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## Testing for Employee Discrimination Using Matched Employer-Employee Data: Theory and Evidence

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June 2003

# Testing for Employee Discrimination Using Matched Employer-Employee Data: Theory and Evidence

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## ABSTRACT

### Testing for Employee Discrimination Using Matched Employer-Employee Data: Theory and Evidence\*

In this paper, we directly test Becker's theory of employee discrimination using matched worker-workplace data from Britain. Based on a structural model with individual and firm heterogeneity, we develop and test two predictions. Firstly, if white employees have a taste for discrimination they should report lower levels of job satisfaction the larger the proportion of ethnic minorities at their workplace. Secondly, white employees' wages should also increase with the concentration of ethnic minority co-workers. Both hypotheses are strongly supported for white males in our data, after controlling for human capital and job amenity variables, though not for females. The white male wage premium for working amongst only ethnic minority co-workers, as compared to working only with whites, is about 12%. Neither of these effects operate via realised racial prejudice at the workplace or employees' feelings concerning job security.

JEL Classification: J3, J7

Keywords: employee discrimination, compensating differentials, structural estimation, wages, job satisfaction

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## 1 Introduction

Becker (1957, 1991) introduced the notion that differential pay between groups can be explained by some employees having a ‘taste for discrimination’. So far, this issue has been investigated almost solely by looking at aggregate differences between white and ethnic minority workers. In this paper we want to look at much more direct evidence from workplaces where these two groups of workers are employed.

We argue that if white employees truly have a taste for discrimination, then we should observe lower job satisfaction for whites when there is a higher concentration of ethnic minority co-workers. Furthermore, if there is a taste for discrimination, we should observe higher pay for white employees, working with higher concentrations of ethnic minority co-workers, by means of a compensating differential. We will attempt to verify these two predictions using matched employee-employer data from the Workplace Employee Relations Survey (WERS98) collected in Britain in 1998. This data is ideally suited to addressing these questions since it combines information given by managers, about the composition of the workforce and working environment, with self-reported information on the job satisfaction and wages of employees at that workplace. We are therefore able to take into account a wide range of individual and firm level characteristics which are likely to be important predictors of job satisfaction and wages. The detailed workplace level information contained in WERS98 also enables us to delve further into the mechanisms of race relations in Britain. In particular, since managers report whether there have been racial tensions at the workplace, we can address the question of whether it is merely the presence of ethnic minority co-workers that bothers white employees, or whether it is racial tension that results in a unhappy working environment for white employees. Similarly, by using self-reported questions on job-insecurity, we can explore the hypothesis that it is mainly the impact of ethnic minority co-workers on white workers’ perceptions of job (in)security that gives rise to a taste for racial discrimination.

The outline of this paper is as follows. In Section 2 we provide an overview of the literatures on discrimination and job satisfaction. We present formal theories of discrimination, via which we can structurally estimate the presence of employee tastes for racial

discrimination, in Section 3. The data we use is presented in Section 4. In Section 5, we present our empirical findings as a set of specifications. The main issue here is whether the effect of the concentration of ethnic minorities in the workplace on the job satisfaction and wages of white workers is robust to the inclusion of individual human capital variables and job characteristics. In addition, we also explore the possible mechanisms via which a taste for discrimination may work. We conclude the paper in Section 6.

## 2 Literature Review

### 2.1 Discrimination

Recent decades have seen a great deal of theoretical work concerned with the possible mechanisms via which individuals from different ethnic minority backgrounds can earn different amounts, even at the same actual productivity level. One of the key theoretical advancements in this literature is Becker's (1957, 1991) "taste for discrimination" model, which is essentially a preference based explanation for racial discrimination. In contrast, virtually all other explanations for observed ethnic minority differentials are non-preference based (see, for a review Frijters, 1999).

A large group of current theories explain observed discrimination in wages and jobs as the outcome of differences in expected productivity (Phelps, 1973). One class of these "statistical discrimination" models assumes there is something wrong with the discriminated group, such as a higher probability of women leaving the labour market (Polachek, 1995), greater difficulty in observing the quality of the workers, or a comparative advantage in a different field of activity (e.g. Becker, 1991; Lazear and Rosen, 1990). A second class of statistical discrimination models explains discrimination as a self-fulfilling prophecy (e.g. Arrow, 1973; Coate and Loury, 1993; Kremer, 1993; Lang, 1986), whereby low expectations of the average productivity of a group lead individuals to undertake actions which make the expectation come true, such as making lower investments in human capital (Kremer, 1993), or applying for jobs for which one is not suited (Rosén, 1997). Weaker versions of the self-fulfilling prophecy argument suggest that persistence in expectations of differential productivity lead groups to segregate into different occupations or human

capital levels, thereby perpetuating initial disadvantages (e.g. Breen and Garcia, 2002).

In recent years, there have also been some papers that have attempted to explain discrimination as a result of group solidarity. Akerlof and Kranton (2000) directly put identity into the utility function, whereby identity then leads individuals to be prepared to suffer loss of income in order to discriminate against other groups. Frijters (1998) models the emergence of group identity itself as the outcome of rational individuals attempting to monopolise rents. Group identity then *ex post* implies discrimination of the group that lost the competition over scarce rents. As far as we know, these group identity explanations have never been tested by economists, though the literature on social exclusion can be seen as supporting their predictions (see Akerlof and Kranton, 2000 for a survey).

Apart from these general explanations, there are theories which can explain discrimination in cases of severe market failures, such as monopsonists taking advantage of different labour-supply elasticities of different groups by offering one group a lower wage rate than the other group, higher transaction costs occurring for one group or the existence of segmented labour markets.

The main theoretical problem with nearly all these theories of discrimination is that they rely heavily on market imperfections: nearly all models become invalid in the absence of labour market rents and/or if individuals could costlessly set up their own firm and become self-employed. Then, those individuals who would earn less than their due in existing firms would simply become self-employed, circumventing any asymmetric information problem or issue of initial expectations. The same criticism has another implication: even in the presence of discriminatory preferences, there must be some productivity advantage to different groups working together nevertheless. Becker's basic argument that groups have complementary skills that force them together is the one we will also adopt in this paper.

Empirically, it has proven difficult to confirm or reject each of these theories. There have been a few studies that have suggested that statistical discrimination occurs. For example, Knowles and Persico (2001) show that the fact that police in Maryland are more likely to search the motor vehicles of African-Americans rather than whites, can be fully explained by the higher *ex ante* probability of the former to give cause for arrest.

Frijters (1999) shows that the propensity of a particular South African clothing firm to hire Indian females rather than African females can be explained by the former's higher expected productivity in that particular plant. Altonji and Pierret (2001) find evidence of statistical discrimination which decreases over time, as employers learn more about individuals' actual productivity. Such studies are rare because they make use of detailed 'productivity' information that is usually missing in large surveys. Indeed, the statistical discrimination models are almost by definition difficult to empirically verify, because one is supposing that discrimination occurs because of information that an employer does not have. It is only in very rare circumstances that economists are more likely to get hold of this missing information than the employer, which generally precludes the direct verification of statistical discrimination arguments.

The taste for discrimination model would appear easier to verify, because one can interpret wage gaps as evidence for such a taste.<sup>1</sup> The perennial difficulty, as for instance noted in the review by Darity and Myers (1998) for the US literature on race, is to adequately control for the possibility of missing quality or human capital variables. A related difficulty is that any differential reward to observed human capital variables (such as education) can be interpreted as either discrimination or as picking up unobserved differences in the content of these variables.<sup>2</sup> Indeed, Neal and Johnson (1996) argue that controlling for pre-market skill levels largely accounts for the US Black-white wage gap. Furthermore, detailed information on those employees who work in firms with ethnic minority co-workers is usually missing, precluding the approach we take in this paper. Chiswick (1973), by contrast, provided an empirical test of the employee racial discrimination hy-

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<sup>1</sup>More direct evidence of employer racial discrimination, at the point of hiring, is available from field experiments, (see Riach and Rich 2002, for a review) whereas a market-based test of discrimination in wage-setting is provided by Szymanski (2000). For evidence concerning the impact on self-employment outcomes, from racial discrimination amongst consumers, see Borjas and Bronars (1989).

<sup>2</sup>See Altonji and Blank (1999) for a review of this methodology and recent US evidence on racial wage differentials. Recent UK studies find a male white / ethnic minority wage gap of approximately 11% in the 1990s (Blackaby et al. 1998, 2002), using a standard decomposition approach. Pudney and Theodoropoulos (2003), using the same data source as in this paper, find an hourly racial pay differential of 13% for males and 6% for females, after controlling for observable and unobservable workplace characteristics.



pothesis using state-level data on ethnic minority density. He shows, both theoretically and empirically, that within skill level wage inequality is higher the greater the proportion of ethnic minorities in the state and interprets this indirect test as supportive evidence.<sup>3</sup>

Experimental approaches to examining the racial discrimination in the US were used by Fershtman and Gneezy (2001). By pairing white and ethnic minority individuals in various strategic games, they were able to ascertain that white male players, in particular, believed people of Eastern origin to be untrustworthy, which the researchers attribute to ‘incorrect stereotyping’. Such an irrationality explanation of racial discrimination is hard to square with economic theory or the extremely long periods for which wage differences persist. It is hence arguable that ‘incorrect stereotyping’ actually reflects a taste for discrimination.

More direct evidence of racial prejudice in the UK population has been reported by Dustmann and Preston (2001). Using the British Social Attitudes Survey they find that 20% of the individuals’ would mind if their boss was from an ethnic minority, 38% reported being at least a little prejudiced against people of other races and 53% would mind if a close relative married someone from an ethnic minority. Interestingly, the strength of these racial hostility indicators increased with the concentration of ethnic minorities in the neighbourhood. Furthermore, racial prejudice dominates economic concerns with regard to negative attitudes concerning ethnic minority immigration to the UK (Dustmann and Preston, 2002). In particular, the perceived adverse effect of further immigration on job security is only significant for highly educated skilled workers, whereas racial factors are important at all educational levels.

## **2.2 The determinants of Job satisfaction**

Following the seminal work of Hamermesh (1977) and Freeman (1978) economic studies of job satisfaction have considered the workforce as a whole (e.g. Clark, 1996; Hamermesh, 2001), and analysed professional groups such as lawyers (e.g. Laband and Lentz, 1998) and nurses (e.g. Shields and Ward, 2001; Shields and Wheatley Price, 2002b). Perhaps

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<sup>3</sup>Interestingly, neither the extensive literature reviews by Cain (1986) nor by Altonji and Blank (1999) cite any other papers providing direct or indirect evidence on the employee discrimination hypothesis.

the main focus of attention has been the influence of pay on job satisfaction. Typically, such studies find that it is not only the absolute level of income that matters, but the relative pay with respect to an expected level or comparison group (e.g. Clark and Oswald, 1996). More generally expectations of the satisfaction from work have been found to vary by workers's age, educational levels and occupation (e.g Clark 1996; Clark and Oswald 1996).

A variety of personal characteristics have been also found to have significant effects on reported job satisfaction levels. For example, Clark and Oswald (1996) find that job satisfaction follows a U-shaped pattern through life, due to shifts in expectations. Clark (1997) finds that females report higher job satisfaction levels than males, which, it is argued, may arise from their lower labour market expectations. Most studies also report job satisfaction levels decrease with higher educational attainment. An exception is Gordon and Denisi (1995).

