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Effort-based career opportunities and working time

Massimiliano Bratti
DEAS, University of Milan, Milan, Italy, and
Stefano Staffolani
Department of Economics, Marche Polytechnic University, Ancona, Italy

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Abstract

Purpose – The purpose of this paper is to describe the hypothesis of effort-based career opportunities as a situation in which profit maximising firms create incentives for employees to work longer hours than the bargained ones, by making career prospects depend on working hours. The paper aims to test some implications of this hypothesis using UK data.

Design/methodology/approach – The empirical analysis uses the British Household Panel Survey (BHPS) and panel data estimators to investigate the existence of a robust correlation between working hours and workers' expected probability of promotion in the current job.

Findings – The analysis shows the existence of a robust positive correlation between working time and workers' expected likelihood of promotion in the BHPS data even when controlling for several individual characteristics and for workers' unobserved heterogeneity.

Research limitations/implications – Although the paper uses panel data, the BHPS does not allow for the identification of the firms in which individuals work, and therefore to control for firm fixed effects. Employer-employee datasets would have allowed a better assessment of the hypothesis.

Originality/value – The paper provides a theoretical explanation for the empirically observed positive association between working time and expected promotion probability and, unlike previous papers that used pooled OLS estimates, it exploits the panel structure of BHPS data to control for individual unobserved heterogeneity.

Keywords Careers, Career development, Hours of work, Promotion, United Kingdom

Paper type Research paper

1. Introduction

In a recent paper Bell and Freeman (2001) explain the differences between hours worked in the USA 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 occupational level and hours worked. Using

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longitudinal data, they also find that hours worked raise both future wages and actual (in the USA) 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 (Lazear and Rosen, 1981; Nalebuff and Stiglitz, 1983; Landers *et al.*, 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:

- We present a simple bargaining model that provides a possible reason why firms might prefer longer working hours than those bargained or desired by workers and use effort-based promotion schemes to provide incentives for employees to work longer hours. In such schemes employees' probability of promotion is directly linked to the number of hours worked.
- 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 analysed Germany and the USA and used pooled estimates, we focus on UK data and use panel data estimators which take into account individual unobserved heterogeneity.

2. The theoretical model

What we call effort-based career opportunities (Section 2.2) may exist only if the following two conditions are met:

(1) firms are "constrained" in working time (Section 2.1); and

(2) workers are willing to work a higher number of hours in order to increase their probability of promotion (Section 2.2).

2.1 Collective bargaining and standard working hours

We assume that workers live for two periods[1]. In the first period they are hired by a firm in an unskilled position (unskilled workers), whereas in the second period they may be promoted to a skilled position (skilled workers). We make this assumption since here we are mainly interested in internal labour markets, i.e. markets where workers are hired in entry level jobs and higher levels are filled from within[2]. We also make the following assumptions.

Assumption 1. Workers are represented by a union that bargains with the firm on hourly wages and, eventually, on working hours.

Assumption 2. Bargaining is done separately for unskilled and skilled workers[3] so that the utility gain of being promoted for the unskilled is exogenously determined with respect to the unskilled bargaining process.

Assumption 3. Workers cannot change employers without incurring costs because of specific human capital, mobility costs, absence of a continuum of jobs.

Assumption 4. Because of a perfect complementarity between unskilled and skilled jobs, only a fixed proportion $\bar{p}$ of unskilled workers is promoted to the skilled position; unions cannot affect workers' probability of promotion in any way.

Assumption 5. Productivity in skilled jobs is higher than that in unskilled jobs.

Assumption 6. Workers' utility function is additively separable into labour income and working time.

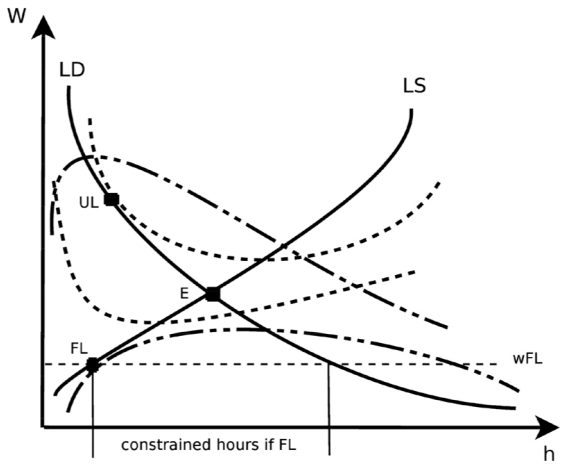
The union bargains for skilled and unskilled workers separately considering the median member, whose utility function is of the type: $U = R(wh) - g(h)$, where w is hourly wage, h standard working hours, $R(wh)$ is the utility of labour income and $g(h)$ is the disutility of work[4], with $R' > 0$, $g' > 0$, $g'' > 0$[5].

In what follows, we assume risk neutral ($R'' = 0$) or risk adverse ($R'' < 0$) individuals. The utility function implies convex isoutility curves with a minimum for:

$$w = \frac{g'(h)}{R'(wh)} \tag{1}$$

which defines the hours supply function (LS) in Figure 1.

