}$. Given that Ω is the outside option $\Omega < R(w \cdot h) - g(h)$ must hold for every bargained wage and working hours. Substituting $R(w \cdot h) - g(h)$ for Ω in the right hand-side of the previous equation, we obtain the sufficient condition: $\frac{\epsilon_g}{\epsilon_R} \geq \frac{R(w \cdot h))}{g(h)}$. Substituting the definition of the elasticities, $\frac{\frac{hg'(h)}{g(h)}}{\frac{whR'(w \cdot h)}{R(wh)}} \geq \frac{R(w \cdot h)}{g(h)}$; therefore $g'(h) \geq wR'(w \cdot h)$. Using the contract curve of equation (2) to substitute $R'(w \cdot h)$, the condition becomes $zy'(h) \geq w$, which is precisely the condition we are looking for.

[8] As observed by Naylor (2002), a firm can force workers off their labor supply curve thanks to its degree of monopsonistic power, which in turn can originate from the absence

2.1.2 Right to manage

Workers choose working time along their *labor supply function*, obtained by maximizing their utility at a given wage:[9]

$$g'(h) = wR'(w \cdot h). \tag{6}$$

The bargaining problem becomes:

$$\max_{w} \; [zy(h(w)) - wh(w)]^{1-\mu}[R(w \cdot h(w)) - g(h(w)) - \Omega]^{\mu}$$

where $h(w)$ is implicitly defined by the *labor supply function* of equation (6).

Differentiating with respect to w and rearranging terms, we obtain the *wage curve*:

$$w = \frac{\frac{1-\mu}{\mu}\frac{1}{\epsilon_g}\left(1 - \frac{\epsilon_R}{\epsilon_g - \epsilon_R}\frac{\Omega}{g(h)}\right) + \frac{1}{\epsilon_y}}{\frac{1-\mu}{\mu}\frac{1}{\epsilon_R}\left(1 - \frac{\epsilon_R}{\epsilon_g - \epsilon_R}\frac{\Omega}{g(h)}\right) + 1} zy'(h) \equiv \theta^{RM} zy'(h) \tag{7}$$

Also in this case we investigate the condition under which $w < zy'(h)$, which is equivalent to solving for $\theta^{RM} < 1$ from equation (7). After some algebraic steps, we obtain exactly the same condition of equation (4) where, also in this case, the term in the square brackets is always positive (see note 7, substituting the hours supply function $g'(h) = wR'(w \cdot h)$).

Therefore, also in the right to manage case the conclusion concerning the willingness of firms to increase working hours above the bargained ones holds if condition (5) is met.

Remark 1 *If the workers' bargaining power is below a given level, firms prefer longer working hours than the bargained ones both in the case of efficient bargaining and in the case of working time decided unilaterally by workers.*

of a continuum of jobs, the presence of search and mobility costs, or firm-specific skills. In this regard, Stewart and Swaffield (1997), using BHPS data, found that age-specific regional unemployment (a proxy for labor market tightness and absence of a continuum of jobs) has a significant positive effect on working hours. We shall see that in some circumstances by linking promotion opportunities to working hours, i.e. by introducing what we call effort-based promotion schemes, firms can rise their profits, and this is another reason why they may mainly fill the skilled positions using internal labor markets.

[9] We do not consider here the case of right to manage model in which firms decide unilaterally working time, since in this case firms are not constrained in terms of working hours and there are no reasons to introduce effort-based promotion schemes.

2.1.3 A synthesis

In figure 1 we present a case where the condition (5) is met, so that firms would prefer longer working hours at the given hourly wage[10]. Therefore, the *wage curve* (equation (3) or (7)) is below the labor demand curve. We show graphically the outcome of bargaining in the two cases outlined above. The intersection between the *wage curve* and the labor supply gives the (not Pareto efficient) equilibrium in the right to manage case (RTM), whereas the intersection between the *wage curve* and the contract curve gives the (Pareto efficient) equilibrium in the case of efficient bargaining (EB; the points UL and FL indicate the case of union leader and firm leader, respectively)[11].

Note that, as Naylor (2002) pointed out, in the EB case employees work longer hours than the desired ones at the current wage, i.e the EB equilibrium is on the right of the labor supply curve. Both in the EB and RTM cases the equilibrium is on the left of the labor demand curve: if firms were able to persuade workers to work longer hours at the given bargained hourly wage they would increase their profits at the expenses of workers' utility.

2.2 The effects of effort-based career opportunities

Let us now consider the case in which firms, once the work contract has been signed, prefer longer working hours than the bargained ones (condition 5 is met) and use effort-based promotion schemes as a device to incentivate workers, who are always better off in the skilled position than in the unskilled one since we assumed that $z_S > z_U$ (assumption 4 in section 2).[12]