Workplace-related characteristics have also been shown to be related to individual job satisfaction. For instance, Idson (1990) finds that employees are less satisfied with their job, the larger the workplace, despite the fact that such workers generally receive higher wages. A number of papers have found a negative correlation between trade union membership and job satisfaction levels (e.g. Borjas, 1979; Freeman, 1978; Gordon and Denisi, 1995; Heywood et al., 2002). However, the causality of such an association is contentious. Non-pecuniary aspects of work have also been shown to be important (e.g. Acemoglu and Pischke, 1998).

Interestingly, particularly in the context of this paper, Shields and Wheatley Price (2002a) have shown that, amongst ethnic minority nurses, perceptions of racial harassment from fellow employees, and from patients, are more likely to occur frequently the higher the concentration of ethnic minorities at the workplace, and in the locality, respectively. Moreover, Shields and Wheatley Price (2002b) find that such experiences significantly reduce the job satisfaction of ethnic minority nurses, and increase their intentions to quit their present employment. This form of employee discrimination reduces the likelihood of reporting job satisfaction to a much greater extent than does racial harassment emating from patients.

However, none of the studies cited above have used matched employee-employer data to examine the determinants of job satisfaction levels. In this paper, the use of such data to examine the influence of ethnic minority co-workers on the job satisfaction and wage levels of white employees, allows us to control for a number of observable workplace characteristics which might otherwise be thought to cause a spurious association.

### 3 Theoretical Framework

We present 3 related models. Firstly, we present a basic standard compensating differentials model where we do not model firm behaviour. This model clearly generates our two main predictions. In order to see whether those predictions would also apply to a situation with endogenous firm behaviour, we then set up an extended version of the Becker (1957, 1991) model of taste for discrimination. In this extension we allow for heterogeneous workers and firms, because we aim to use data on different individuals and firms with different ethnic minority densities. Finally, in Section 4, we present the empirical equations that we estimate and discuss the circumstances under which we can interpret them as fully structural estimation equations.

#### 3.1 The partial-equilibrium compensating differential model

We write the indirect utility function of an ethnic minority worker  $i$  at job (or workplace)  $k$  as being a function of job satisfaction, individual characteristics, and wages:

$$\begin{aligned} u_{ik} &= U(JS_{ik}, w_{ik}, x_i) \\ JS_{ik} &= JS(w_{ik}, eth_k, x_i, z_k) \end{aligned} \tag{3.1}$$

where  $JS_{ik}$  is the job satisfaction of individual  $i$  at job  $k$ ;  $w_{ik}$  is the total amount of wages of individual  $i$  at job  $k$ ;  $eth_k$  is the density of ethnic minority workers at job  $k$ ;  $x_i$  is a set of individual characteristics, and  $z_k$  is a set of characteristics of job  $k$ . We assume that both  $U(\cdot)$  and  $JS(\cdot)$  are differentiable, increasing in  $w_{ik}$ , and continuous. By definition, a taste for discrimination on the part of white workers implies  $\frac{\partial JS_{ik}}{\partial eth_k} < 0$ . Because we can

observe job satisfaction directly, we can directly check this prediction if we could control for the other variables. Therefore, our first hypothesis is:

Hypothesis 1: given wages, firm, and individual characteristics, job satisfaction is lower for white workers when there is a higher density of ethnic minority co-workers at the workplace.

Now, in a free-mobility equilibrium where there is a distribution of  $eth_k$  for white workers with the same individual characteristics, it has to hold that these individuals are indifferent between working at their job and working at another job. This in turn means that at the margin there would have to hold:

$$\frac{du_{ik}}{deth_k} = 0 \quad (3.2)$$

which implies:

$$\frac{\partial U_{ik}}{\partial JS_{ik}} \left( \frac{\partial JS_{ik}}{\partial eth_k} + \frac{\partial JS_{ik}}{\partial w_{ik}} \frac{dw_{ik}}{deth_k} \right) + \frac{\partial U_{ik}}{\partial w_{ik}} \frac{dw_{ik}}{deth_k} = 0$$

and hence:

$$\frac{dw_{ik}}{deth_k} = \frac{-\frac{\partial U_{ik}}{\partial JS_{ik}} \frac{\partial JS_{ik}}{\partial eth_k}}{\frac{\partial U_{ik}}{\partial JS_{ik}} \frac{\partial JS_{ik}}{\partial w_{ik}} + \frac{\partial U_{ik}}{\partial w_{ik}}} > 0 \quad (3.3)$$

which shows that white workers have to be compensated for working with many ethnic minority co-workers. This feature of an equilibrium leads us to our second hypothesis:

Hypothesis 2: If employees have a taste for discrimination then, given firm and individual characteristics, wages should be higher for white workers when there are higher proportions of ethnic minority co-workers at the workplace.

This result crucially assumes that there are no market imperfections that would prevent white workers flowing from one firm to another. Given such free mobility though, it is clear that firms with many ethnic minority co-workers have to pay higher wages to whites in order to attract white workers.

Now, we can complicate this very simple model by hypothesising that there are intervening mechanisms via which a taste for discrimination may work. To be precise, we can postulate that:

$$\begin{aligned}
JS_{ik} &= JS(w_{ik}, x_i, z_k, g_{ik}) \\
g_{ik} &= g(eth_k)
\end{aligned}
\tag{3.4}$$

where  $g(\cdot)$  can be a stochastic function.

In words, this would mean that  $eth_k$  works via another measurable variable  $g_{ik}$ . We should then find that  $g_{ik}$  is a factor in job satisfaction and in compensating wage differentials. What identifies  $g$  as the ‘intervening’ factor, apart from theoretical considerations, would be that the effect of  $eth_k$  on  $JS_{ik}$ , conditional on  $g_{ik}$ , becomes zero, *and* that the effect of  $eth_k$  on  $w_{ik}$  conditional on  $g_{ik}$  becomes zero. In the empirical section we will look at two possible candidates for an intervening mechanism. The first is the level of racial tension, as reported by the manager of the workplace. This is a direct indicator of an uneasiness between white and ethnic minority workers. The second is the degree to which individuals feel insecure in their job, which has often been argued by sociologists to be important for explaining discrimination (e.g. Cassirer, 1996).

### 3.2 A general equilibrium model of employee tastes for discrimination

In this Section we explore the competitive environment in which the predictions above would also hold. To this aim, we extend the Becker (1991) model of discrimination, to include both individual and firm heterogeneity, in order to allow for firms with different ethnic minority densities and for individuals with different skills.

We first simplify the indirect utility function for white workers:

$$\begin{aligned}
u_{ik} &= JS_{ik} + \gamma_1 \ln w_{ik} + f_1(x_i) \\
JS_{ik} &= \gamma_2 \ln w_{ik} + \delta_1 eth_k + f_2(x_i)
\end{aligned}
\tag{3.5}$$

where  $f_1(\cdot)$  and  $f_2(\cdot)$  are arbitrary functions of individual characteristics. As normalisation we set  $\gamma_1 + \gamma_2 = 1$  This means the indirect decision-utility function reads:

$$u_{ik} = \ln w_{ik} + \delta_1 eth_k + [f_1(x_i) + f_2(x_i)]
\tag{3.6}$$

where a taste for discrimination would imply that  $\delta_1 < 0$ . Now, we introduce individual heterogeneity by posing that each white individual  $i$  has an efficiency number  $q_i^{wh}$  of ‘white skills’. The total measure of white individuals is 1, and the cumulative distribution of white efficiency numbers is denoted as  $Q^{wh}(q)$ . We assume that this distribution has finite mean and that  $Q^{wh}(0) = 0$ . This last assumption essentially means we assume every worker has a positive marginal product. Hence we can interpret the unemployed as having  $q^{wh}0$ .

For ethnic minority workers, we take the same indirect utility framework and label them by  $j$ :

$$u_{jk} = \ln w_{jk} + \delta_2 eth_k + [f_3(x_j) + f_4(x_j)] \quad (3.7)$$

Each ethnic minority worker  $j$  has an efficiency number  $q_j^{em}$  of ‘ethnic minority skills’. The total measure of ethnic minority individuals is  $\eta$  and the cumulative distribution of ethnic minority efficiency numbers is denoted by  $Q^{em}(q)$ . Again, we assume that this distribution has finite mean and that  $Q^{em}(0) = 0$ .

There is a continuum of active firms in this economy. Following Becker (1991), we take a Cobb-Douglas production structure to explain why workers of different ethnicities work together in the first place. More precisely, workplace  $k$  is characterised by a production function:

$$y_k = WH_k^{1-\alpha_k} EM_k^{\alpha_k}$$

Here,  $WH_k$  denotes the number of efficiency units of white skill that is employed in workplace  $k$ . Also,  $EM_k$  denotes the number of efficiency units of ethnic minority skill employed in workplace  $k$ , and  $\alpha_k \in [0, 1]$  is a production parameter specific to workplace  $k$ . The cumulative distribution of  $\alpha_k$  is denoted by  $A(\alpha_k)$  and we assume it is increasing and differentiable everywhere on  $\alpha_k \in (0, 1)$ . There can be positive mass-points at  $\alpha_k = 0$  and  $\alpha_k = 1$ . This parameter allows for firms with only white workers (i.e. when  $\alpha_k$  equals 0), or only ethnic minority workers (when  $\alpha_k$  equals 1), or a mix (when  $0 < \alpha_k < 1$ ). By definition,  $eth_k = EM_k / (EM_k + WH_k)$ .

For each individual firm  $k$ , the price of output is a decreasing function  $p(y_k)$ . We

assume that this function is continuous and differentiable for  $y_k > 0$ , that  $\frac{\partial^2 p(y_k)y_k}{\partial^2 y_k} < 0$  (i.e. decreasing marginal benefit), that  $\lim_{y_k \downarrow 0} p(y_k) \rightarrow +\infty$ , and that  $\lim_{y_k \rightarrow \infty} p(y_k) \rightarrow 0$ . These standard assumptions guarantee that firm size will always be non-zero and finite.

Solving this model, the main result is that utility maximisation leads to wage schedules satisfying  $w_{ik}^{wh} = e^{-\delta_1 eth_k} w_0^{wh} q_i^{wh}$  and  $w_{jk}^{em} = e^{-\delta_2 eth_k} w_0^{em} q_j^{em}$ . Here,  $w_0^{wh}$  denotes the wage for white workers in completely white workplaces. Its value, together with  $w_0^{em}$ , will be solved by firm behaviour. The term  $e^{-\delta_1 eth_k} > 1$  equals the compensating differential that white workers have to be given to work in workplace  $k$ . Under these wage schedules, all workers are indifferent about where they will work and a distribution of ethnic minority densities can be observed.