Firm's profits are given by: $\pi = zy(h) - wh$, where $zy(h)$ is the total revenue function and z is higher for the skilled jobs than for the unskilled ones (Assumption 5)[6], with $y' > 0$, $y'' < 0$. Hence, isoprofit curves are concave with a maximum for:



Notes: The LS and LD curves are the labour supply and the labour demand curves, respectively. In the figure the following equilibria are represented: E competitive market equilibrium; UL union leader Stackelberg equilibrium; FL firm leader Stackelberg equilibrium

Figure 1.
Hour-constrained firms

$$w = zy'(h) \tag{2}$$

which defines the hours demand function (LD) in Figure 1.

The intersection between the demand and supply curves gives the competitive market equilibrium (point E in Figure 1).

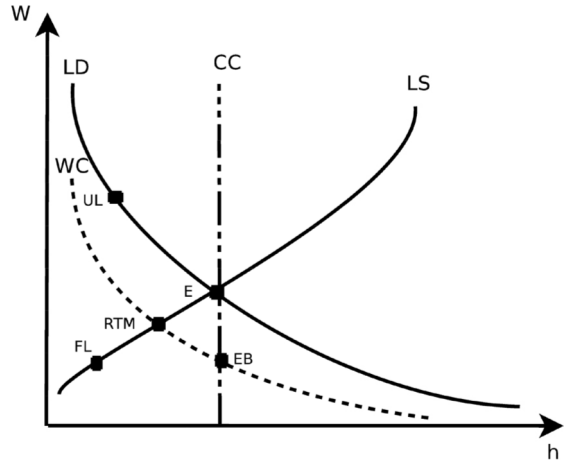
From Figure 1, it clearly emerges that for every equilibrium with a wage lower than the competitive market one (point E) and with working time to the left of the labour demand function, firms are "constrained" in working hours[7]. An equilibrium with these characteristics is not unrealistic even in the case of bargaining[8]. According to Nash's bargaining hypothesis, social partners maximise the following function:

$$\max_{w,h} \Lambda \equiv \pi(w,h)^{1-\mu} V(w,h)^{\mu} \tag{3}$$

where μ is the union's bargaining power and $V(w,h)$ is the utility of the median union member given by $U(w, h)$ minus the utility of the outside option[9]. Following the seminal paper of McDonald and Solow (1981), we define "efficient bargaining" (EB) the case in which firms and unions bargain over wages and standard hours worked[10].

Figure 2 shows a possible result for the two types of bargaining. The "efficient bargaining model" defines the contract curve CC (given by the tangency condition between isoprofit and isoutility curves):

$$R'(wh) = \frac{g'(h)}{zy'(h)} \tag{4}$$



Notes: This figure shows the case of risk neutral workers.The LS, LD, CC and WC curves are the labour supply, labour demand, contract and wage curves, respectively. In the figure the following equilibria are represented: E competitive market equilibrium; EB efficient bargaining equilibrium; RTM right to manage equilibrium; UL union leader Stackelberg equilibrium; FL firm leader Stackelberg equilibrium

Figure 2.
The outcome of the bargaining process

which represents the set of efficient equilibria[11] and the "wage curve" WC that indicates the wage level emerging from bargaining for each level of working hours. The position of the wage curve depends crucially on the bargaining power of social partners. The higher the firm bargaining power, the lower the position of the curve (for a given working time, wages are lower and profit higher, see Appendix 2). The intersection between CC and WC curves gives the efficient bargaining equilibrium EB in Figure 2, which is drawn assuming that firms have high-bargaining power so that they are "constrained" in working time. The equilibrium EB, even if Pareto-efficient, gives a wage rate lower than the marginal productivity of work.

Remark 1. If the union's bargaining power is below a given level ($\mu < \bar{\mu}$), the firm prefers longer working hours than the standard ones bargained with the union because the marginal productivity of working hours is higher than the bargained wage.

Proof. See Appendix 2. □

2.2 Individual behaviour and actual working hours

Let us now consider the case in which firms, once the work contract has been signed, prefer longer working hours than the bargained ones and use effort-based promotion schemes as a device to provide incentives for workers, who are always better off in the skilled position than in the unskilled one since we assumed that z is higher in skilled positions (Assumption 5 in Section 2.1)[12].

We wonder if a worker would accept working a higher number of working hours than the standard ones in order to raise her probability of promotion.

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 (1981) and focus here on the case of two workers, one of which must be promoted by a firm. Firms promote the worker with longer working time, i.e. h_i, while if both workers work the same amount of hours promotion is random[13]. We also 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". The worker's i actual working hours (h_i^a) are defined by:

$$h_i^a = h_i + e_i \tag{5}$$

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

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

$$p_1 = Pr\left(h_1^a > h_2^a\right) = Pr(h_1 - h_2 > e_2 - e_1) = Pr(h_1 - h_2 > e) = F(h_1 - h_2) \tag{6}$$

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 second period utility of workers in unskilled and skilled jobs, respectively, and $\Delta U = U^{\mathrm{S}} - U^{\mathrm{U}}$ as the "skill premium"[14].