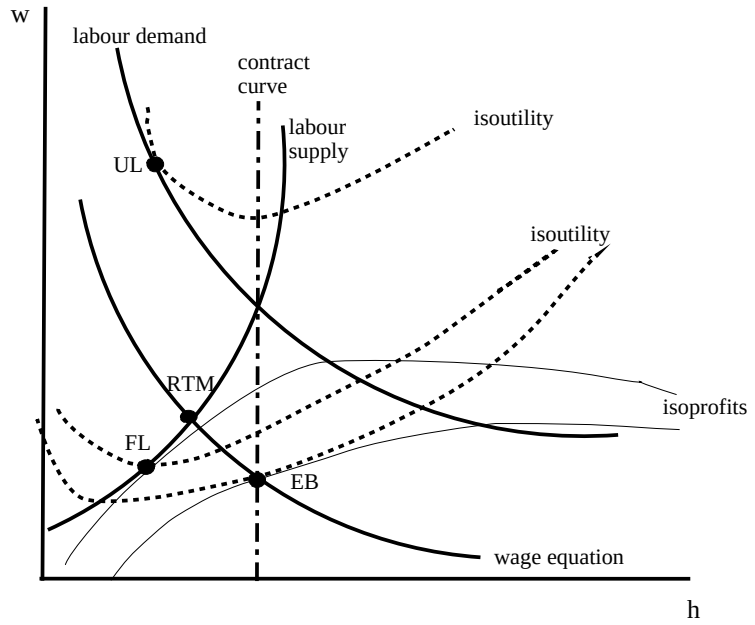
[10] The figure considers the case of risk neutral workers, with a vertical contract curve.

[11] In the simplified case in which workers are risk neutral ($\epsilon_R = 1$) and the outside option is zero ($\Omega = 0$) the optimal values in the efficient bargaining model are: $h^* = \left(\frac{\epsilon_y z}{\epsilon_g}\right)^{\frac{1}{\epsilon_g - \epsilon_y}}$ and $w^* = \epsilon_y z \left(\frac{1-\mu}{\epsilon_g} + \frac{\mu}{\epsilon_y}\right) h^{*(\epsilon_y - 1)}$, whereas results for the right to manage are $h^* = z\left(\frac{\epsilon_y(1-\mu)+\epsilon_g\mu}{\epsilon_g^2}\right)^{\frac{1}{\epsilon_g-\epsilon_y}}$ and $w^* = \epsilon_g \left(\frac{1}{h^*}\right)^{1-\epsilon_g}$.

[12] By totally differentiating equation (1) with respect to z and using the envelope theorem we obtain: $\frac{d\Lambda^*}{dz} = (1-\mu)\frac{\frac{\partial \pi^*}{\partial z}}{\pi^*} = (1-\mu)\frac{y(h^*)}{\pi^*}$ which is surely positive. So that Λ must increase with z. In the EB model we can write the first FOC as:

$$U(w,h) = \frac{1-\mu}{\mu} R'(w,h)\pi(w,h,z)$$

Figure 1: Bargaining



Legend: EB Efficient bargaining equilibrium; RTM right to manage equilibrium; UL Union leader Stackelberg equilibrium; FL Firm leader Stackelberg equilibrium.
Note. The figure depicts the case of risk neutral workers.

We are considering a situation (EB case) in which, in a first stage, bargaining between trade unions and firms defines the wage rate and the standard working hours, whereas, in a second stage, each worker can freely choose her overtime hours.

For the sake of simplicity, we assume that the effort-based promotion schemes take the form of rank-order tournaments à la Lazear and Rosen

In the case of risk neutral individuals $R'(w,h) = constant$, i.e. the derivative of the utility function with respect to the parameter z has the same sign of the derivative of the profit function, so, given the previous result that Λ is increasing in z, both utility and profits must grow with z.
It can be shown that workers are always better-off in the skilled position also in the case of risk adverse workers (the proof is available upon request from the authors).

(1981) and focus here on the case of two workers, one of which must be promoted by a firm. Firms promote the worker with the larger working time, i.e. h_i, while if workers work the same amount of hours promotion is random. As in Lazear and Rosen (1981) we assume that each worker is not able to observe the working time of her opponent, or that she does not know her opponent, and consequently she plays against the "market". Worker's i actual working hours (h_i^a) are defined by:

$$h_i^a = h_i + e_i \tag{8}$$

where h_i is the working time chosen by the worker and e_i a stochastic term, determined for instance by workers' health status.

Let us indicate with 1 and 2 the subscripts for the two workers. The probability that worker 1 is promoted, i.e. she wins the tournament, is given by:

$$p_1 = Pr(h_1^a > h_2^a) = Pr(h_1 - h_2 > e_2 - e_1) = Pr(h_1 - h_2 > e) = F(h_1 - h_2) \tag{9}$$

where $e = e_2 - e_1$ and $F(\cdot)$ is the cumulative distribution function of e. We define $f(\cdot)$ as the density function of e.

Let us define U_U and U_S the single period expected utility of workers in unskilled and skilled jobs, respectively and $\Delta U = U_S - U_U$.[13]

With *career opportunities based on working time*, the life-time expected utility of the unskilled worker 1 (V_1) is:

$$V_1 = R(w^B h_1) - g(h_1) + \beta\left[F(h_1 - h_2)\Delta U\right] + \beta[w^B h^B - g(h^B)] \tag{10}$$

where β is the discount factor, w^B the wage emerging from bargaining (given by the solution of equations (2) and (3) in the EB case or equations (6) and (7) in the RTM one.) and the last term indicates that an unskilled worker in the second period works precisely the bargained hours.

The choice variable for the unskilled worker 1 is h_1: she can choose to work longer hours than the bargained ones (which we label as h^B, solution

[13]Given that in the second period workers have no longer the incentive to work longer hours, since promotion is not possible any more, they will work the number of hours bargained (or preferred). Then, ΔU does not depend on h_1 and turns out to be increasing in z_S and decreasing in z_U.

of equations (2) and (3) or (6) and (7)) choosing a working time of h_1^*, so that $h_1^* \geq h^B$ must always hold.