The profit function of firm  $k$  reads:

$$\pi_k = p_k(y_k)y_k - EM_k e^{-\delta_2 eth_k} w_0^{em} - WH_k e^{-\delta_1 eth_k} w_0^{wh}$$

Now, because the cost function is homogeneous of degree one and the production function is constant-returns to scale, the cost-minimising ratio  $\frac{EM_k}{EM_k + WH_k}$  at relative wages  $\frac{w_0^{wh}}{w_0^{em}}$  is the same for each level of  $y_k$ . Denote the optimal ratio as  $eth_k^*(\frac{w_0^{wh}}{w_0^{em}})$ . Now, for most parameter values  $\{\delta_1, \delta_2, \alpha_k\}$ , it is the case that  $eth_k^*(\frac{w_0^{wh}}{w_0^{em}})$  is differentiable in  $w_0^{wh}$  and  $w_0^{em}$  everywhere. However, for some values of  $\{\delta_1, \delta_2, \alpha_k\}$  there are discontinuities in  $eth_k^*(\frac{w_0^{wh}}{w_0^{em}})$  where  $\lim_{\frac{w_0^{wh}}{w_0^{em}} \downarrow c} eth_k^*(\frac{w_0^{wh}}{w_0^{em}}) > eth_k^*(c)$  at any discontinuity point  $c$ .<sup>4</sup> There trivially holds:

$$\begin{aligned} eth_k^*(\frac{w_0^{wh}}{w_0^{em}}) &= 1 \text{ iff } \alpha_k = 1 \\ eth_k^*(\frac{w_0^{wh}}{w_0^{em}}) &= 0 \text{ iff } \alpha_k = 0 \\ 0 &< eth_k^*(\frac{w_0^{wh}}{w_0^{em}}) < 1 \text{ iff } 0 < \alpha_k < 1 \end{aligned}$$

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<sup>4</sup>To give an example. Take  $\alpha_k = 0.8$ ,  $\delta_1 = -0.1$  and  $\delta_2 = 4$ . There is then a discontinuity in  $eth_k^*(\frac{w_0^{wh}}{w_0^{em}})$  at  $\frac{w_0^{wh}}{w_0^{em}} \approx 16.7$ . More generally, we can specify a region  $\delta_1 < \Delta^*(\alpha)$  for which  $WH_k e^{-\delta_1 eth_k} w_0^{wh}$ , the second part of the cost function, is no longer convex and discontinuities arise.  $\Delta^*(\alpha)$  is implicitly defined as  $\arg_{\delta_1} \{ \min_E \{ \frac{\partial^2 EM_k^{\frac{\alpha-1}{\alpha}} e^{-\delta_1 \frac{EM}{EM+EM_k^{\frac{\alpha-1}{\alpha}}}}}{\partial^2 EM} \} = 0 \}$ . This function is itself decreasing, though it's second derivative can be positive. For  $0 > \delta_1 > \Delta^*(\alpha)$  and  $\delta_2 < 0$ , the cost function is strictly convex and  $eth_k^*(\frac{w_0^{wh}}{w_0^{em}})$  is therefore differentiable everywhere.

and in the generic case  $\frac{\partial eth_k^*(\frac{w_0^{wh}}{w_0^{em}})}{\partial \alpha_k} > 0$ . Except at boundary values for  $\alpha_k$ , we can write  $EM_k = (\frac{eth_k^*}{1-eth_k^*})^{1-\alpha} y_k$  and  $WH_k = (\frac{1-eth_k^*}{eth_k^*})^\alpha y_k$ . Because the minimum of the cost function, given  $y_k$ , is differentiable in  $w_0^{wh}$  and  $w_0^{em}$ , there is a unique and differentiable implicit function  $y_k(w_0^{wh}, w_0^{em})$ .

What needs to be checked now is whether equilibrium actually exists and is unique. For this purpose, we can define total market demand functions  $D(\cdot)$  for  $EM$  and  $WH$  :

$$\begin{aligned} D^{EM}(w_0^{wh}, w_0^{em}) &= \int_0^{1^-} y_k(w_0^{wh}, w_0^{em}) \left( \frac{eth_k^*(\frac{w_0^{wh}}{w_0^{em}})}{1-eth_k^*(\frac{w_0^{wh}}{w_0^{em}})} \right)^{1-\alpha} dA(\alpha_k) \\ &\quad + (1-A(1^-))y_k(w_0^{wh}, w_0^{em}) \\ D^{WH}(w_0^{wh}, w_0^{em}) &= \int_{0^+}^1 y_k(w_0^{wh}, w_0^{em}) \left( \frac{1-eth_k^*(\frac{w_0^{wh}}{w_0^{em}})}{eth_k^*(\frac{w_0^{wh}}{w_0^{em}})} \right)^\alpha dA(\alpha_k) \\ &\quad + A(0)y_k(w_0^{wh}, w_0^{em}) \end{aligned}$$

Market equilibrium now requires that there exist a set  $\{w_0^{wh}, w_0^{em}\}$  for which  $D^{EM}(w_0^{wh}, w_0^{em}) = \eta \int qdQ^{em}(q)$  and  $D^{WH}(w_0^{wh}, w_0^{em}) = \int qdQ^{wh}(q)$ . The right-hand side of these constraints is simply a fixed number. For existence, we can appeal to the fixed-point theorem.<sup>5</sup> Uniqueness is not guaranteed<sup>6</sup> because of the non-monotonicity of the demand functions of the individual firms. Under the specific assumptions of this model therefore, equilibria exist and will each yield a distribution of observed  $eth_k$  where the wage profiles will exhibit compensating differentials for a taste for discrimination. The crucial assumption is that

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<sup>5</sup>The conditions for the fixed point theorem apply:  $D^{EM}(w_0^{wh}, w_0^{em})$  and  $D^{WH}(w_0^{wh}, w_0^{em})$  are continuous because the contribution of each firm is discontinuous only in a finite number of points with mass zero for market demand. Furthermore,  $\lim_{w_0^{em} \downarrow 0} D^{EM}(w_0^{wh}, w_0^{em}) = \infty$ ,  $\lim_{w_0^{wh} \downarrow 0} D^{WH}(w_0^{wh}, w_0^{em}) = \infty$ ,  $\lim_{w_0^{em} \rightarrow \infty} D^{EM}(w_0^{wh}, w_0^{em}) = 0$  and  $\lim_{w_0^{wh} \rightarrow \infty} D^{WH}(w_0^{wh}, w_0^{em}) = 0$ . Hence there must be some finite point  $\{w_0^{*,wh}, w_0^{*,em}\}$  that satisfies both constraints.

<sup>6</sup>The problem in proving uniqueness is that the non-convexity of the cost function allows for the possibility at the individual firm that  $\frac{\partial EM}{\partial w^{wh}} > -\frac{\partial EM}{\partial w^{em}} > 0$  and  $\frac{\partial WH}{\partial w^{em}} > -\frac{\partial WH}{\partial w^{wh}} > 0$  for some range (for examples, see a previous footnote). This means that at the aggregate also, we can have that  $\frac{\partial D^{EM}}{\partial w^{wh}} > -\frac{\partial D^{EM}}{\partial w^{em}} > 0$  and  $\frac{\partial D^{WH}}{\partial w^{em}} > -\frac{\partial D^{WH}}{\partial w^{wh}} > 0$ . This in turn implies the possibility of multiple equilibria. In each of these equilibria the relative wage schedules must still be the same though.



of no (long run) mobility restrictions of workers between firms and that there is some skill complementarity between white and ethnic minority workers in some firms.

## 4 Empirical Framework and Data Description

### 4.1 Empirical models

We estimate the following job satisfaction equation, whereby  $JS_{ik}^*$  denotes the latent job satisfaction of white individual  $i$  in workplace  $k$  and  $JS_{ik}$  the categorical observed value

$$\begin{aligned} JS_{ik}^* &= x_{ik}\beta_1 + \delta_1^* eth_k + \ln(w_{ik}) + v_k + \epsilon_i \\ JS_{ik} &= n \Leftrightarrow \lambda_{n-1} < JS_{ik}^* \leq \lambda_n \end{aligned}$$

where  $x_{ik}$  is a set of variables including ethnic minority density,  $\ln(w_{ik})$  is log wages,  $\lambda_n$  are cut-off points increasing in  $n$ ,  $v_k$  is a normally distributed random effect of the workplace, and  $\epsilon_i$  is an individual normally distributed random error. The categorical answers run from  $n=0$  to  $n=4$ . As normalisations, we put  $\lambda_{-1} = 0$ ,  $\lambda_4 = \infty$ , and  $Var(\epsilon_i) = 1$ . Note that this normalisation is not trivial in the sense that an observationally equivalent model can be run with  $Var(\epsilon_i) = \sigma^2$  in which all the estimated coefficient would be a factor  $\sigma$  higher. Hence,  $\delta_1^*$  only identifies  $\frac{\delta_1}{\sigma}$ , which means a positive value for the estimated  $\delta_1^*$  only implies a positive  $\delta_1$ . This random effects ordered probit model is estimated using Gaussian quadrature.

Considering the structural interpretation of this equation, we must bare in mind that our extended theoretical model only allows for one endogenous workplace characteristic, namely ethnic minority density. This means that in order to interpret  $\beta$  as the structural estimates of the full model, we would have to interpret the coefficients of any other workplace specific variable as picking up some (otherwise unobserved) individual characteristic such as worker quality. This consideration does not hold for the partial equilibrium model: we can directly interpret the findings on  $\delta_1^*$  as giving direct evidence on a taste for discrimination under the assumptions of the partial equilibrium model.

We simultaneously estimate a wage model with latent log-wage  $\ln w_{ik}^*$  equal to :

$$\begin{aligned}\ln w_{ik}^* &= x_{ik}\beta_2 + \delta_1 eth_k + \epsilon_k^w + \epsilon_i^w \\ w_{ik} &= n \Leftrightarrow \kappa_{n-1} < w_{ik}^* \leq \kappa_n\end{aligned}$$

where  $\delta_1$  refers to the full model and  $\epsilon_i^w$  and  $\epsilon_k^w$  are assumed to be independently normally distributed. This model is estimated with standard interval-regression techniques, whereby the only peculiarity is that the error term has two components instead of one. Again, this equation can be directly interpreted in the partial equilibrium framework. In order to interpret it as an estimation of the fully structural model, we would have to interpret the effect of each  $x_{ik}$  as due to the effect of fixed individual characteristics, such as worker quality.

## 4.2 Data and Dependent Variables

Our data is taken from the Workplace Employee Relations Survey (WERS98) which was collected between October 1997 and July 1998. The survey covered all workplaces with 10 or more employees, located in Great Britain (England, Scotland and Wales) and engaged in activities within Sections D (Manufacturing) to O (Other Community, Social and Personal Services) of the 1992 Standard Industrial Classification.<sup>7</sup> The survey covered both the private and public sectors. The sample of workplaces was selected through a process of stratified random sampling, with over-representation of larger workplaces and some industries using the Inter Departmental Business Register (IDBR). The main objective of WERS98 was to provide a substantial bank of data on the nature of workplace employment relations in Britain at the end of the 1990s (see Forth and Kirby, 2000, for additional details). This was the first survey of its kind in Britain.

The Survey took place at workplace level and had three distinct components:

- (i) **Main management interview:** A face-to-face interview with the senior person

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<sup>7</sup>Workplaces whose main activity lied within the following Sections of the 1992 Standard Industrial Classification are not covered by WERS98: Agriculture, Hunting and Forestry (A), Fishing (B), Mining and Quarrying (C), Private households with employed persons (P) and Extra-territorial organizations and bodies (Q).

at the workplace with day-to-day responsibility for industrial relations, employee relations or personnel matters - 2191 managers were interviewed, with a response rate of 80.4%;

- (ii) **Survey of employees:** A self-completion questionnaire distributed to a random selection of up to 25 employees in each workplace - the questionnaire was distributed at 1880 workplaces (manager permitting), with a response rate of around 64%;
- (iii) **Worker representative interview (where present):** A face-to-face interview with the most senior representative of the trade union with the largest number of members at the workplace, or with the most senior employee representative who sits on a workplace-level consultative committee - this occurred in 947 workplaces (manager permitting, and where relevant), with a response rate of 82%.

Each of the three survey components can be linked by means of a unique workplace identifier. In this paper we use data from both the manager interview and the survey of employees. Our sample comprises 1764 workplaces and just over 24,000 employees, and given the focus of the paper is restricted to white employees only.<sup>8</sup> A small number of observations (about 5%) were deleted due to either missing responses from managers about key workplace characteristics or missing responses from employees about job satisfaction or wages. A simple probit analysis suggests that these missing observations were reasonably random in observable characteristics. In this paper we use the employee as our unit of analysis, but match in important workplace characteristics.