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

$$V_1 = R\left(w^{\mathrm{B}} h_1\right) - g(h_1) + \beta[F(h_1 - h_2)\Delta U] + \beta[R(w^{\mathrm{B}} h^{\mathrm{B}}) - g(h^{\mathrm{B}})] \tag{7}$$

where β is the discount factor, w^{B} is the bargained wage rate and the last term indicates that an unskilled worker in the second period works precisely for standard hours h^{B}.

The unskilled worker 1 can work longer hours than the bargained ones 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:

$$g'(h_1) = R'\left(w^{B}h_1\right)w^{B} + \beta\frac{\partial F(h_1 - h_2)}{\partial h_1}\Delta U \tag{8}$$

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:

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

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 standard one.

Remark 2. When firms and unions act according to the efficient bargaining model and firms use effort-based promotion schemes, the probability that an individual will work longer hours than the bargained ones increases in the "skill premium" and in the sensitivity of the probability to be promoted to working hours and decreases in the degree of risk aversion.

Proof. Comparing equation (8) with the contract curve (equation (4)) the condition in order to have $h_1^* \geq h^{B}$, so that $g'\left(h_1^*\right) \geq g'\left(h^{B}\right)$, is:

$$R'\left(w^{B}h_1\right)w^{B} + \beta f(h_1 - h_2)\Delta U > R'(w^{B}h^{B})zy'(h^{B})$$

where, if Remark 1 holds, $zy'\left(h^{B}\right) > w^{B}$. Assume that $h_2 = h^{B}$ and $h_1 = h^{B}$. The previous condition can hold or not depending on the magnitude of the positive term $\beta f(0)\Delta U$. When h_1 increases, $R'\left(w^{B}h_1^*\right)w^{B}$ decreases for risk adverse individuals and remains constant for risk neutral individuals, whereas the term $\beta f(h_1 - h_2)\Delta U$ always increases. The higher $f(h_1 - h_2)$ and ΔU, the higher the increase in the second addend in the left hand side. The right-hand side is not affected by h_1[15]. □

If effort-based career opportunities are effective, in the two-person game described above, it is easy to show that the strategy of working for standard hours is dominated by that of working overtime[16]. Nevertheless, the workers' decisions concerning working time may be considered as a sort of repeated game so that cooperation may emerge[17].

We can therefore conclude our theoretical analysis by stating that, if firms' profits increase with effort-based career opportunities and workers optimal strategy is to accept working longer hours, each worker works longer hours than the ones she would have chosen and has the same probability to be promoted. Workers' utility is reduced. Cooperation among workers may emerge in order to reduce the effectiveness of effort-based 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 characteristics of household, individuals and jobs[18]. We use data from the first ten waves of this survey, which refer to the years 1991-2000.

The relevant question in the survey for our purposes is "In the current job do you have opportunities for promotion?" whose possible answers are yes or no. This question is placed in a section of the questionnaire which asks personal questions. 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 in the current job (p_i) used 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 normally worked per week (times 4.34) gives the hourly net wage that we use in our empirical estimates[19].

From the first ten waves of the BHPS we selected a sample of individuals who worked 20 hours or more per week[20], 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)[21]. We drop from the original sample (which includes 111,206 observations), 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 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, in Table I. It is immediately noticed 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[22] and that also in the UK data it is possible to observe the "hours surplus" reported for 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.

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 their current working time. In particular, in our framework workers with longer working hours expect *ceteris paribus* a higher probability of future promotion.

Quintiles of weekly working hours distribution	Average normal weekly working hours	Promotion opportunities? Yes	Preferred working hours		
			Less	More	Equal
Men					
1	35.06	52.68	21.94	10.86	67.21
2	39.83	51.79	27.30	7.81	64.89
3	43.57	57.63	34.12	7.19	58.69
4	48.50	57.94	43.16	5.34	51.49
5	59.83	55.85	55.18	3.84	40.98
Total	45.01	54.95	35.53	7.36	57.11
Women					
1	24.57	37.62	16.65	12.30	71.05
2	35.63	48.25	34.50	4.95	60.55
3	38.52	51.41	38.40	3.63	57.97
4	40.99	54.81	40.02	3.11	56.87
5	50.06	62.09	55.67	2.45	41.88
Total	36.71	49.65	35.04	5.85	59.11

Source: 1991-2000 BHPS data, pooled sample

Table I.
Quintiles of working hours distribution, opportunity of career advancements and preferred working hours

The ideal data to test the implications of our model would be employer-employee matched data, where it would be possible to control for the relative working time of employees within the same firm and estimate the relationship between working hours and the probability of actual promotions. Unfortunately, such data are not readily available and we use longitudinal micro-data from the BHPS, instead.

We can use BHPS micro-data to test another implication of our model, namely the positive correlation between working hours and workers' expected probabilities of promotion. Since, we assumed that workers do not know the actual working time of their colleagues, but they only have an exogenous expectation of it (which is proxied in the empirical model by firm and individual specific covariates and by fixed or random effects), according to our model we should find a positive correlation between a worker's working time and her expected probability of promotion. The strength of this positive correlation will depend, among other things, on the plausibility of the assumptions of our model for the UK, such as the prevalence of internal labour markets, the fact that wages and hours are bargained at firm level, and so on.