Maximizing the life-time expected utility with respect to working hours of worker 1 (h_1), we obtain:

$$g'(h_1) = R'(w^B h_1)w^B + \beta \frac{\partial F(h_1 - h_2)}{\partial h_1} \Delta U \tag{11}$$

which defines h_1^*, the working time that is chosen if effort-based promotion schemes are used by firms. Following Lazear and Rosen (1981), we use here the Nash-Cournot assumption that each worker considers the working hours of her opponent as given, since she plays against the market. Therefore:

$$\frac{\partial F(h_1 - h_2)}{\partial h_1} = f(h_1 - h_2) > 0, \tag{12}$$

which is equivalent to saying that workers with longer working hours expect a higher probability of promotion.

We wonder if this working time is higher than the bargained one.

In the EB case[14], depending on:

- the value of ΔU, therefore on the "tournament prize", which we label the as "skill premium", i.e. the increase in the single period utility gained from promotion;
- the increase in the probability to be promoted with respect to working hours, $f(h_1 - h_2)$, therefore on the way firms have proposed the promotion scheme;

we obtain that the working time that workers actually choose may be higher than or equal to the bargained one.[15] Therefore, effort-based promotion

[14]Comparing equation (11) with the contract curve (equation (2)) a sufficient but non necessary condition in order to have $h_1^* > h^B$, so that $g'(h_1^*) > g'(h^B)$ is:

$$R'(w^B h_1^*)w^B > R'(w^B h^B)zy'(h^B) = R'(w^B h^B)\frac{w^B}{\theta^{EB}}$$

where the right-hand-side is obtained from equation (3). This condition is never met. But we were dealing with a sufficient non necessary condition. Hence, the working time workers choose considering the career opportunities may be equal or higher than the bargained one.

[15]Graphically, this result depends on the fact that in efficient bargaining, working hours are higher than the desired ones (the point EB in figure 1 is on the right of the hours supply function).

schemes are not necessarily always effective in increasing working hours.

In the RTM case, we can substitute the hours supply function of equation (6) into equation (11), to obtain:

$$R'(w^B h^B)w^B - R'(w^B h_1)w^B = \beta f(h_1 - h_2)\Delta U \tag{13}$$

then suppose that $h_1^* = h^B$, so that workers prefer a working time not higher than the bargained one. In this case the left-hand-side is zero whereas the right-hand-side is positive. Therefore, $h_1^* > h^B$ must hold: in the right to manage model we can state that an effort-based promotion scheme always raises working time.

Remark 2 *When partners act according to the RTM and firms use* effort-based promotion schemes *employees always prefer to work longer hours than the bargained ones.*

Considering equation (11) we can state that:

Remark 3 *When* effort-based career opportunities *are effective, working hours depend positively on the responsiveness of the probability of promotion to working time ($f(h_1 - h_2)$) and the increase in utility if promoted (ΔU).*

2.3 Welfare effects and workers' cooperation

Assume the results of remarks 1 and 3 hold. If all workers are assumed to behave in the same way, each of them decides her working hours in the way described by equation (11). When a Nash equilibrium exists,[16] simmetry implies that $h_1 = h_2 = h$, i.e. all employees work the same amount of hours. Hence, the probability to be promoted is for every worker at its 'natural' level ($p_1 = p_2 = 1/2$), but employees work longer hours than the ones each of them would have chosen in the absence of effort-based incentives.

Nevertheless, none of them can reduce her working hours below the one described by equation (11) without incurring in a reduction of the promotion probability.

In terms of game theory, if promotion schemes are effective, the equilibrium described by equation (11) is a not Pareto-efficient Nash-equilibrium.

[16] See Lazer and Rosen (1981, p. 845) on the existence of such an equilibrium.

Table 1: Worker's expected utility

		Worker 1	
		cooperate	non cooperate
Worker 2	cooperate	$V_1^{B,B}$, $V_2^{B,B}$	$V_1^{*,B}$, $V_2^{B,*}$
	non cooperate	$V_1^{B,*}$, $V_2^{*,B}$	$V_2^{*,*}$, $V_2^{*,*}$

To show this result, consider a firm with two workers. Let us call $V_1^{\kappa\upsilon}$ the expected utility of worker 1 who plays the strategy κ when worker 2 plays υ, where κ and υ represent two possible strategies: choosing bargained hours (h^B, which we define cooperative behavior) or choosing hours considering effort-based opportunities (h^*, which we define non-cooperative behavior).

It should be clear that, if remarks 3 holds, worker 1 prefers to work h^* hours regardless the behavior of the other worker, i.e. $V_1^{*\upsilon} > V_1^{B\upsilon}$ for $\upsilon = *, B$. We can therefore state that $V_1^{*B} > V_1^{BB}$ and that $V_1^{**} > V_1^{B*}$. Furthermore, consider equation (10): in the case workers choose the same behavior, the probability to be promoted is $p_1 = p_2 = 1/2$. Therefore, from equation (10) we can write:

$$V_1^{BB} - V_1^{**} = R(w^B h^B) - g(h^B) - [R(w^B h^*) - g(h^*)], \quad with \quad h^* > h^B$$

But in the case of the RTM model h^B is alongside the labor supply curve, so it must be the optimal working time given the wage w^B; in the case of EB model (with $zy'(h) > w$) bargained working hours must lie on the right of the labor supply curve (see figure 1), so that workers would prefer lower working hours than the bargained ones: $V_1^{BB} > V_1^{**}$. Consequently, we can state that $V_1^{*B} > V_1^{BB} > V_1^{**} > V_1^{B*}$.