The key variable of interest in this paper is the proportion of the workplace who are of ethnic minority origin, which we take as our measure for  $eth_k$ . This information is collected from the main manager interview.<sup>9</sup> In percentage terms, the responses range

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<sup>8</sup>Although separate analyses investigating the effect of ethnic minority density at the workplace on the job satisfaction and wages of ethnic minority workers would be very interesting, the small sample of ethnic minority workers contained in the WERS (given that there was no over-sampling of ethnic minorities) prevents such a study.

<sup>9</sup>One limitation of the data, however, is that we only know the proportion of all ethnic minority workers and not the detailed breakdown by particular ethnic groups. The main ethnic minority groups in Britain are South Asian (Indian, Pakistani and Bangladeshi), Black Caribbean, Black African and

from 0% to 88%, with the average workplace consisting of 4.7% (with a standard deviation of 9.1%) of workers from ethnic minorities. This reflects the 5.5% of the total population in Britain who are from ethnic minorities. Around 41.7% of workplaces have no ethnic minority workers, a further 37.7% have between 1-5% of their workforce from the ethnic minorities, 9.1% have between 6-10%, 6.8% have between 11-30% and 4.7% have more than 30% of their workforce from the ethnic minorities.

The two dependent variables of interest are job satisfaction and wages, both of which are self-reported by employees in the employee questionnaire. The job satisfaction questions are:

How satisfied are you with the following aspects of your job?

1. The amount of influence you have over your job.
2. The amount of pay you receive.
3. The sense of achievement you get from your work.
4. The respect you get from supervisors/managers.

The responses to each of these questions was reported on a 5-point scale ranging from Very Satisfied (1), Satisfied (2), Neither Satisfied or Dissatisfied (3), Dissatisfied (4) and Very Dissatisfied (5). Unfortunately, employees were not asked directly to evaluate their overall job satisfaction. Consequently, the job satisfaction measure we use is constructed by creating four binary variables taking the value of unity if the worker reports to be either Very Satisfied or Satisfied with a particular aspect of his or her job and zero otherwise. We then sum over the four binary variables to get an overall job satisfaction score that ranges between 0 (not satisfied with any aspects of the job) to 4 (Very Satisfied or Satisfied with all four job aspects). We discuss the sensitivity of our main results to different definitions of overall job satisfaction at the end of the main results section.

Table 1 highlights the distributions of the job satisfaction by gender. It is clear that the majority of workers in Britain report satisfaction with the amount of influence they have over their job (57.9% of men, 60.2% of women), the sense of achievement they get from Chinese. Therefore our estimates of the effect of ethnic minority density at the workplace on the job satisfaction and wages of white workers will be a weighted average since some white workers might prefer working with certain ethnic minority groups more than others.

their work (60.7%, 66.9%) and the respect they get from supervisors/managers (54.2%, 62.45). In contrast, only 33.1% of males and 38.8% of females report satisfaction with the amount they get paid. Interestingly, each of these figures is significantly higher for females than males, which concurs with a number of previous studies that find that women are happier at work than males (Clark, 1997). This gender differential is also clearly reflected in the average satisfaction score of 2.06 for males and 2.28 for females.

The wage information asked of respondents in the employee questionnaire relates to the following question:

How much do you get paid for your job here, before tax and other deductions are taken out? If your pay changes before tax from week to week because of overtime, or because you work different hours each week, think about what you earn on average.

Unfortunately, respondents were not free to report their wage exactly, but rather asked to report it within 12 bands. Figure 1 shows the distribution of wages by gender. As expected, the male wage distribution lies substantially to the right of the female distribution, which partly reflects the far greater percentage of females than males who are employed on a part-time basis. In the empirical wage models we specifically control for the number of working hours.

To get a first feel for the relationship between ethnic minority density at the workplace and job satisfaction and wages, Tables 2 and 3, respectively, provide some simple cross-tabulations of these variables. To aid this we have split the proportion of ethnic minorities at the workplace into three categories - no ethnic minorities at the workplace, a proportion of 0.01 - 0.24 of workers from ethnic minorities and a greater than 0.24 proportion of ethnic minority workers, and we divide wages into four broad bands - Very Low, Low, Medium and High. For both males and females there is some suggestion that average job satisfaction for white workers is lower in workplaces that have a high ethnic minority density. However, the 'raw' relationship between ethnic minority density and wages is less clear. There is some evidence suggesting that the percentage of whites earning High wages (i.e. > £360 per week) is greater in workplaces which have a high density of ethnic minority workers. Similarly, very high ethnic minority density workplaces have significantly fewer workers earning less than £141 per week than workplaces with no ethnic minority workers.

Overall, these relationships tentatively appear to be consistent with white workers having a taste for discrimination which is compensated by higher wages in high ethnic minority density workplaces.

### 4.3 Explanatory variables

For both the job satisfaction and wage empirical models presented in Section 4.1, we perform a four-step sensitivity analysis by successively increasing the number of variables in  $x_{ik}$ . Firstly, we fit the models including only direct personal characteristics and basic job characteristics as covariates (termed the Basic specification). These are: age, marital status, dependant children, health, highest qualification, broad occupation group, log weekly wages (calculated at the mid-points of the bands), log working hours, whether the employee works from home, temporary job, trade union membership and job tenure. Additionally, we control for the unemployment / vacancy rate (in the travel-to-work area) and regional house prices (which we have mapped in to the data). Secondly, we then test the robustness of our main results by adding a number of individual work-related characteristics to control for as much individual heterogeneity as possible (termed Extended 1). These variables, interpreted as proxies for worker quality, are whether or not the employee agrees that his or her job requires one to work very hard or does not have enough time to get their job done, how many days of off-the-job employer-funded training the worker has received in the last 12 months and whether the worker reports that he or she is often asked for advice about workplace practices by supervisors/managers. All of the variables identified so far are from information recorded during the employee interview.

Thirdly, we extend these models using the unique matched employee-employer feature of WERS98, by adding information at the workplace level to capture various job circumstances and to control for workplace quality (referred to as Extended 2). The variables, taken from the manager interview, include the percentage of employees working part-time or who are female; whether an equal opportunities policy is in force; trade union density; the number of employees and whether the workplace is part of a multi-plant firm; broad industrial classification and whether the owner-manager is present. In addition, we

control for a number of recent workplace history aspects (all relating to the previous 12 months). These are whether there has been difficulties filling vacancies; the percentages of vacancies filled internally; of full-time employees who received off-the-job employer-funded training; of workdays lost due to absence and of workers who had a work-related injury. Furthermore, we include two variables to capture aspects of the pay distribution, namely, the percentages of employees earning less than £9,000 per year and more than £29,000 per year.

In our final specification (Extended 3), we additionally include variables that can be interpreted as ‘intervening variables’. These are whether or not a white worker feels that his or her job is secure (taken from the employee questionnaire) and whether there has been reported racial tension or complaints about working conditions at the workplace in the 12 months (taken from the manager interview). The first of these variables allows us to explore the perceived wisdom that it is mainly the effect of ethnic minority workers on feelings of job-insecurity of white workers that generates a taste for discrimination. More generally, these additional estimates will be informative about the mechanisms by which race relations operate at the British workplace.

Importantly, in each of the four empirical specifications we also control for regional house prices and unemployment / vacancy rates, in the travel-to-work area, in order to allow for differences in the cost of living and outside employment opportunities across Britain. Moreover, initial pooling tests suggest that it would be inappropriate to combine both males and females into single models, thus we perform separate job satisfaction and wage analyses by gender.

## 5 Empirical Results

The results from the four specifications of the job satisfaction ordered probit model for white males and females are shown, respectively, in Tables A1 and A2. Given the difficulty in interpreting the quantitative effect of an explanatory variable on job satisfaction from these non-linear models we also provide (for brevity, only for the Extended 3 specification) the associated Marginal Effect (ME), calculated at the means of the other explanatory variables and setting the random effects term to be equal to zero. The corresponding

results from the interval wage regressions are presented in Tables A3 and A4.

### 5.1 The effect of ethnic minority density on job satisfaction and wages

In order to aid the discussion of the importance of ethnic minority density at the workplace, we report the parameter estimates for ethnic minority density for all specifications of the job satisfaction and wage models and present them in Table 4.

A robust finding is that the effect of ethnic minority density on job satisfaction is negative for all specifications of the job satisfaction model for both males and females.<sup>10</sup> However, there is a clear difference in the magnitude of this effect by gender. Looking first at the results for males, we see that in the Basic specification, with only individual characteristics as controls, the effect is -0.629. The wage effect is largest here, with a white male having to be compensated by around 19% higher wages to work in a workplace where all of his co-workers were ethnic minority, compared to a workplace with no ethnic minority co-workers. When we add ‘job-involvement’ variables (Extended 1), the negative effect of ethnic minority density on job satisfaction increases slightly, whereas there is a small decrease in the positive effect of ethnic minority density on wages (to 16%). A comparison of the log likelihood values also indicates that the fit of the models increases substantially. This supports the notion that ‘job-involvement’ variables capture a lot of individual variation important for wages and job satisfaction. Since they can be correlated with, but are not reasonably caused by, ethnic minority density at the workplace, it is clearly important to control for them. When we further add a host of workplace characteristics (Extended 2), the importance of ethnic minority density drops both for job satisfaction (to -0.532) and wages (to 12%). Given that these comprehensive workplace characteristics pick up a great deal of individual and workplace quality information (as evidenced by the change in log-likelihoods), we view this specification as yielding the most reliable estimate of the total effect of ethnic minority density on white male workers.

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<sup>10</sup>Just for information, a simple bivariate model of job satisfaction, where job satisfaction is regressed only on ethnic density, finds a coefficient of -0.307 ( $t$ -stat = 1.88) for females and -0.415 ( $t$ -stat = 2.16) for males. Bivariate wage models find a coefficient of 0.475 ( $t$ -stat = 3.29) and 1.016 ( $t$ -stat = 5.58), respectively.



Turning to our final specification (Extended 3), where we include variables that can be viewed as ‘intervening’, we surprisingly find no change in the effect of ethnic minority density on either job satisfaction or wages (and little improvement in log-likelihoods). Although job-insecurity indeed is an important variable for job satisfaction, it is apparently not capturing any of the effect of ethnic minority density. This is an interesting finding which to some extent supports a number of recent studies which have found no significant effect of immigration on the job security of the majority population (see Borjas, 1999, for a review, and Dustmann and Preston, 2002, for UK evidence).

When we turn to females, qualitatively the same story applies. Again job-involvement variables capture a great deal of individual heterogeneity but do not alter the ethnic minority density effect. Workplace characteristics do capture a lot of the effect of ethnic minority density though, both in wages and in job satisfaction. The absolute changes in the effects of ethnic minority density, when we include workplace characteristics, are the same for males as for females. In this favoured specification, the signs are the same as for males, but the effects are much smaller and statistically insignificant. Hence, insofar as ethnic minority density is a negative job-amenity, it appears to be significantly so for white males but not for white females. Furthermore, when we add ‘intervening’ variables, there is no substantial change in the effect of ethnic minority density, implying that job insecurity and racial tensions are not actually important intervening variables for the effect of ethnic minority density amongst white female employees.

In our favoured specification (Extended 2 model), the effect of ethnic minority density on job satisfaction is -0.532 for males and -0.215 for females. On a 0 to 4 scale, this is quite a large effect, and indeed the ME’s for ethnic minority density are amongst the largest of the entire set of variables. The wage effects of ethnic minority density for this specification are 12% for males and 7% for females.<sup>11</sup> If this wage effect truly reflects the effect of ethnic minority density as a job amenity, this would mean that an absolute

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<sup>11</sup>Interestingly, these compensating wage differentials are very close to the hourly wage gaps, between white and ethnic minority employees, found using WERS 98 by Pudney and Theodoropoulos (2003), namely 13% amongst males and 6% amongst females. The male finding also closely mirrors the 11% male wage differential found for the UK in the 1990s by Blackaby et al. (1998, 2002).

change of 0.1 in latent job satisfaction is roughly worth 2.5% in wages.