As to the specific institutional setting prevailing in the UK, some of our model assumptions can be considered as fairly reasonable. Indeed, the UK is characterised by the prevalence of company and plant level bargaining and little or no co-ordination with upper-level associations (OECD, 2004, p. 148). Trade union density, a proxy of unions' bargaining power, in the UK was declining over time from 39 per cent in 1990 to 31 per cent in 2000 and collective bargaining coverage falling from 40 per cent in 1990 to 30 per cent in 2000 (OECD, 2004, p. 142). While union density was lower than the OECD average by about 10 percentage points, the collective bargaining coverage was similar to the OECD average. Moreover, the system of UK industrial relations in the period under study was characterised by the tendency of unions to bargain over wages and standard working hours and to leave workers to do paid overtime work, at premium rates, to increase their incomes (Rubery *et al.*, 2005). This was a marked

difference with respect to the traditional model of industrial relations prevailing in most European countries where unions often set maximum working hours and maximum overtime hours and expected extra hours to be taken as time off in lieu rather than as paid working hours. However, Rubery *et al.* (2005) show that in the UK employers for several reasons are now increasingly demanding longer working hours without paying higher hourly rates or even asking unpaid overtime.

In such a general framework, the adoption of internal promotion schemes that reward longer hours may be particularly attractive to employers.

In the theoretical model we considered only a single internal labour market and assumed workers' homogeneity within single firms. In reality there exist many different internal labour markets (i.e. firms) and workers may be heterogeneous within and between firms. Moreover, there are many competitive theories of promotion, e.g. promotion may depend on individual's observed and unobserved productivity. For all these reasons, we include some controls for employers' characteristics (such as sector of activity, number of employees) and observed employees' characteristics (such as education, tenure and age, among the others) among the explanatory variables in the equation for the expected probability of promotion. 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 other unobservable individual "third factor" different from firms' adoption of effort-based promotion schemes, simultaneously affecting working time and the likelihood of promotion. One of these factors may be an individual's productivity or ambition.

In order to mitigate this problem of individual unobserved heterogeneity we use panel data methods. In particular, the unobserved time-invariant heterogeneity across individuals will be accounted for by directly modelling it as random or fixed effects (FE)[23].

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

$$p_{it} = a_0 + a_1 h_{it} + a_2 \mathbf{X}_{1it} + a_3 \mathbf{X}_{2it} + u_i + \varepsilon_{it} \tag{10}$$

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. Depending on the type of model chosen, u_i is an individual fixed or a random effect. h_i are standard working hours, $\mathbf{X}_{1i}$ a vector of personal characteristics, $\mathbf{X}_{2i}$ a vector of employer's characteristics and ε_{it} an error term.

Our coefficient of interest is a_1, i.e. the average association 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 observed and unobserved individual heterogeneity, as evidence that is consistent with the hypothesis that some firms use effort-based promotion schemes. The size and significance of a_1 will depend on the number of firms using effort-based promotion schemes in our estimation sample. Here, we are not interested in assessing the direction of causality or to estimate a "causal" effect (i.e. workers work more when firms adopt effort-based promotion schemes and, in this case, they expect a higher promotion probability if they work more).

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 1. We include among the regressors real hourly wages, year dummies, family composition, a quadratic in age, travel time to workplace, home property, spouse's employment status, parents' social class, education, a dummy for temporary jobs, sector of activity, socio-economic group, firm size, dummy for public sector and a quadratic in tenure[24].

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[25].

We analyse the working hours-promotion opportunities relationship only for men to avoid modelling female labour force participation[26]. We are aware of the fact that this relationship might be especially strong for women who traditionally have to split their time between family and work, and therefore have a higher variance in the number of hours offered in the labour market (Francesconi, 2001). Since, we use panel data methods, we also exclude all individuals with only one time observation from the sample.

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

In general, in the pooled logit models, we observe that the inclusion of 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 per cent points (0.20 in model (1)), i.e. an increase by one in weekly working hours is associated with an increase in the expected probability of promotion by 0.36 per cent points[27].

In a second step we exploit the longitudinal structure of our sample and use panel data estimators. We estimate two models, a FE conditional logit model (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 (Heckman, 1979). This is likely to be the case since by using the FE model we loose 1,922 individuals, representing about the 50 per cent 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, laying a special emphasis on the within-individuals variation.

The coefficient of working hours remains statistically significant in both RE (at the 1 per cent statistical level) and FE models (at the 5 per cent 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 lay a special emphasis on the RE estimator, which enables us to use a larger sample and reduces 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 per cent level.