It is clear that the strategy of choosing the bargained hours is always dominated. This happen for both workers, so that the Nash equilibrium is to work a number of hours that is consistent with the effort-based promotion scheme, i.e. $h_1 = h_2 = h^*$. Obviously, this equilibrium is not Pareto efficient.

Table 1 illustrates the outcome of the effort-based promotion hypothesis, representing the payoff matrix. The strategy to cooperate (i.e, to decide together with the other workers the working time in a binding commitment)

is dominated by the strategy not to cooperate. However, we have assumed in section 2 that individuals live for two periods and promotion can take place in the second period only, i.e. that the game is a one-shot game. Nevertheless, if the decision concerning working hours is taken by workers an indefinite number of times, as it is well known from game theory, the *cooperative equilibrium* may emerge.

Remark 4 *If remark 1 holds, firms profits increase with effort-based career opportunities. If remark 3 holds, workers optimal strategy is to accept working longer hours. Unless workers cooperate, when firms use effort-based promotion schemes, each worker works longer hours than the ones she would have chosen, and has the same probability to be promoted. Workers' utility is reduced; people work longer hours enjoying less leisure.*

In such a situation, as in Naylor (2001), unions could act as a countervailing power, by increasing the cohesion and cooperation among workers and reducing the effectiveness of effort base promotion schemes.

3 The BHPS data

In the empirical analysis we use data from the British Household Panel Survey (BHPS), a British representative survey that gathers a wealth of information on households', individuals' and job characteristics.[17] We use data from the first 10 waves of this survey, which refer to the years 1991-2000. The relevant question in the survey for our purposes is the following: "In the current job do you have opportunities for promotion?", whose possible answers are yes or no. We label this dummy variable as CAREER. We use this variable as a proxy for the value of a worker's expected probability of future promotion (p_i) in the theoretical model. Using information on the *number of hours normally worked per week (excluding overtime)* and on the *number of overtime hours in normal week* we compute the total hours normally worked per week. The ratio between the *the usual net pay per month in the current job*, available from the survey and the total hours

[17] See Taylor (2001) for an introduction to the BHPS.

normally worked per week (times 4.34) gives the hourly net wage that we use in our empirical estimates.[18]

From the first 10 waves of the BHPS we select a sample of individuals who worked 20 or more hours per week.[19] So do we since we want to focus only on people for whom working in the marketplace is the main activity and whose working time is more likely to be responsive to career prospects (compared to 'marginal' or less career motivated workers).[20] We drop from the original sample (which includes 111,206 observations) also people in non-civilian occupations, self-employed workers and observations with missing data for at least one of the variables included in the econometric model and obtain a sample of 43,926 observations. In order to have a first look at the relationship between hours worked and career opportunities we report in Tables 2 and 3 the average working hours, the fraction of individuals having promotion opportunities in the current job, and the preferred working hours by quintile of the working hours distribution for men and women, respectively. It is immediate to note that there seems to exist a positive relationship between hours worked and the expected opportunities of career advancement in the current job. Moreover, individuals working longer hours are more likely to prefer a shorter working time, suggesting that employers can force employees to work longer hours than the latter prefer[21] and that also in the UK data it is possible to observe the 'hours surplus' reported in US and German data by Bell and Freeman (2001). These are only raw summary statistics of course and the positive correlation between working hours and promotion opportunities may be only spurious and driven by the different characteristics of workers in the different quintiles of the hours distribution. For this reason, in our empirical analysis we shall take into account workers' observed and unobserved heterogeneity.

[18] As observed by Bell and Freeman (2001) wages computed in this way may be affected by a considerable measurement error.

[19] We exclude individuals with more than 90 working hours per week.

[20] A similar sample selection criterion has been applied in the recent literature by Bell and Freeman (2001) and Booth et al. (2003). In particular, Bell and Freeman (2001) observe that including also part-timers in the analysis strongly weakens the income inequality-hours relationship.

[21] In this regard see also Stewart and Swaffield (1997).

Table 2: Quintiles of the work hours distribution, opportunity of career and preferred hours (BHPS data) - Men

Quintiles of weekly hours worked	Average normal working hours	Promotion opportunities		Preferred working hours		
		no	yes	less	more	equal
1	35.06	47.32	52.68	21.94	10.86	67.21
2	39.83	48.21	51.79	27.30	7.81	64.89
3	43.57	42.37	57.63	34.12	7.19	58.69
4	48.50	42.06	57.94	43.16	5.34	51.49
5	59.83	44.15	55.85	55.18	3.84	40.98

Note. 1991-2000 BHPS data, pooled sample.

Table 3: Quintiles of the work hours distribution, opportunity of career and preferred hours (BHPS data) - Women

Quintiles of weekly hours worked	Average normal working hours	Promotion opportunities		Preferred working hours		
		no	yes	less	more	equal
1	24.57	62.38	37.62	16.65	12.30	71.05
2	35.63	51.75	48.25	34.50	4.95	60.55
3	38.52	48.59	51.41	38.40	3.63	57.97
4	40.99	45.19	54.81	40.02	3.11	56.87
5	50.06	37.91	62.09	55.67	2.45	41.88

Note. 1991-2000 BHPS data, pooled sample.