Apart from the robustness checks presented above, we have also fitted several model specifications that allowed for differential effects for different age and education groups. Importantly, the estimated effects of ethnic minority density were found to be similar across age groups, education groups, and industries. However, significance was affected by the reduction in sample size. We have also examined the robustness of these results to two alternative derivations of overall job satisfaction, and found that our main results are qualitatively unchanged. For example, instead of collapsing the 5-point responses to the four job satisfaction questions into binary variables (i.e. 1= very satisfied or satisfied), and then summing over the resulting four variables, we simply aggregated the raw responses leading to an overall job satisfaction variable ranging from 0 to 16. Such additional calculations are available from the authors on request.

## 5.2 The general determinants of job satisfaction

Before we conclude the paper we also briefly discuss the plausibility of the other parameter estimates. Overall, our results comply favourably with the findings of the recent job satisfaction literature using British data (see, for example, Clark, 1996; Shields and Ward, 2001; Shields and Wheatley Price, 2002b). We too find that job satisfaction is increasing with wages, and decreasing with hours of work, for both men and women. For males, we find a U-shaped relationship between age and job satisfaction but, for females, we find that job satisfaction is clearly increasing with age. However, the results concerning our wage distribution measures show little evidence of a relative wage effect. For both males and females, higher levels of education are associated with reduced job satisfaction, whilst individuals in managerial and professional occupations clearly have the highest job satisfaction levels. Interestingly, job satisfaction is higher for workers who report that their job requires them to work very hard, for those who have received employer-funded off-the-job training in the last year and for those who are often asked advice from their supervisors/managers. Individuals who report that they do not have enough time to get their job done also enjoy lower job satisfaction levels.

Turning to workplace characteristics, we find that job satisfaction is higher at work-

places that have a large proportion working part-time, but the gender composition of the workplace is not a significant predictor of job satisfaction. For males we find that employees in small workplaces report higher job satisfaction levels whereas females job satisfaction levels are significantly associated with the presence of an equal opportunities policy and trade union density. Industry is also an important determinant of job satisfaction in Britain, even after controlling for many other workplace characteristics. Interestingly, the percentage of workdays lost due to absence is not a significant predictor of job satisfaction at the workplace.

Turning to our intervening variables, which might explain the reasons for tastes for discrimination arising, we find that feelings of job insecurity significantly reduce job satisfaction for both males and females. However, we find little evidence that working in a workplace that has, according to the manager, experienced racial tension, discrimination or bad working conditions in the last 12 months, is associated with reported job satisfaction levels. Finally, it is clearly the case that there exist unobserved workplace-specific characteristics that impact on job satisfaction, even after extensively controlling for workplace characteristics. This latter finding reinforces the usefulness of matched employee-employer survey data when investigating the determinants of job satisfaction.

### **5.3 The determinant of wages**

Finally, we will briefly discuss the auxiliary results from the wage equations. As expected, we find a n-shaped age profile, with wages being highest in the age range 40-49 for both genders. Education is clearly important, as is marital status, having dependant children and health. Occupation is a major predictor of wages, with wages being highest for managers and professionals. There is the expected tenure profile, and weekly wages are increasing with hours worked. Working in a temporary job is associated with lower wages, whilst there are positive wage effects of working at home and being a member of a trade union. Wages are higher in regions where house prices are high, capturing differences in the cost of living across Britain. There is also some evidence for males that wages are lower in travel-to-work areas that have higher unemployment / vacancy rates.

Those who undertook training in the last 12 months report higher wages, as do those

workers who report that they are often asked by their supervisor/manager for advice about workplace practices. For males only, wages are lower in workplaces that have a high density of part-time workers and higher in workplaces that employ a high percentage of female workers. Trade union density is clearly associated with higher wages, but wages are only higher in larger workplaces for males. Industry is an important predictor of wages, with workers in financial services earning the most. For females, wages are higher in single workplace firms and lower in workplaces that have had problems filling vacancies in the last 12 months. For males, there is some evidence indicating that wages are higher in workplaces that suffer from a lot of work-related injuries, possibly capturing a compensating differential effect. Lastly, the wage workplace wage distribution variables have the expected effect, with an individual's wages being higher in workplaces with a higher percentage of workers earning more than £29,000 per year.

## 6 Conclusions

In this paper, we have been able to provide one of the first direct empirical tests of Becker's (1957, 1991) theory of employees' tastes for racial discrimination, using detailed information from a unique matched employee-employer survey (WERS98) conducted in Britain in 1997/98. To motivate our empirical analyses we presented a partial-equilibrium compensating differential model, which clearly predicts that white workers should have lower job satisfaction if they work with a large number of ethnic minority workers. Furthermore, it suggests that this loss of job satisfaction should be compensated for by higher wages. We also extended this model into a general equilibrium framework.

We have found robust evidence in support of the theory. In particular, we have found that white workers are less satisfied with their job the greater the proportion of ethnic minority co-workers. Moreover, white male workers would require a wage premium of around 12% to compensate them for a move from a workplace with no ethnic minority co-workers to one with only ethnic minority co-workers. This finding is consistent with a structural model of worker allocation in the presence of a taste for discrimination amongst employees. For females, the effects were smaller and statistically insignificant, with a necessary compensating differential of about 7%.

An important finding is that the taste for discrimination does not operate through greater job insecurity for white workers, which is consistent with recent studies showing that immigration does not reduce the job-security of native-born workers (see, Borjas, 1999).

The detailed survey data we have used has allowed us to comprehensively control for a wide-range of workplace characteristics, capturing both workplace quality and amenities. Failure to control for such characteristics could otherwise have led to a spurious relationship between ethnic minority density and our dependent variables. Of course, it is still possible that our data is lacking an important negative job amenity that happens to be related to ethnic minority density at the workplace. However, it is clearly the case that such an amenity is unrelated to age, education, gender, health, industry, job security, occupation or region. We hence find it difficult to interpret our findings in any other way than a clear endorsement of the employee ‘taste for discrimination’ model in the UK. Indeed, it seems more likely that we have underestimated the effects of ethnic density. If, for example, the unobserved lower-quality white workers are more likely to be found in workplaces with higher ethnic minority density, then this would bias our wage results downward (Hwang et al. 1992). Another potential source of downward bias is our assumption that occupations are exogenous. It is quite likely that one form of compensation for job amenities is to assign someone to a higher occupation than would otherwise be warranted on the basis of their human capital characteristics.<sup>12</sup> We therefore view our wage findings as lower bounds.

A taste for discrimination could imply racial prejudice by white workers in Britain. There is certainly some evidence of racist attitudes in the general population (Dustmann and Preston, 2001) and racial harassment appears prevalent in some British workplaces (Shields and Wheatley Price 2002a, 2002b). However, an alternative explanation of our results is that white workers and ethnic minority co-workers simply find it hard to get along because of language or other cultural barriers. To assign blame to a white worker who prefers to work with people he or she might get along with easily is not necessarily

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<sup>12</sup>We ran separate analyses that ignored occupations. This did increase the wage effects of ethnic density by a factor of about 1.2.

warranted. Similarly, there may be a taste for discrimination amongst ethnic minority employees, although we were unable investigate this possibility. Whilst there has been some success in reducing employer discrimination, through the emphasis on equal opportunities monitoring and the threat of legal action, it is less clear how legislative activity can eliminate racially biased preferences or discriminatory tastes .

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TABLE 1: The Distribution of Job Satisfaction by Gender

Percentage	MALES	FEMALES
<i>Job Satisfaction Aspect</i>		
Amount of influence (1,0)	57.9 (0.46)	60.2 (0.46)
Amount of pay (1,0)	33.1 (0.44)	38.8 (0.45)
Sense of achievement (1,0)	60.7 (0.45)	66.9 (0.44)
Respect from supervisor/manager (1,0)	54.2 (0.46)	62.4 (0.45)
Average overall satisfaction score (0-4)	2.06 (0.01)	2.28 (0.01)

Note: Standard error of mean value shown in parentheses.

FIGURE 1: The Distribution of Wages by Gender

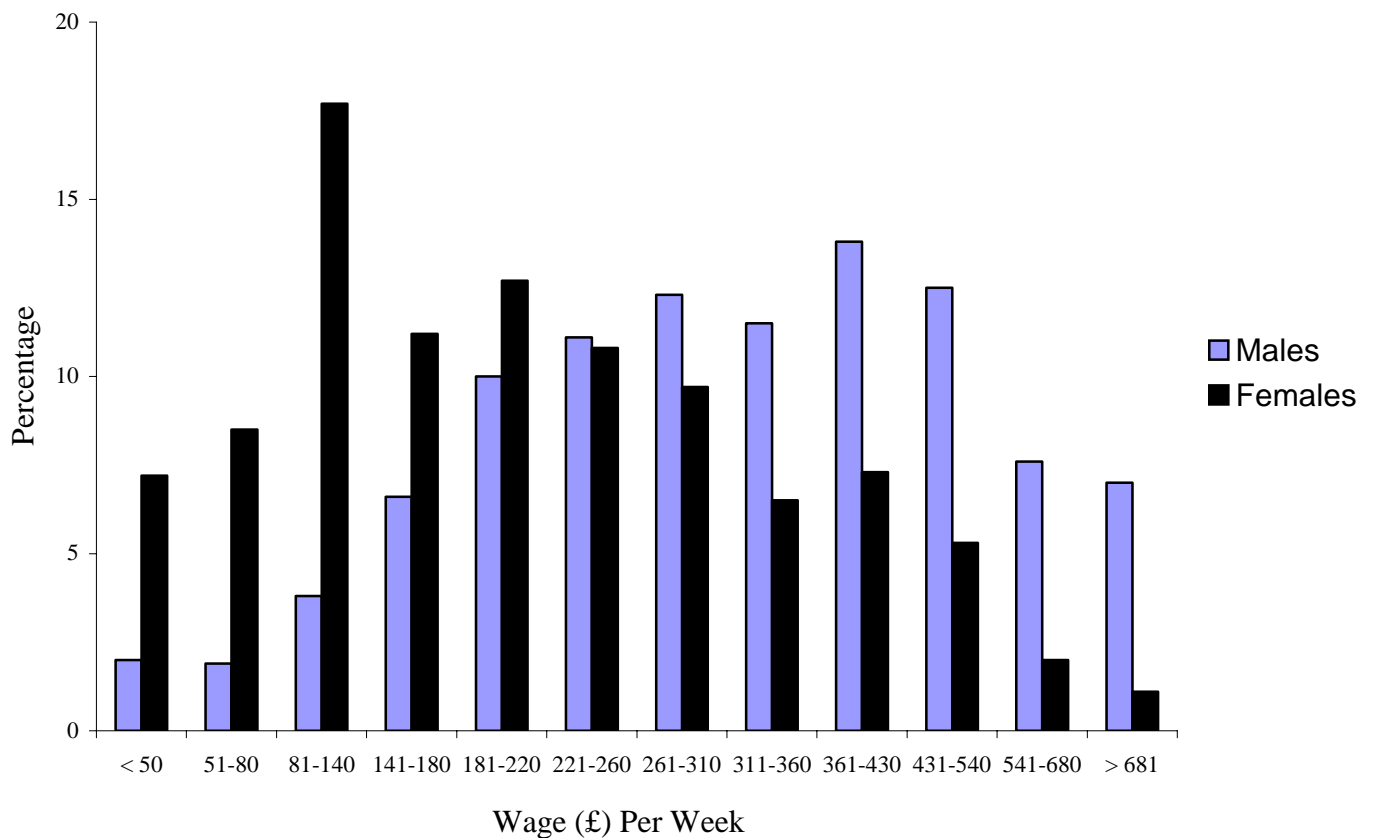


TABLE 2: Average Job Satisfaction by Workplace Ethnic Density

Percentage	MALES	FEMALES
<b><i>Ethnic Density</i></b>		
> 25% of employees from ethnic minorities	1.92 (0.07)	2.14 (0.06)
1-24%	2.05 (0.02)	2.22 (0.02)
0% of employees from ethnic minorities	2.09 (0.02)	2.37 (0.02)

Note: Standard error of mean value shown in parentheses.