Table II. Total working hours-expected 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 (per cent)	0.20	0.36	0.35	0.36	[c]	[c]	0.22	0.21
Other controls	No	Yes	No	Yes	No	Yes	No	Yes
No. of observations	16,859		16,859		9,694		9,694	
No. of groups	3,811		3,811		1,889		1,889	
Overall significance[a]	11.19 (0.00)	1,329.19 (0.00)	25.02 (0.00)	1,458.14 (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 H_0: $\rho = 0$ (p-value)[b]	–	–	3,465.76 (0.00)	2,116.03 (0.00)	–	–	88.86 (0.00)	43.35 (0.00)

Notes: Significant at *10 per cent; **5 per cent; ***1 per cent; [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 FE are not computed by the software. The complete estimates are available from the authors upon request. The dependent variable is a dichotomous variable that takes on value one in case an individual declared having promotion opportunities in the current job and zero otherwise. Pooled logit standard errors are robust to the presence of heteroskedasticity. Marginal effects (m.e.) are computed at the sample mean. The model also includes all covariates included in Table AI in Appendix

It is evident that when estimated in the same sample the RE and FE models give remarkably similar estimates of the effect of working hours. From the RE model estimated on the full sample, we obtain a marginal effect of 0.36 per cent 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 suggests that our estimates should not suffer from a substantial omitted variable bias.

From Table II, 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[28]. In order to have an idea of other explanatory variables, we report their marginal effects for the RE specification (2) in Appendix 2[29].

Therefore, we generally find in the BHPS data a positive and significant correlation between total weekly working hours and a worker's perceived probability of future promotion in her 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 might use some variants of the effort-based promotion scheme outlined in Section 2.1. 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[30]. The results are shown in Table III.

The effect of overtime work on the expected probability of promotion is significant at the 1 per cent level and the marginal effect is 0.4 per cent points, higher than that of normal working hours.

The effect of unpaid overtime is positive and statistically significant at 10 per cent 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.

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 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 separate RE logit models including as explanatory variables total working hours, overtime hours and unpaid overtime, respectively, and interacting them with the dummy for the presence of a union in the workplace.

The results are shown in Table IV. 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 insignificant at the 10 per cent level (the p-value is 0.102).

The coefficient on the interaction term between unpaid overtime and the presence of a union in the workplace is negative as expected. Indeed, a negative effect is predicted by our theoretical model since in firms where workers have a higher bargaining power (proxied by the union dummy) effort-based promotion schemes are less likely

	Overtime			Unpaid overtime		
	Coefficient	s.e.	m.e. (per cent)	Coefficient	s.e.	m.e. (per cent)
No. of weekly hours	0.016***	0.004	0.40	0.011**	0.005	0.260
Other controls		Yes			Yes	
No. of observations		16,624			16,614	
No. of groups		3,670			3,757	
Overall significance[a]		1,439.82 (0.00)			1,284.43 (0.00)	
Log-likelihood		−8,836.03			−8,836.96	
Test H_0: $\rho = 0$ (p-value)[b]		2,104.44 (0.00)			2,111.09 (0.00)	

Notes: Significant at *10 per cent; **5 per cent; ***1 per cent. [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. The dependent variable is a dichotomous variable that takes on value one in case an individual declared having promotion opportunities in the current job and zero otherwise. Pooled logit standard errors are robust to the presence of heteroskedasticity. Marginal effects (m.e.) are computed at the sample mean. The model also includes all covariates included in Table AI in Appendix. The number of observations and individuals differs across columns since for each specification of the working hours we considered only the observations with non-missing values

Table III. Overtime and unpaid overtime working hours-expected promotion opportunities estimates (RE logit models)

to be adopted. In particular, the gap in the effect of increasing one hour unpaid overtime between unionised and non-unionised firms is −0.57 per cent points.

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. Therefore, when overtime is done, it is not positively associated to the expectation of a promotion. The positive and significant effect of the presence of a union within a firm on the expected probability of promotion can be interpreted as evidence that internal labour markets are more likely to emerge when workers' bargaining power is high.

So far we have investigated the correlation existing between current working hours and the expected probability of promotion. We have seen that under some conditions our theoretical model predicts a positive correlation and that this prediction is confirmed by the data. However, one may wonder whether it would be rational for workers to expect a positive effect of longer working hours on the likelihood of being promoted if in reality this effect does not exist.

For this reason we also estimate the correlation between working hours and the probability of an actual promotion. We use the same waves of the BHPS (1991-2000) excluding the first wave (1991) since we estimate the probability of a promotion between time t and time $t + 1$ using workers' and firms' characteristics at time t. For the definition of promotion we follow Francesconi (2001) and Booth *et al.* (2003). The BHPS has a section on employment history that has a record of all job changes along with their characteristics since the previous interview (September). Since, for the jobs which started and ended between two interviews working hours are not available, we have to exclude all individuals who changed their workplace in the same period. Those individuals who changed jobs because of promotion were classified as "promoted".

Table V shows the estimates obtained from the RE logit model. We estimate three different specifications using total working hours, total overtime and unpaid overtime, respectively. The marginal effect of an increase by one in weekly hours on the

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

Variables	Normal working hours			Overtime hours			Unpaid overtime hours		
	Coefficient	s.e.	m.e. (per cent)	Coefficient	s.e.	m.e. (per cent)	Coefficient	s.e.	m.e. (per cent)
No. of weekly 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	
No. observations		16,859			16,624			16,614	
No. 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 H_0: $\rho = 0$ (p-value)[b]		2,116.16 (0.00)			2,103.6 (0.00)			2,110.05 (0.00)	

Notes: Significant at *10 per cent; **5 per cent; ***1 per cent. [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. The dependent variable is a dichotomous variable that takes on value one in case an individual declared having promotion opportunities in the current job and zero otherwise. 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. The model also includes all covariates included in Table AI in Appendix. The number of observations and individuals differs across columns since for each specification of the working hours we considered only the observations with non-missing values