4 Empirical analysis

An immediate implication of the simple theoretical model outlined in section 2 is that if firms use effort-based promotion schemes workers' expected probability of future promotion depends positively on current working time. In particular, in our framework workers with longer working hours expect *ceteris paribus* a higher probability of future promotion. The ideal data to test this implication would be employer-employee matched data, where it would be possible to control for the relative working time of employees within the same firm. Unfortunately, such data are not readily available and we use longitudinal micro-data, instead. In particular, we include among the explanatory variables some controls for employers' characteristics (such as sector of activity, number of employees) and observed employees' characteristics (such as education and age, among the others), which will be considered as proxies for the working time that employers and employees bargain in certain types of firms. However, as observed by Bell and Freeman (2001), the correlation between hours worked and the expected probability of promotion may be only spurious and determined by some unobservable 'third factor' simultaneously affecting working time and the likelihood of promotion. In order to mitigate this problem of *simultaneity bias* we use panel data methods. In particular, the unobserved heterogeneity across individuals will be accounted for by directly modelling it as random or fixed effects.

In what follows, we estimate a panel data logit model of workers' perceived probability of future promotion of the following type:

$$p_i = a_0 + a_1 h_i + a_2 X_{1i} + a_3 X_{2i} + u_i + \epsilon_{it} \tag{14}$$

where i and t are subscripts for individuals and time, respectively. p_i is an indicator variable which equals one if individual i expects to be promoted in the current job and zero otherwise. u_i is, depending on the type of model chosen, an individual fixed or a random effect. h_i are working hours, X_{1i} a vector of personal characteristics, X_{2i} a vector of employer's characteristics and ϵ_{it} an error term. Our coefficient of interest is a_1, i.e. the relation between working hours and a worker's perceived probability of promotion. At this stage we are mainly interested in the sign and the significance of the

correlation a_1. We interpret a positive and significant coefficient a_1, once we account for both individual observed and unobserved heterogeneity, as evidence that is consistent with the hypothesis that firms use effort based promotion schemes.[22]

We include in the empirical specifications several controls for personal and job characteristics. The full list of control variables with some descriptive statistics is reported in Appendix A. We include among the regressors real hourly wages, year dummies, gender, family composition, a quadratic in age, travel time to workplace, home property, spouse's employment status, parents' social class, education, a dummy for temporary job, sector of activity, socio-economic group, firm size, dummy for public sector and a quadratic in tenure.

We start the analysis with a simple logit model on the pooled sample. With such a model the observations are considered independent (as in a cross-section), i.e. we do not exploit the fact that some observations refer to the same person and do not take into account individual unobserved attributes in the estimation method.[23] In order to avoid all problems related to the potential self-selection of women into employment, we estimate the working hours-promotion opportunities relationship only for men. We are aware of the fact that the working hours-promotion probability relationship might be especially strong for women who traditionally have to split their time between family and work, and have therefore a higher variance in the number of hours offered in the labor market. Since we use panel data methods, we also exclude from the sample all individuals with only one time observation.

In Table 4 for each model we report the results of two specifications, one including among the explanatory variables the total number of hours worked only (1), and the other including the full set of controls (2). In both specifications the working time is highly statistically significant. In

[22]On the grounds that our random or fixed effects account for all possible factors simultaneously affecting both promotion and working time, the estimated effect a_1 also represents the "true causal effect" of working time on the likelihood of promotion.

[23]However, standard errors shown in Table 4 account for the fact that observations for the same individual are correlated.

general, in the pooled logit models, we observe that including the control variables changes (in particular increases) the magnitude of the effect of hours worked on the expected promotion probability. This confirms that individuals with different observed characteristics have different expected probabilities of promotion. The marginal effect in model 2, which includes the full set of controls, is 0.36 percent points (0.20 in model 1), i.e. increasing by one weekly working hours is associated with an increase in the expected probability of promotion of 0.36 per cent points.[24]

In a second step we exploit the longitudinal structure of our sample and use panel data estimators. We estimate two models, a fixed effects (FE) conditional logit model (see Chamberlain 1980) and a random effects (RE) logit model. When using the FE conditional logit model it is necessary to use only the observations for which the value of the CAREER dummy changes over time ('movers'). This implies that we are working with a potentially selected sample, with the possibility of introducing in the analysis a *sample selection bias* (see Heckman, 1979). This is likely to be the case since by using the FE model we loose 1,922 individuals, representing about the 50% of the sample. In particular, we are likely to exclude all variation in career opportunities between individuals who never had opportunities of career advancement and those who always had it, giving a special emphasis to the within-individuals variation. The coefficient of working hours remains statistically significant in both the RE (at the 1% statistical level) and the FE models (at the 5% level) including the full set of controls. Hence, the positive correlation between working hours and the probability of promotion is confirmed and turns out to be robust to panel data methods. In what follows we give a special emphasis to the RE estimator, which enables us to use a larger sample and reduce the risk of sample selection bias. However, in order to justify our choice we have to show that the estimates obtained using the two methods are similar. Hence, we estimate the RE model only in the sample of 'movers' and obtain a coefficient of working hours of 0.008, significant at the 10% level. It is evident that when estimated in the same sample the RE and FE models give remarkably similar estimates of the

[24]Marginal effects are computed at the sample mean.