TABLE 3: Wage Distribution by Workplace Ethnic Density

Percentage	MALES				FEMALES			
	L	M1	M2	H	L	M1	M2	H
<b><i>Ethnic Density</i></b>								
> 25% of employees from ethnic minorities	6.4 (1.2)	29.6 (2.2)	34.7 (2.3)	29.2 (2.2)	19.7 (1.9)	35.7 (2.3)	33.5 (2.2)	11.1 (1.5)
1-24%	6.6 (0.3)	25.4 (0.5)	37.5 (0.6)	30.6 (0.6)	28.9 (0.6)	36.0 (0.6)	25.4 (0.6)	9.7 (0.4)
0% of employees from ethnic minorities	9.3 (0.4)	30.6 (0.7)	38.0 (0.7)	22.0 (0.6)	40.4 (0.7)	32.6 (0.7)	20.2 (0.6)	6.8 (0.4)

Notes: Standard error of mean value shown in parentheses. L (low wages) means wages less than £141 per week; M1 (lower middle) means wages between £141 and £260 per week, M2 (higher middle) means wages between £261 and £360 per week and H (high wages) means wages above £360 per week.

TABLE 4: Summary of Main Results

	BASIC			EXTENDED 1			EXTENDED 2			EXTENDED 3		
	$\beta$	<i>t</i> -stat	ME	$\beta$	<i>t</i> -stat	ME	$\beta$	<i>t</i> -stat	ME	$\beta$	<i>t</i> -stat	ME
<b>MALES</b>												
<i>Job Satisfaction Models</i>												
Ratio of ethnic minorities to whites	-0.629	-4.75	-0.16	-0.703	-4.20	-0.17	-0.532	-2.99	-0.13	-0.468	-2.34	-0.12
<i>Wage Models</i>												
Ratio of ethnic minorities to whites	0.188	2.25	-	0.158	2.10	-	0.117	1.85		0.123	1.91	-
<b>FEMALES</b>												
<i>Job Satisfaction Models</i>												
Ratio of ethnic minorities to whites	-0.339	-2.22	-0.10	-0.389	-1.96	-0.11	-0.215	-1.06	-0.06	-0.137	-0.68	-0.04
<i>Wage Models</i>												
Ratio of ethnic minorities to whites	0.165	2.37	-	0.159	2.29	-	0.071	1.18	-	0.065	1.08	-

*Notes:* The full sets of parameter estimates for each of the models are given in Table A1-A4 in the appendix. ME is the marginal effect (estimated from the ordered probit random effects models) calculated at the means of the explanatory variables and setting the (workplace) random effects terms to be equal to zero.

TABLE A1: The Determinants of Job Satisfaction for White Males:  
Ordered Probit (Workplace) Random Effects Estimates

Explanatory Variables	BASIC		EXTENDED 1		EXTENDED 2		EXTENDED 3		
	$\beta$	t-stat	$\beta$	t-stat	$\beta$	t-stat	$\beta$	t-stat	ME
Percentage of ethnic minorities / 100	-0.629	-4.75	-0.703	-4.20	-0.532	-2.99	-0.468	-2.34	-0.124
Age 25-29	-0.222	-4.63	-0.140	-2.80	-0.137	-2.66	-0.112	-2.18	-0.024
Age 30-39	-0.239	-5.18	-0.118	-2.40	-0.119	-2.36	-0.032	-0.62	-0.007
Age 40-49	-0.184	-3.81	-0.032	-0.61	-0.036	-0.68	0.090	1.65	0.021
Age 50-59	-0.039	-0.77	0.126	2.30	0.119	2.12	0.245	4.28	0.060
Age > 60	0.369	5.31	0.587	7.96	0.566	7.55	0.614	7.94	0.176
Married / Co-habiting	0.004	0.16	0.005	0.19	0.006	0.22	0.002	0.09	0.001
Dependant children	-0.001	-0.03	0.007	0.20	0.004	0.10	0.015	0.42	0.003
Long-term health condition	-0.192	-4.43	-0.188	-4.15	-0.185	-4.08	-0.174	-3.79	-0.036
Degree or equivalent	-0.284	-7.01	-0.264	-6.19	-0.277	-6.27	-0.264	-5.98	-0.056
'A' level or equivalent	-0.272	-6.67	-0.258	-6.09	-0.260	-6.02	-0.247	-5.71	-0.051
'O' level or equivalent	-0.215	-6.12	-0.208	-5.76	-0.210	-5.70	-0.194	-5.22	-0.041
CSE or equivalent	-0.068	-1.69	-0.069	-1.67	-0.075	-1.78	-0.069	-1.62	-0.015
Manager	0.358	6.77	0.243	4.15	0.206	3.38	0.233	3.72	0.057
Professional	0.060	1.16	0.052	0.92	0.013	0.22	0.026	0.42	0.006
Technical	-0.169	-3.22	-0.163	-2.85	-0.168	-2.81	-0.148	-2.43	-0.031
Clerical	-0.221	-3.98	-0.231	-3.86	-0.219	-3.49	-0.187	-2.96	-0.038
Craft	-0.114	-2.47	-0.093	-1.82	-0.117	-2.14	-0.096	-1.74	-0.021
Services	-0.017	-0.29	-0.105	-1.50	-0.128	-1.65	-0.091	-1.16	-0.020
Operator	-0.374	-8.03	-0.341	-6.54	-0.332	-6.01	-0.349	-6.21	-0.069
Other	-0.208	-4.15	-0.156	-2.83	-0.157	-2.70	-0.172	-2.91	-0.036
Log weekly wages (pre-tax )	0.396	13.61	0.335	10.17	0.379	10.80	0.396	11.16	0.089
Log hours	-0.404	-10.41	-0.385	-9.04	-0.372	-8.42	-0.382	-8.78	-0.086
Works at home	0.234	7.22	0.198	5.25	0.205	5.37	0.207	5.39	0.050
Temporary job	0.133	2.72	0.123	2.45	0.133	2.59	0.330	6.52	0.085
Trade union member	-0.175	-8.24	-0.191	-7.27	-0.151	-4.72	-0.112	-3.47	-0.025
< 1 year with current firm	0.258	6.90	0.218	5.39	0.215	5.24	0.234	5.74	0.057
1 - 2 years with current firm	0.099	2.53	0.071	1.67	0.067	1.55	0.111	2.52	0.026
3 - 5 years with current firm	0.081	2.68	0.070	2.16	0.064	1.92	0.079	2.39	0.018
6 - 10 years with current firm	-0.012	-0.39	0.002	0.07	-0.002	-0.07	0.002	0.06	0.001
Log regional house prices	0.000	-1.67	0.012	0.24	0.006	0.12	0.007	0.12	0.002
Unemployment rate (travel-to-work-area)	0.003	0.53	0.006	0.76	0.007	0.88	0.015	1.82	0.003
Agree - Job requires one to work very hard	-	-	0.159	6.07	0.160	6.02	0.147	5.48	0.032
Agree - Not enough time to get job done	-	-	-0.332	-13.87	-0.333	-13.55	-0.295	-11.71	-0.065
1-4 days of off-the-job training	-	-	0.356	11.10	0.376	11.24	0.339	10.01	0.084
5-10 days of off-the-job training	-	-	0.200	7.48	0.208	7.42	0.194	6.92	0.045
Often asked advice about workplace practices	-	-	0.611	20.12	0.607	19.84	0.556	17.83	0.147
% of employees working part-time	-	-	-	-	0.002	2.63	0.002	2.36	0.001
% of employees who are female	-	-	-	-	0.001	1.45	0.001	0.69	0.000
Equal opportunities policy in force	-	-	-	-	-0.008	-0.22	-0.003	-0.08	-0.001
Trade union density at workplace	-	-	-	-	0.000	-0.79	0.000	0.08	0.000
Log firm size (no. of employees)	-	-	-	-	-0.033	-2.19	-0.031	-2.00	-0.007

TABLE A1: (Continued)

Construction	-	-	-	-	0.047	0.83	0.039	0.70	0.009
Wholesale	-	-	-	-	-0.153	-3.23	-0.189	-3.85	-0.040
Hotels and restaurants	-	-	-	-	-0.108	-1.26	-0.101	-1.19	-0.022
Transport	-	-	-	-	-0.123	-2.26	-0.140	-2.55	-0.030
Financial	-	-	-	-	-0.216	-3.21	-0.130	-1.85	-0.027
Other business	-	-	-	-	-0.130	-2.39	-0.127	-2.30	-0.027
Education	-	-	-	-	-0.115	-1.76	-0.238	-3.48	-0.048
Health	-	-	-	-	-0.148	-2.14	-0.128	-1.83	-0.027
Other	-	-	-	-	-0.107	-1.76	-0.126	-1.96	-0.027
Single workplace firm	-	-	-	-	0.109	2.64	0.108	2.46	0.025
Owner manager firm	-	-	-	-	-0.017	-0.34	-0.050	-0.93	-0.011
Problem filling vacancies	-	-	-	-	-0.033	-1.22	-0.045	-1.66	-0.010
% of vacancies filled internally	-	-	-	-	-0.002	-0.26	-0.007	-0.89	-0.002
% of employees receiving off-the-job training	-	-	-	-	0.006	0.82	0.007	1.09	0.002
% of workdays lost due to absence	-	-	-	-	-0.004	-0.93	-0.007	-1.68	-0.002
% of workers having workplace injury	-	-	-	-	-0.351	-1.33	-0.384	-1.36	-0.086
Absence information missing	-	-	-	-	-0.072	-1.81	-0.062	-1.53	-0.014
Injury information missing	-	-	-	-	-0.011	-0.35	0.003	0.09	0.001
% of employees <£9,000 per year	-	-	-	-	0.000	0.54	0.000	0.21	0.000
% of employees >£29,000 per year	-	-	-	-	0.000	1.09	0.000	1.26	0.000
Racial tensions at the workplace	-	-	-	-	-	-	0.052	0.43	0.012
Discrimination at the workplace	-	-	-	-	-	-	-0.072	-1.17	-0.016
Bad conditions concerns at workplace	-	-	-	-	-	-	0.014	0.42	0.003
Agree that your job is secure	-	-	-	-	-	-	0.813	27.49	0.182
Indifferent about job security	-	-	-	-	-	-	0.356	11.16	0.087
Standard deviation of random effect	0.071	3.06	0.213	12.18	0.194	10.16	0.198	10.39	
Log Likelihood	-16080		-14999		-14965		-14557		
Sample	10052		10052		10052		10052		

Notes: The omitted categories are age less than 25, single, no children, free of long-term health condition, no qualifications, sales, does not work at home, permanent job, not a trade union member, with current firm more than 10 years, does not agree that 'my job requires that I work very hard', does not agree that 'I never seem to have enough time to get my job done', has not undertaken any employer-funded off-the-job training in last 12 months, manager does not frequently ask my views about changes to work practices, no equal opportunities policy at the workplace, manufacturing sector, multi-workplace firm, no owner manager, no problems filling vacancies in last 12 months, no problems due to racial harassment at the workplace in last 12 months, no problems due to discrimination at the workplace in last 12 months, no problems due to bad working conditions at the workplace in last 12 months and disagree with the statement 'I feel my job is secure in this workplace'. The ME is the marginal effect from Extended 3 model calculated at the means of the explanatory variables and setting the random effects term to zero. '-' means that the variable is not included in model.