Table V. The effect of working time on the probability of an actual promotion (RE logit models)

Variable	Normal working hours Coefficient	s.e.	m.e. (per cent)	Overtime hours Coefficient	s.e.	m.e. (per cent)	Unpaid overtime hours Coefficient	s.e.	m.e. (per cent)
No. of weekly hours	0.007	0.004	0.03	0.015***	0.005	0.07	0.007	0.007	0.030
Other controls		Yes			Yes			Yes	
No. of observations		11,173			11,646			11,638	
No. of individuals		2,466			2,447			2,446	
Overall significance[a]		451.98 (0.00)			453.56 (0.00)			447.99 (0.00)	
Log-likelihood		−3,123.50			−3,081.89			−3,884.38	

Note: Significant at *10 per cent; **5 per cent; ***1 per cent. [a]Wald test for the exclusion of all covariates but the constant. The dependent variable is a dichotomous variable that takes on value one in case of an actual promotion (as defined in Section 4) and zero otherwise. The model also includes all covariates included in Table AI in Appendix. Working time and the other control variables are lagged one year. The number of observations and individuals differs across columns since for each specification of the working hours we considered only the observations with non-missing values

likelihood of promotion is 0.03, 0.07 and 0.03 per cent, for total hours, total overtime and unpaid overtime, respectively, but only that of overtime turns out to be statistically significant (at 1 per cent). Therefore, also when analysing actual promotions we observe the highest correlation with total overtime hours.

Our findings are consistent with those in Francesconi (2001) and Booth *et al.* (2003) who both estimate a marginal effect of a one hour increase in overtime of 0.1 per cent on the probability of an actual promotion, using BHPS data related to a different period (1991-1995). It is important to note that the lower correlation of working hours with actual promotions than with expected promotions is consistent with our assumption that individuals may not take into account (for instance because they do not observe it) the behaviour of their colleagues when deciding their optimal working time. Moreover, like Francesconi (2001) and Booth *et al.* (2003), we are estimating the correlation of working hours with the likelihood of an actual promotion in the following year while the information on the opportunity of promotion in the current job available in the BHPS refers to an undefined future date.

5. Concluding remarks

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

With a simple bargaining model we describe the case in which a firm, in order to maximize profits, prefers longer working hours than the standard bargained ones if the union's bargaining power is lower than a given level. In this situation, firms can provide an incentive for employees to work longer hours than the ones bargained by making career advancements depending 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 longer in order to increasing her probability of career advancement, but, in a symmetrical equilibrium, all employees will work longer hours and have the same probability of career advancement. Only if workers cooperate, they can resist the opportunistic behaviour 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 labour market such as the inverted U-shaped age profile in actual working hours (Stewart and Swaffield, 1997), since only relatively young workers (less than 35 years) are more likely to experience career advancements. Our model is also potentially able to explain a number of phenomena such as gender differences 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 and that the strongest correlation between working hours and expected opportunity of promotion is found for overtime hours. Panel estimators applied to the same dataset show that there is also a positive correlation between overtime hours and actual promotions (as already shown by Francesconi, 2001 and Booth *et al.*, 2003) in the UK.

In brief, the empirical evidence in the UK, in addition to the one in Germany and the USA (Bell and Freeman, 2001), is consistent with the adoption of effort-based promotion schemes by employers. 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 lower labour income with higher leisure time (Rubery *et al.*, 2005).

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

Notes

1. Considering an infinite time horizon we obtain qualitatively the same results, but with more complex algebra.
2. 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 labour markets. Other possible reasons for the emergence of internal labour markets are reviewed in Lazear and Oyer (2004).
3. If we assume, alternatively, that bargaining is done for unskilled workers alone while the firm unilaterally decides wages and working hours for skilled workers the implications of our model do not change.
4. In what follows, x' indicates the first derivative of the variable x with respect to its argument and x'' the second derivative.
5. Given that the premium in the case of promotion is exogenous to the unskilled bargaining process, if we had considered unskilled workers' lifetime expected utility instead of uniperiodal utility the results of the model would not have changed. Assume that the lifetime expected utility of the median union member is given by:

$$\mathrm{EU} = R(wh) - g(h) + \beta[(1 - \bar{p})[R(wh) - g(h)] + \bar{p}U^S]$$

which can be written as:

$$\mathrm{EU} = [R(wh) - g(h)]\kappa + \beta\bar{p}U^S$$

where β is the discount factor, U^S is the uniperiodal utility of skilled workers (exogenous to bargaining) and $\kappa = 1 + \beta(1 - \bar{p})$. Therefore, the slope of the isoutility curves and the labour supply function are not affected by $\bar{p}$ and U^S.