Table 4: Total working hours-promotion opportunities estimates

no. of weekly hours worked	Pooled logit (full sample)		RE logit (full sample)		FE logit ('movers')		RE logit ('movers')	
	1	2	1	2	1	2	1	2
coefficient	0.008***	0.014***	0.015***	0.015***	0.014***	0.007**	0.009***	0.008***
standard error	0.002	0.003	0.003	0.003	0.003	0.004	0.002	0.003
marginal effect (%)	0.20	0.36	0.35	0.36	$^{(c)}$	$^{(c)}$	0.22	0.21
Other controls	NO	YES	NO	YES	NO	YES	NO	YES
N. obs.	16,859		16,859		9,694		9,694	
N. individuals	3,811		3,811		1,889		1,889	
Overall significance$^{(a)}$	11.19(0.00)	1329.19(0.00)	25.02(0.00)	1458.14(0.00)	16.61(0.00)	725.97(0.00)	13.39(0.00)	747.95(0.00)
Log-likelihood	-11,585.41	-10,012.74	-9,852.53	-8,954.70	-3,821.50	-3,466.82	-6,663.66	-6,224.68
Test Ho: ρ=0 (p-value)$^{(b)}$	-	-	3465.76(0.00)	2116.03(0.00)	-	-	88.86(0.00)	43.35(0.00)

Note. * significant at the 10%; ** significant at the 5%; *** significant at the 1%. Standard errors are robust to the presence of heteroskedasticity. Marginal effects (m.e.) are computed at the sample mean.

$^{(a)}$ Test for the exclusion of all covariates but the constant (Wald test in the pooled logit model and the RE logit models, Likelihood Ratio test in the FE logit model); $^{(b)}$ Test for the pooled logit model vs. the random effects logit model, distributed as a $\chi^2(1)$, rejection of the null hypothesis implies that the random effects model must be preferred; $^{(c)}$ It is not possible to report the marginal effects on the unconditional probability of a positive outcome (CAREER=1) since the fixed effects are not computed by the software. The complete estimates are available upon request from the authors.

effect of working hours. From the RE model estimated on the full sample, we obtain a marginal effect of 0.36 percent points, which is identical to the estimate from the pooled logit model. Moreover, it must be noted that the RE estimates of the effect of working hours are very robust to the inclusion of the control variables, which reduces the risk that our estimates suffer from a substantial omitted variable bias. From Table 4, it also appears that the estimated marginal effects are rather similar to those found by Bell and Freeman (2001) on German data for the specification including educational controls.[25] In order to have an idea of other explanatory variables, we report their marginal effects for the RE specification (2) in Appendix B.

Therefore, we generally find in the BHPS data a positive and significant correlation between total weekly working hours and worker's perceived probability of future promotion in the current job. Although we have included in the empirical model several potential explanatory variables for working hours such as firm size, sector and workers' personal characteristics, we are comparing workers in different firms and for this reason overtime hours can be a better proxy for the position of each worker in the working hours distribution within a firm (that is the variable determining the promotion probability in our theoretical model). Moreover, firms may use some variants of the effort-based promotion scheme outlined in section 2. For instance, in order to choose the workers to be promoted firms might use only overtime or unpaid overtime work. For these reasons we re-estimated the RE models using the specification including all control variables (model 2) and substituting total working hours with overtime and unpaid overtime hours, respectively.[26] The results are shown in Table 5. The effect of overtime work on the probability of promotion is significant at the 1% level and the marginal effect is 0.4 per cent points, higher than that of normal working hours. The effect is higher than that found by Booth et al. (2001) in their analysis on the effect on actual promotions of overtime work in the UK (0.1

[25]Using the marginal effect of the hours measured in logarithms from table 7, column (2'), in their article, and dividing it by the average number of hours in the period 1985-95 reported in table 1, we obtain a marginal effect on the expected probability of promotion of increasing by one the hours worked of 0.24 per cent points.

[26]Booth et al. (2001) include both these variables as proxies of workers' effort in their empirical model of actual promotions in the UK.

Table 5: Overtime and unpaid overtime working hours-promotion opportunities estimates (RE logit models)

	overtime			unpaid overtime		
	Coeff.	s.e.	m.e. (%)	Coeff.	s.e.	m.e. (%)
no. of weekly hours	0.016***	0.004	0.40	0.011**	0.005	0.26
other controls		YES			YES	
N. obs.		16,624			16,614	
N. individuals		3,670			3,757	
Overall significance$^{(a)}$		1439.82(0.00)			1284.43(0.00)	
Log-likelihood		-8,836.03			-8,836.96	
Test Ho: rho=0 (p-value)$^{(b)}$		2,104.44(0.00)			2,111.09(0.00)	

Note. * significant at the 10%; ** significant at the 5%; *** significant at the 1%. Standard errors are robust to the presence of heteroskedasticity. Marginal effects (m.e.) are computed at the sample mean.

$^{(a)}$ Test for the exclusion of all covariates but the constant (Wald test in the pooled logit model and the RE logit models, Likelihood Ratio test in the FE logit model); $^{(b)}$ Test for the pooled logit model vs. the random effects logit model, distributed as a $\chi^2(1)$, rejection of the null hypothesis implies that the random effects model must be preferred.

Table 6: Models with interaction terms between working hours and firm union status (RE logit models)

no. of weekly hours worked	normal working hours			overtime hours			unpaid overtime hours		
	Coeff.	s.e.	m.e. (%)	Coeff.	s.e.	m.e. (%)	Coeff.	s.e.	m.e. (%)
number of hours	0.014***	0.004	0.34	0.021**	0.005	0.52	0.019***	0.007	0.46
union job	0.789***	0.265	18.81	0.924***	0.082	21.93	0.904***	0.074	21.47
interaction	0.002	0.006	0.05	-0.012	0.007	-0.29	-0.023**	0.011	-0.57
Other controls		YES			YES			YES	
N. obs.		16,859			16,624			16,614	
N. individuals		3,811			3,760			3,757	
Overall significance$^{(a)}$		1,458.26(0.00)			1,432.39(0.00)			1,423.42(0.00)	
Log-likelihood		-8,954.66			-8,834.69			-8,834.61	
Test Ho: rho=0 (p-value)$^{(b)}$		2,116.16(0.00)			2,103.6(0.00)			2,110.05(0.00)	

Note. * significant at the 10%; ** significant at the 5%; *** significant at the 1%. Standard errors are robust to the presence of heteroskedasticity. Marginal effects (m.e.) are computed at the sample mean. Interaction is the interaction between working hours and the presence of a union in the firm.