TABLE A2: The Determinants of Job Satisfaction for White Females:  
Ordered Probit (Workplace) Random Effects Estimates

Explanatory Variables	BASIC		EXTENDED 1		EXTENDED 2		EXTENDED 3		
	$\beta$	<i>t</i> -stat	$\beta$	<i>t</i> -stat	$\beta$	<i>t</i> -stat	$\beta$	<i>t</i> -stat	ME
Percentage of ethnic minorities / 100	-0.339	-2.22	-0.389	-1.96	-0.215	-1.06	-0.137	-0.68	0.044
Age 25-29	0.036	0.83	0.088	1.86	0.084	1.77	0.115	2.42	0.033
Age 30-39	0.016	0.41	0.083	1.96	0.073	1.67	0.147	3.36	0.042
Age 40-49	0.078	1.85	0.150	3.32	0.124	2.68	0.221	4.74	0.065
Age 50-59	0.192	4.13	0.273	5.45	0.246	4.80	0.336	6.47	0.102
Age > 60	0.561	6.98	0.637	7.49	0.605	6.95	0.640	7.37	0.216
Married / Co-habiting	0.117	4.66	0.124	4.65	0.119	4.38	0.121	4.44	0.033
Dependant children	0.015	0.42	0.022	0.58	0.028	0.73	0.032	0.83	0.009
Long-term health condition	-0.221	-4.31	-0.194	-3.59	-0.184	-3.38	-0.163	-2.97	-0.043
Degree or equivalent	-0.502	-11.78	-0.502	-10.92	-0.522	-11.04	-0.496	-10.49	-0.124
'A' level or equivalent	-0.308	-7.78	-0.323	-7.68	-0.328	-7.61	-0.291	-6.76	-0.075
'O' level or equivalent	-0.194	-5.89	-0.205	-5.83	-0.204	-5.71	-0.179	-4.97	-0.049
CSE or equivalent	-0.054	-1.31	-0.068	-1.56	-0.073	-1.65	-0.055	-1.23	-0.015
Manager	0.430	7.88	0.367	6.08	0.361	5.66	0.385	6.03	0.121
Professional	0.229	4.66	0.233	4.12	0.164	2.65	0.162	2.60	0.047
Technical	0.051	1.11	0.018	0.34	0.015	0.25	0.028	0.45	0.008
Clerical	-0.047	-1.38	-0.010	-0.25	-0.008	-0.16	0.006	0.12	0.002
Craft	-0.005	-0.06	0.022	0.21	-0.003	-0.03	0.061	0.54	0.018
Services	0.111	2.71	0.004	0.09	-0.042	-0.73	-0.006	-0.10	-0.002
Operator	-0.332	-5.76	-0.331	-4.86	-0.349	-4.54	-0.331	-4.25	-0.081
Other	0.093	2.14	0.096	1.84	0.083	1.44	0.099	1.69	0.029
Log weekly wages (pre-tax )	0.255	9.20	0.229	7.36	0.258	7.86	0.276	8.26	0.077
Log hours	-0.332	-10.02	-0.337	-9.01	-0.334	-8.69	-0.335	-8.68	-0.094
Works at home	0.364	8.94	0.344	7.53	0.341	7.40	0.355	7.73	0.111
Temporary job	0.044	1.08	0.036	0.80	0.028	0.60	0.267	5.71	0.081
Trade union member	-0.154	-6.67	-0.179	-6.54	-0.188	-6.11	-0.157	-5.08	-0.043
< 1 year with current firm	0.273	7.33	0.214	5.22	0.223	5.41	0.219	5.29	0.065
1 - 2 years with current firm	0.115	2.99	0.057	1.38	0.062	1.47	0.060	1.44	0.017
3 - 5 years with current firm	0.076	2.39	0.054	1.57	0.059	1.69	0.069	1.99	0.020
6 - 10 years with current firm	0.009	0.27	-0.004	-0.11	-0.002	-0.04	0.006	0.18	0.002
Log regional house prices	0.000	-3.26	-0.090	-1.71	-0.105	-1.93	-0.121	-2.19	-0.034
Unemployment rate (travel-to-work-area)	-0.009	-1.52	-0.011	-1.31	-0.010	-1.25	-0.008	-0.99	-0.002
Agree - Job requires one to work very hard	-	-	0.177	5.96	0.181	5.99	0.157	5.18	0.042
Agree - Not enough time to get job done	-	-	-0.337	-13.90	-0.343	-14.00	-0.320	-12.88	-0.088
1-4 days of off-the-job training	-	-	0.297	8.45	0.309	8.64	0.284	7.92	0.086
5-10 days of off-the-job training	-	-	0.172	6.76	0.173	6.64	0.161	6.10	0.046
Often asked advice about workplace practices	-	-	0.560	17.43	0.557	17.26	0.502	15.78	0.157
% of employees working part-time	-	-	-	-	0.003	3.38	0.002	3.15	0.001
% of employees who are female	-	-	-	-	0.000	-0.39	-0.001	-0.90	0.000
Equal opportunities policy in force	-	-	-	-	-0.090	-2.33	-0.059	-1.49	-0.017
Trade union density at workplace	-	-	-	-	0.001	1.41	0.001	2.28	0.000
Log firm size (no. of employees)	-	-	-	-	-0.010	-0.66	-0.011	-0.77	-0.003



TABLE A2: (Continued)

Construction	-	-	-	-	-0.003	-0.04	-0.007	-0.07	-0.002
Wholesale	-	-	-	-	-0.150	-2.45	-0.210	-3.41	-0.056
Hotels and restaurants	-	-	-	-	-0.071	-0.86	-0.098	-1.17	-0.026
Transport	-	-	-	-	-0.180	-2.27	-0.209	-2.57	-0.054
Financial	-	-	-	-	-0.238	-3.57	-0.170	-2.44	-0.045
Other business	-	-	-	-	0.014	0.23	-0.009	-0.14	-0.002
Education	-	-	-	-	0.013	0.21	-0.054	-0.84	-0.015
Health	-	-	-	-	-0.107	-1.67	-0.089	-1.37	-0.025
Other	-	-	-	-	-0.117	-1.59	-0.116	-1.48	-0.031
Single workplace firm	-	-	-	-	-0.025	-0.64	-0.035	-0.89	-0.010
Owner manager firm	-	-	-	-	0.096	1.87	0.072	1.31	0.021
Problem filling vacancies	-	-	-	-	-0.068	-2.47	-0.071	-2.54	-0.020
% of vacancies filled internally	-	-	-	-	0.007	0.95	-0.003	-0.39	-0.001
% of employees receiving off-the-job training	-	-	-	-	-0.009	-1.24	-0.004	-0.54	-0.001
% of workdays lost due to absence	-	-	-	-	0.001	0.37	0.000	0.02	0.000
% of workers having workplace injury	-	-	-	-	-1.096	-3.19	-1.152	-3.51	-0.323
Absence information missing	-	-	-	-	-0.053	-1.32	-0.062	-1.56	-0.017
Injury information missing	-	-	-	-	-0.013	-0.39	-0.017	-0.52	-0.005
% of employees <£9,000 per year	-	-	-	-	-0.001	-1.66	-0.001	-2.38	0.000
% of employees >£29,000 per year	-	-	-	-	0.000	1.09	0.000	1.25	0.000
Racial tensions at the workplace	-	-	-	-	-	-	-0.008	-0.07	-0.002
Discrimination at the workplace	-	-	-	-	-	-	-0.031	-0.46	-0.009
Bad conditions concerns at workplace	-	-	-	-	-	-	-0.027	-0.71	-0.008
Agree that your job is secure	-	-	-	-	-	-	0.753	23.76	0.199
Indifferent about job security	-	-	-	-	-	-	-0.001	-0.68	0.080
Standard deviation of random effect	0.071	2.76	0.228	12.28	0.202	10.70	0.200	7.79	
Log Likelihood	-16117		-15174		-15128		-14790		
Sample	10085		10085		10085		10085		

Notes: The omitted categories are age less than 25, single, no children, free of long-term health condition, no qualifications, sales, does not work at home, permanent job, not a trade union member, with current firm more than 10 years, does not agree that 'my job requires that I work very hard', does not agree that 'I never seem to have enough time to get my job done', has not undertaken any employer-funded off-the-job training in last 12 months, manager does not frequently ask my views about changes to work practices, no equal opportunities policy at the workplace, manufacturing sector, multi-workplace firm, no owner manager, no problems filling vacancies in last 12 months, no problems due to racial harassment at the workplace in last 12 months, no problems due to discrimination at the workplace in last 12 months, no problems due to bad working conditions at the workplace in last 12 months and disagree with the statement 'I feel my job is secure in this workplace'. The ME is the marginal effect from Extended 3 model calculated at the means of the explanatory variables and setting the random effects term to zero. '-' means that the variable is not included in model.

TABLE A3: The Determinants of Log Weekly Wages for White Males:  
Interval Regression Estimates