6. For simplicity, we do not indicate a suffix for the two different types of jobs.
7. This result holds even if the labour supply function is downward sloping, as long as its slope is lower, in absolute value, than the one of the labour demand function.
8. Let us consider, for instance, the case where firms act as Stackelberg leaders maximising profits under the constraint of the labour supply function of equation (1), so that:

$$\pi = zy(h) - \frac{g'(h)}{R'(wh)}\,h$$

It is easy to show that the first-order condition gives:

$$zy'(h) = w + \frac{g''(h)R'(wh) - wR''(wh)g'(h)}{[R'(wh)]^2}\,h$$

For $g''(h) > 0$ and risk adverse or neutral individuals, the marginal productivity of working time is higher than the hourly wage (see point FL in Figure 1) so that firms prefer longer working hours than the ones supplied by workers.

9. If we had considered the lifetime expected utility of the median union member, we would have obtained:

$$V(w,h) = \kappa[R(wh) - g(h)] + \bar{p}\beta U^S - \Omega$$

where Ω represents outside utility. Results do not change.

10. The "right to manage" (RTM) case, in which social partners bargain over wages whereas the working time is freely chosen by unions, is also shown in Figure 2.
11. The curve is vertical for risk neutral workers and it is downward sloping for risk adverse ones, see Appendix 2.
12. The proof is available from the authors upon request.
13. We do not claim that this is the most general model of promotions or that in the real world all promotions are made using this scheme. Here, we simply specify a model which can explain a positive correlation between working time and workers' expected probability of promotion while in Section 4 we will investigate if our model is consistent with the empirical evidence.
14. 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 for standard hours. As such, ΔU does not depend on h_1 and turns out to be increasing in z_S, i.e. the value of z in skilled jobs, and decreasing in z_U, i.e. the value of z in unskilled jobs.
15. In the RTM case, we obtain a less stringent condition. Indeed when firms and unions act according to the RTM and firms use effort-based promotion schemes employees always prefer to work longer hours than the standard ones.
16. A formal proof is available from the authors upon request.
17. In such a situation, as in Naylor (2002), unions could act as a countervailing power, by increasing the cohesion and cooperation among workers.
18. See Taylor (2001) for an introduction to the BHPS.
19. As observed by Bell and Freeman (2001) wages computed in this way may be affected by a considerable measurement error.
20. We exclude individuals with more than 90 working hours per week.
21. 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-time workers in the analysis strongly weakens the income inequality-hours relationship.
22. In this regard see also Stewart and Swaffield (1997).

23. As it was correctly observed by an anonymous referee, this does not address the problem of time-variant unobserved heterogeneity such as changes in firms' policies. As we will say below the scope of our empirical analysis is simply to assess whether "on average" there exists a positive correlation between working hours and workers' expected likelihood of promotion after controlling for individual observed and unobserved heterogeneity and firms' observed heterogeneity. We argue that this correlation is likely to emerge if firms adopt effort-based promotion schemes. Since, we do not have firms' identifiers we cannot control for firms' fixed effects.
24. Some of these variables are included to "clean" the correlation between working time and the expected probability of promotion from job and firm characteristics which may be associated with both longer working hours and a higher expected probability of promotion independently of the adoption of effort-based promotion schemes, such as firm size and sector, being in non-manual vs manual jobs, etc.
25. However, standard errors shown in Table II account for the fact that observations for the same individual are correlated.
26. We estimated the same models for women and the correlation between working hours and the expected probability of promotion turned out to be higher than for men. The same is observed by Francesconi (2001) in his analysis of the probability of actual promotions.
27. Marginal effects are computed at the sample mean.
28. Using the marginal effect of the hours measured in logarithms reported in Table 7, column (2′), in their article, and dividing it by the average number of hours in the period 1985-1995 shown in Table 1, we obtain a marginal effect of hours worked on the expected probability of promotion of 0.24 per cent points.
29. We also estimated the model separately for white collars and blue collars but the results were similar across the two types of workers and we did not report it. Full results are available from the authors upon request.
30. Booth *et al.* (2003) include both these variables as proxies of workers' effort in their empirical model of actual promotions in the UK.
31. The parameter Ω may also depend positively on the uniperiodal expected gain due to promotion, which has been assumed exogenous to the bargaining process, see note 5.
32. In the (w, h) space, the contract curve is downward sloping for risk adverse individuals. Indeed, by totally differentiating the contract curve we obtain:

$$\frac{\mathrm{d}w}{\mathrm{d}h} = -\frac{z[y''(h)R'(wh) + y'(h)R''(wh)w] - g''(h)}{zy'(h)R''(wh)h}$$

which is obviously a vertical line for risk neutral workers (since R' becomes constant).
33. Indeed, this term is positive if:

$$\frac{\varepsilon_g}{\varepsilon_R} > \frac{\Omega + g(h)}{g(h)}$$

Given that Ω is the outside option $\Omega < R(wh) - g(h)$ must hold for every bargained wage and working hours. Substituting Ω by $R(wh) - g(h)$ in the right-hand-side of the previous equation, we obtain the sufficient condition:

$$\frac{\varepsilon_g}{\varepsilon_R} > \frac{R(wh)}{g(h)}$$

Substituting the definition of the elasticities:

$$\frac{hg'(h)/g(h)}{whR'(wh)/R(wh)} > \frac{R(wh)}{g(h)}$$

therefore $g'(h) > wR'(wh)$. Using the contract curve of equation (4) to substitute $R'(wh)$, the condition becomes $zy'(h) \geq w$, which is precisely the condition we are looking for. This result is also confirmed for the case outlined in note 5.