$^{(a)}$ Test for the exclusion of all covariates but the constant (Wald test in the pooled logit model and the RE logit models, Likelihood Ratio test in the FE logit model); $^{(b)}$ Test for the pooled logit model vs. the random effects logit model, distributed as a $\chi^2(1)$, rejection of the null hypothesis implies that the random effects model must be preferred.

per cent points).[27]

The effect of unpaid overtime is positive and statistically significant at the 10% and the marginal effect is 0.26 per cent points, lower than in the previous case. This seems to suggest that the expected probability of promotion is more responsive to overtime hours than to total working hours or unpaid overtime hours. This is consistent with a model in which firms use overtime hours to determine workers' probability of promotion.

In what follows we explore another implication of our model. In section 2 we have seen that firms are more likely to be constrained in terms of desired working hours when the bargaining power of workers is not very high. One might expect the bargaining power of workers to be higher in firms in which employees are organized into a union. Therefore, we estimate the RE logit model including the full set of control variables using as an explanatory variable total working hours, overtime hours and unpaid overtime, respectively, and interacting these measures with the presence of a union in the workplace. The results are shown in Table 6. When we consider total working hours the interaction term is not statistically significant. When we include overtime work, the effect of the interaction term is of the expected sign (negative) but not very precisely estimated and only marginally not significant at the 10% level (the p-value is 0.102). The effect of the interaction term between unpaid overtime and presence of a union in the workplace is negative (as expected) and only marginally not significant at the 5% level. We remind the reader that the negative sign is what is expected given that in firms in which workers have a higher bargaining power, for which the union dummy is a proxy, effort based promotion schemes are less likely to be adopted. In particular the gap in the effect of unpaid overtime between non unionized and unionized firms is about -0.57 percent points, ranging from 0.46 for non unionized firms and -0.11 for unionized firms. This evidence supports the idea that in firms in which workers bargaining power is high employers might not be able to adopt effort-based promotion schemes so as overtime, when it is done, has no effect (in our estimates it even has a detrimental effect) on the likelihood of promotion. The positive and significant effect of

[27] This is what our model predicts if workers expect a 'reaction' of their colleagues, in terms of increasing hours worked, weaker than the actual one.

the presence of a union within a firm on the probability of promotion can be interpreted as evidence that internal labor markets are more likely to emerge when workers' bargaining power is high.

5 Concluding remarks

In this paper we build on the empirical findings in Bell and Freeman (2001), of a positive relationship between working hours and expected or actual probabilities of employees' promotion, to show why firms may be interested in using effort-based promotion schemes, i.e. schemes in which promotions positively depend on working hours, to increase working hours supplied by employees.

With a simple bargaining model we describe the case in which a firm, in order to maximize profits, prefer longer working hours than the bargained ones if unions' bargaining power is lower than a given level. In this situation, firms can incentivate employees to work longer hours than the ones bargained by making career advancement depend on working hours. The increase in employees' working hours depends positively on the size of the "skill-premium", i.e. the increase in the utility gained from promotion, and on the sensitivity of the promotion probability to working time.

With the adoption of *career opportunities based on working time* on the part of firms, each worker might work more in order to increase her probability of career advancement, but, in a symmetrical equilibrium, all employees will work longer hours and have the same probability of a career advancement. Only if workers cooperate, they can resist the opportunistic behavior of working more than their colleagues.

Career opportunities based on working time might raise working hours, production, profits and per-capita GDP, at the cost of a reduction in workers' utility.

Our theoretical model is coherent with some stylized facts observed in the UK labor market such as the inverted-U shaped age profile in actual work hours (Stewart and Swaffield 1995), since only relatively young workers (less than 35) are more likely to experience career advancements. Our model is also able to explain a number of phenomena such as gender dif-

ferences in career advancements or the comparative advantage in terms of career opportunities of women choosing traditionally female dominated sectors or jobs. The first may stem from the lower number of hours worked by married or cohabiting women who also have home responsibilities, the second from the fact that women choosing female dominated sectors are more likely to compete with women (who work relatively less hours) for career advancements.

We seek some empirical evidence for the UK supporting our claim that the 'hours surplus' puzzle discussed in Bell and Freeman (2001), i.e. the fact that most employees would prefer to work less hours, may originate from firms using effort-based promotion schemes. Our analysis of the BHPS data shows that there is indeed a highly statistically significant positive correlation between hours worked and workers' expected probability of future promotion. Use of panel data estimators confirms that this result is robust to the potential presence of unobserved heterogeneity.

In summary, the use of effort-based promotion schemes seems to be in place also in the UK in addition to Germany and the US (see Bell and Freeman, 2001). As we have shown, these practices may have interesting implications in terms of reducing workers' welfare. Our theoretical analysis suggests that setting upper limits to working time, through collective agreements or by law may increase workers' utility, at the cost of a reduction in per capita GDP: if our model assumptions are correct, workers would like to substitute higher leisure to lower income.

For future research, it would be interesting to apply the analysis in this paper to data sets relating to other countries and to employers-employees matched data to assess how spread these practices are across countries, and to quantify the precise effect of hours worked on workers' expected or actual promotions at firm level.

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Appendix

Table A1: Control variables used in the econometric estimates (BHPS data)

variable	**description**
whreal	real hourly wage
year	year (11)
individual characteristics	
nch02	number of children in the household aged 0-2
nch34	number of children in the household aged 3-4
nch511	number of children in the household aged 5-11
nch1215	number of children in the household aged 12-15
age	age at date of interview
age2	age squared at date of interview
nchild	number of own children in the household
property	house property (4)
jbttwt	minutes spent travelling to work
spjb	whether spouse/partner employed now (Y/N)
socclas	parents social class (7)
educa	highest academic qualification (7)
workplace characteristics	
temporary	temporary job (Y/N)
sect	sector (9)
skillseg	socio economic group (12)
size2	firm size (5)
public	private sector (Y/N)
tenure	tenure
tenure2	tenure squared
unionjob	union at worplace (Y/N)

Note. In brackets are reported the number of categories for categorical variables.

Table A2: Coefficients, standard errors and marginal effects for control variables (RE model with full controls using total working hours, see Table 4)

Variable	Coeff.		s.e.	m.e.	mean
htot	0.015	***	0.003	0.004	45.105
whreal	0.008		0.009	0.002	6.149
nch02	0.241	**	0.113	0.058	0.094
nch34	-0.001		0.110	0.000	0.090
nch511	0.199	**	0.087	0.048	0.297
nch1215	0.143		0.089	0.034	0.168
age	-0.013		0.022	-0.003	36.819
age2	-0.001	**	0.000	0.000	1489.190
nchild	-0.152	*	0.084	-0.037	0.644
temporary	-2.096	***	0.156	-0.446	0.030
unionjob	0.883	***	0.070	0.210	0.474
jbttwt	0.002		0.001	0.000	25.346
public	0.281	**	0.114	0.067	0.212
tenure	-0.157	***	0.014	-0.038	8.683
tenure2	0.004	***	0.000	0.001	116.946
Home property					
house rented	0.004		0.430	0.001	0.202
house owned outright	0.084		0.438	0.021	0.118
house owned with mortgage	0.236		0.430	0.057	0.677
other			reference		
Spouse's work					
no spouse			reference		
spouse does not work	0.043		0.109	0.010	0.162
spouse work	0.039	*	0.084	0.009	0.561
Industry dummy					
Agriculture, Hunting, Forestry, Fishing			reference		
Mining and Quarrying	0.231		0.201	0.056	0.055
Manufacturing	0.122		0.177	0.030	0.149
Electricity, Gas and Water	0.032		0.180	0.008	0.123
Construction	-0.024		0.199	-0.006	0.056
Wholesale and Retail Trade, Restaurants	0.222		0.179	0.054	0.157
Transport, Storage and Communications	0.535	***	0.191	0.127	0.088
Finance, Insurance, Business Services	0.408	**	0.182	0.098	0.135
Community, Social and Personal Services	0.096		0.186	0.024	0.200
Socio-Economic Group					
managers,large	1.916	***	0.365	0.444	0.142
managers,small	1.564	***	0.367	0.364	0.072
professional employees	1.865	***	0.373	0.433	0.078
int. non-manual,workers	1.694	***	0.367	0.394	0.105
int. non-man,foreman	2.310	***	0.380	0.521	0.036
junior non-manual	1.771	***	0.364	0.412	0.107
personal service wkrs	1.347	***	0.405	0.312	0.017
foreman manual	1.693	***	0.362	0.394	0.083
skilled manual wkrs	0.796	**	0.357	0.175	0.197
semi-skilled manual wkrs	1.134	***	0.359	0.259	0.123
unskilled manual wkrs	0.777	**	0.381	0.170	0.029
farmers managers			reference		

cont'd

Variable	Coeff.		s.e.	m.e.	mean
Education					
higher degree			reference		
1st degree	0.551	**	0.225	0.127	0.129
hnd,hnc,teaching	0.381	*	0.242	0.090	0.087
a level	0.000		0.223	0.000	0.239
o level	-0.132		0.227	-0.033	0.265
cse	-0.074		0.260	-0.018	0.069
none of these	0.043		0.240	0.010	0.180
Firm size (no. of employees)					
1-9			reference		
10-49	0.314	***	0.086	0.078	0.261
50 - 99	0.666	***	0.106	0.165	0.127
100 - 499	1.022	***	0.095	0.248	0.276
500 or more	1.143	***	0.106	0.274	0.191
Parents' social class					
professional			reference		
managerial and technical	0.344	*	0.194	0.085	0.234
skilled non-manual	0.297		0.203	0.073	0.156
skilled manual	0.327	*	0.196	0.081	0.286
partly skilled	0.395	*	0.220	0.097	0.101
unskilled	0.150		0.289	0.037	0.029
Inapplicable	0.265		0.206	0.066	0.143
Year					
1991			reference		
1992	-0.136		0.148	-0.025	0.030
1993	-0.336	**	0.143	-0.064	0.034
1994	-0.841	***	0.139	-0.177	0.037
1995	-0.984	***	0.101	-0.212	0.110
1996	-1.015	***	0.103	-0.219	0.115
1997	-0.924	***	0.106	-0.197	0.120
1998	-0.939	***	0.109	-0.201	0.133
1999	-0.998	***	0.111	-0.215	0.167
2000	-1.278	***	0.118	-0.285	0.160

Note. * significant at the 10%; ** significant at the 5%; *** significant at the 1%. Standard errors are robust to the presence of heteroskedasticity. Marginal effects (m.e.) are computed at the sample mean.