34. In the RTM hypothesis the equilibrium must be on the labour supply curve. Even in this case we obtain that if the bargaining power of firms is high enough, the bargaining outcome "constrains" firms in working time, as in the case of Figure 2, point RTM.

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Further reading

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Appendix 1. Descriptive statistics and effects of other covariates

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	Home 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 workplace (Y/N)

Note: In parentheses are reported the number of categories for categorical variables

Table AI.
Control variables used in the econometric models (BHPS data)

Appendix 2. Proof of Remark 1

Hourly wage and standard working hours are chosen following Nash bargaining. After defining firm's profits as $\pi(w,h) = zy(h) - wh$ and union's utility as $V(w,h) = R(wh) - g(h) - \Omega$, where Ω indicates the median union member's reservation utility[31], firms and unions maximize the following expression:

$$\max_{w,h} \Lambda \equiv \pi(w,h)^{1-\mu} V(w,h)^{\mu} \tag{11}$$

where μ is the contractual strength of the union and $1 - \mu$ the contractual strength of the firm.

The first-order conditions (FOCs), with respect to w and h, can be written as:

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

$$\frac{1-\mu}{\mu} \frac{V(w,h)}{\pi(w,h)} = \frac{g'(h) - wR'(wh)}{zy'(h) - w}$$

Equating the two FOCs we obtain the contract curve (CC) of equation (4)[32].

Variable	Coefficient	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	1,489.190
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 works	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
Intermediate non-manual, workers	1.694***	0.367	0.394	0.105
Intermediate non-manual, 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 workers	1.134***	0.359	0.259	0.123
Unskilled manual workers	0.777**	0.381	0.170	0.029
Farmers managers		Reference		
Education				
Higher degree		Reference		
First degree	0.551**	0.225	0.127	0.129

(*continued*)

Table AII.
Effect of other variables on the expected opportunity of promotion (RE logit model)

Variable	Coefficient	s.e.	m.e.	Mean
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

Notes: Significant at *10 per cent; **5 per cent; ***1 per cent. The dependent variable is a dichotomous variable that takes on value one in case an individual declared having promotion opportunities in the current job and zero otherwise. The model also includes year dummies. Marginal effects (m.e.) are computed at the sample mean. This table refers to the estimates from the RE logit model including all controls and using total working hours (Table II)

Table AII.

In order to obtain the wages, we substitute the contract curve in the first FOC. Thereafter, we assume that functions $R(wh)$, $y(h)$, $g(h)$ have constant elasticities, ε_R, ε_y, ε_g, respectively, and that $\varepsilon_g > 1 > \varepsilon_y$. After some algebraic steps we obtain:

$$w = \frac{\frac{1-\mu}{\mu}\frac{1}{\varepsilon_g}\left(1+\frac{\Omega}{g(h)}\right)+\frac{1}{\varepsilon_y}}{\frac{1-\mu}{\mu}\frac{1}{\varepsilon_R}+1} zy'(h) \equiv \theta^{\mathrm{EB}} zy'(h) \tag{12}$$

equation (12) is the wage curve (WC) because it indicates the wage level emerging from bargaining for each level of working hours. The whole solution of the model is given by solving the system of equations (4) and (12). 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 (12) this happens if $\theta^{\mathrm{EB}} < 1$ which can be written as:

$$\frac{1-\mu}{\mu}\frac{1}{\varepsilon_g\varepsilon_R}\left[\varepsilon_g - \varepsilon_R\left(1+\frac{\Omega}{g(h)}\right)\right] > \frac{1-\varepsilon_y}{\varepsilon_y} \tag{13}$$

The term in square brackets is always positive if $zy'(h) > w$[33].

Therefore, solving for μ in equation (13), we can state that firms are "constrained" in working hours ($zy'(h) > w$) if unions' bargaining power is lower than a critical value which, in turn, is lower than unity:

$$\mu < \bar{\mu} < 1$$

where:

$$\bar{\mu} \equiv \left[1 + \frac{\frac{1-\varepsilon_y}{\varepsilon_y}}{\frac{1}{\varepsilon_R} - \left(1 + \frac{\Omega}{g(h)}\right)\frac{1}{\varepsilon_g}} \right]^{-1}. \tag{14}$$

The higher the firms' bargaining power, the closer the bargaining outcome to the firm Stackelberg equilibrium (FL).

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[34].

About the authors

Massimiliano Bratti (doctorate, University of Ancona, PhD, University of Warwick) is an Assistant Professor at the University of Milan (Milan, Italy), a CHILD (Turin) member and an IZA (Bonn) Research Fellow. He teaches labour economics and his main research fields are education economics, labour economics and family and population economics. Massimiliano Bratti is the corresponding author and can be contacted at: Massimiliano.Bratti@unimi.it

Stefano Staffolani (PhD, University of Ancona) is an Associate Professor at the Marche Polytechnic University (Ancona, Italy) where he teaches microeconomics, labour economics and personnel economics. His main research fields are labour economics and education economics. E-mail: S.Staffolani@univpm.it