Explanatory Variables	BASIC		EXTENDED 1		EXTENDED 2		EXTENDED 3	
	$\beta$	<i>t</i> -stat	$\beta$	<i>t</i> -stat	$\beta$	<i>t</i> -stat	$\beta$	<i>t</i> -stat
Percentage of ethnic minorities / 100	0.188	2.25	0.158	2.10	0.117	1.85	0.123	1.91
Age 25-29	0.250	13.71	0.257	14.10	0.223	13.30	0.224	13.37
Age 30-39	0.355	19.92	0.364	20.37	0.328	20.03	0.329	20.08
Age 40-49	0.397	21.08	0.410	21.64	0.388	22.09	0.388	22.16
Age 50-59	0.381	19.09	0.396	19.69	0.380	20.47	0.380	20.49
Age > 60	0.212	8.27	0.237	9.30	0.247	10.41	0.247	10.46
Married / Co-habiting	0.105	12.19	0.103	12.11	0.086	11.23	0.085	11.16
Dependant children	0.041	4.10	0.040	4.10	0.042	4.77	0.043	4.79
Long-term health condition	-0.034	-2.17	-0.032	-2.06	-0.030	-2.39	-0.030	-2.40
Degree or equivalent	0.265	17.51	0.263	17.48	0.263	18.94	0.263	18.96
'A' level or equivalent	0.142	10.07	0.138	9.79	0.133	10.36	0.133	10.36
'O' level or equivalent	0.082	6.77	0.079	6.60	0.086	7.93	0.086	7.91
CSE or equivalent	0.023	1.66	0.022	1.59	0.037	2.96	0.037	2.95
Manager	0.487	18.78	0.467	18.45	0.421	19.30	0.420	19.27
Professional	0.393	14.84	0.382	14.72	0.344	15.15	0.343	15.09
Technical	0.285	11.07	0.278	10.99	0.183	8.35	0.182	8.30
Clerical	0.094	3.53	0.092	3.54	-0.005	-0.22	-0.006	-0.25
Craft	0.122	4.86	0.126	5.13	0.052	2.43	0.051	2.40
Services	-0.158	-3.95	-0.172	-4.23	-0.107	-2.61	-0.106	-2.59
Operator	-0.025	-0.96	-0.010	-0.40	-0.088	-4.06	-0.088	-4.08
Other	-0.178	-6.89	-0.163	-6.47	-0.147	-6.45	-0.148	-6.45
Log hours	0.697	23.64	0.694	23.40	0.606	20.81	0.606	20.82
Works at home	0.148	11.08	0.136	10.35	0.093	7.87	0.093	7.84
Temporary job	-0.152	-6.63	-0.148	-6.48	-0.122	-6.06	-0.122	-6.06
Trade union member	0.094	8.88	0.086	8.20	0.048	4.87	0.048	4.88
< 1 year with current firm	-0.160	-10.81	-0.166	-11.19	-0.125	-9.36	-0.125	-9.31
1 - 2 years with current firm	-0.145	-9.72	-0.151	-10.05	-0.106	-7.96	-0.106	-7.89
3 - 5 years with current firm	-0.093	-8.50	-0.094	-8.69	-0.055	-5.65	-0.054	-5.59
6 - 10 years with current firm	-0.062	-6.02	-0.059	-5.83	-0.034	-3.62	-0.034	-3.59
Log regional house prices	0.262	11.51	0.269	12.01	0.246	12.27	0.245	12.22
Unemployment rate (travel-to-work-area)	-0.005	-1.31	-0.004	-1.10	-0.006	-1.97	-0.006	-1.91
Agree - Job requires one to work very hard	-	-	0.004	0.41	0.011	1.35	0.010	1.30
Agree - Not enough time to get job done	-	-	-0.023	-3.00	-0.013	-1.81	-0.012	-1.78
1-4 days of off-the-job training	-	-	0.090	8.01	0.052	5.04	0.052	5.07
5-10 days of off-the-job training	-	-	0.064	7.53	0.044	5.62	0.045	5.64
Often asked advice about workplace practices	-	-	0.039	3.88	0.052	5.39	0.051	5.37
% of employees working part-time	-	-	-	-	-0.005	-12.38	-0.005	-12.33
% of employees who are female	-	-	-	-	0.001	2.40	0.001	2.35
Equal opportunities policy in force	-	-	-	-	0.011	0.74	0.011	0.74
Trade union density at workplace	-	-	-	-	0.001	2.49	0.001	2.42
Log firm size (no. of employees)	-	-	-	-	0.027	4.77	0.027	4.76

TABLE A3: (Continued)

Construction	-	-	-	-	-0.005	-0.25	-0.004	-0.21
Wholesale	-	-	-	-	-0.034	-1.88	-0.034	-1.85
Hotels and restaurants	-	-	-	-	-0.134	-4.37	-0.134	-4.40
Transport	-	-	-	-	-0.054	-2.76	-0.052	-2.65
Financial	-	-	-	-	0.061	2.33	0.064	2.39
Other business	-	-	-	-	-0.030	-1.34	-0.029	-1.28
Education	-	-	-	-	-0.128	-5.46	-0.127	-5.39
Health	-	-	-	-	-0.114	-4.22	-0.113	-4.17
Other	-	-	-	-	-0.074	-3.13	-0.073	-3.07
Single workplace firm	-	-	-	-	-0.013	-0.84	-0.014	-0.87
Owner manager firm	-	-	-	-	-0.025	-1.26	-0.024	-1.19
Problem filling vacancies	-	-	-	-	0.011	1.05	0.011	1.03
% of vacancies filled internally	-	-	-	-	-0.006	-2.09	-0.006	-2.15
% of employees receiving off-the-job training	-	-	-	-	-0.002	-0.89	-0.003	-0.91
% of workdays lost due to absence	-	-	-	-	-0.002	-1.19	-0.002	-1.22
% of workers having workplace injury	-	-	-	-	0.168	1.75	0.159	1.70
Absence information missing	-	-	-	-	-0.026	-1.72	-0.027	-1.80
Injury information missing	-	-	-	-	0.046	3.97	0.046	3.93
% of employees <£9,000 per year	-	-	-	-	-0.001	-3.11	-0.001	-3.34
% of employees >£29,000 per year	-	-	-	-	0.001	6.48	0.001	6.74
Racial tensions at the workplace	-	-	-	-	-	-	0.019	0.39
Discrimination at the workplace	-	-	-	-	-	-	-0.019	-0.96
Bad conditions concerns at workplace	-	-	-	-	-	-	0.012	0.90
Agree that your job is secure	-	-	-	-	-	-	0.002	0.22
Indifferent about job security	-	-	-	-	-	-	-0.002	-0.28
Log Likelihood	-18429	-18353	-17566	-17563				
Sample	10052	10052	10052	10052				

Notes: The omitted categories are age less than 25, single, no children, free of long-term health condition, no qualifications, sales, does not work at home, permanent job, not a trade union member, with current firm more than 10 years, does not agree that 'my job requires that I work very hard', does not agree that 'I never seem to have enough time to get my job done', has not undertaken any employer-funded off-the-job training in last 12 months, manager does not frequently ask my views about changes to work practices, no equal opportunities policy at the workplace, manufacturing sector, multi-workplace firm, no owner manager, no problems filling vacancies in last 12 months, no problems due to racial harassment at the workplace in last 12 months, no problems due to discrimination at the workplace in last 12 months, no problems due to bad working conditions at the workplace in last 12 months and disagree with the statement 'I feel my job is secure in this workplace'. '-' means that the variable is not included in model. The standard errors have been adjusted for workplace clustering.

TABLE A4: The Determinants of Log Weekly Wages for White Females:  
Interval Regression Estimates

Explanatory Variables	BASIC		EXTENDED 1		EXTENDED 2		EXTENDED 3	
	$\beta$	<i>t</i> -stat	$\beta$	<i>t</i> -stat	$\beta$	<i>t</i> -stat	$\beta$	<i>t</i> -stat
Percentage of ethnic minorities / 100	0.165	2.37	0.159	2.29	0.071	1.18	0.065	1.08
Age 25-29	0.163	11.23	0.162	11.22	0.126	9.45	0.126	9.46
Age 30-39	0.233	15.55	0.231	15.43	0.202	14.90	0.202	14.86
Age 40-49	0.220	15.03	0.219	14.98	0.212	15.92	0.212	15.84
Age 50-59	0.208	12.59	0.209	12.67	0.207	13.69	0.207	13.60
Age > 60	0.127	4.46	0.130	4.62	0.140	5.36	0.140	5.39
Married / Co-habiting	0.007	0.84	0.006	0.73	0.007	1.01	0.007	0.99
Dependant children	0.060	5.11	0.059	5.01	0.054	4.93	0.054	4.95
Long-term health condition	-0.062	-4.18	-0.061	-4.10	-0.056	-3.86	-0.057	-3.92
Degree or equivalent	0.343	21.60	0.337	21.13	0.320	21.52	0.319	21.38
'A' level or equivalent	0.193	14.44	0.188	14.08	0.173	14.26	0.172	14.20
'O' level or equivalent	0.134	11.77	0.130	11.44	0.122	11.73	0.121	11.69
CSE or equivalent	0.029	2.23	0.027	2.04	0.040	3.32	0.039	3.26
Manager	0.562	26.03	0.550	25.75	0.453	21.78	0.453	21.73
Professional	0.470	21.49	0.458	21.20	0.394	17.25	0.394	17.21
Technical	0.353	16.46	0.345	16.11	0.235	10.35	0.235	10.34
Clerical	0.262	15.80	0.263	16.03	0.106	5.80	0.107	5.80
Craft	0.080	2.49	0.093	2.89	0.003	0.09	0.003	0.11
Services	0.002	0.10	-0.006	-0.27	-0.008	-0.35	-0.008	-0.37
Operator	0.044	1.83	0.064	2.64	-0.095	-4.10	-0.094	-4.04
Other	-0.120	-6.13	-0.115	-5.95	-0.148	-7.25	-0.147	-7.21
Log hours	0.933	51.87	0.920	50.30	0.847	46.51	0.846	46.51
Works at home	0.139	9.22	0.133	8.88	0.087	5.92	0.088	5.95
Temporary job	-0.064	-3.37	-0.061	-3.23	-0.063	-3.37	-0.066	-3.52
Trade union member	0.097	9.66	0.090	8.98	0.074	7.28	0.074	7.26
< 1 year with current firm	-0.144	-10.73	-0.144	-10.60	-0.129	-10.28	-0.129	-10.27
1 - 2 years with current firm	-0.118	-8.82	-0.121	-9.12	-0.112	-9.23	-0.112	-9.21
3 - 5 years with current firm	-0.092	-8.72	-0.092	-8.79	-0.080	-8.30	-0.081	-8.37
6 - 10 years with current firm	-0.050	-5.15	-0.050	-5.17	-0.037	-4.06	-0.037	-4.08
Log regional house prices	0.240	10.05	0.243	10.16	0.221	10.50	0.221	10.47
Unemployment rate (travel-to-work-area)	0.004	1.27	0.004	1.27	0.026	2.97	0.026	2.96
Agree - Job requires one to work very hard	-	-	0.024	2.48	0.020	2.67	0.020	2.63
Agree - Not enough time to get job done	-	-	0.011	1.35	0.031	3.20	0.031	3.23
1-4 days of off-the-job training	-	-	0.045	4.19	0.048	5.96	0.047	5.97
5-10 days of off-the-job training	-	-	0.052	6.08	0.041	4.97	0.042	5.00
Often asked advice about workplace practices	-	-	0.020	2.24	-0.004	-11.76	-0.004	-11.91
% of employees working part-time	-	-	-	-	0.000	1.37	0.000	1.39
% of employees who are female	-	-	-	-	0.018	1.14	0.018	1.17
Equal opportunities policy in force	-	-	-	-	0.000	2.09	0.000	2.10
Trade union density at workplace	-	-	-	-	0.025	4.76	0.024	4.51
Log firm size (no. of employees)	-	-	-	-	-0.018	-0.71	-0.019	-0.78

TABLE A4: (Continued)

Construction	-	-	-	-	-0.052	-2.75	-0.051	-2.69
Wholesale	-	-	-	-	-0.127	-4.30	-0.127	-4.27
Hotels and restaurants	-	-	-	-	0.002	0.07	0.001	0.04
Transport	-	-	-	-	0.023	1.05	0.021	0.96
Financial	-	-	-	-	0.032	1.46	0.031	1.41
Other business	-	-	-	-	-0.082	-4.00	-0.082	-4.00
Education	-	-	-	-	-0.011	-0.56	-0.012	-0.57
Health	-	-	-	-	-0.015	-0.58	-0.015	-0.60
Other	-	-	-	-	-0.011	-0.67	-0.011	-0.67
Single workplace firm	-	-	-	-	-0.066	-2.80	-0.066	-2.76
Owner manager firm	-	-	-	-	0.004	0.43	0.004	0.43
Problem filling vacancies	-	-	-	-	-0.010	-3.25	-0.010	-3.19
% of vacancies filled internally	-	-	-	-	-0.001	-0.57	-0.001	-0.57
% of employees receiving off-the-job training	-	-	-	-	-0.001	-0.34	-0.001	-0.37
% of workdays lost due to absence	-	-	-	-	-0.002	-1.59	-0.002	-1.61
% of workers having workplace injury	-	-	-	-	-0.053	-0.54	-0.053	-0.54
Absence information missing	-	-	-	-	-0.012	-0.90	-0.012	-0.88
Injury information missing	-	-	-	-	0.020	1.77	0.019	1.74
% of employees <£9,000 per year	-	-	-	-	-0.001	-3.76	-0.001	-3.70
% of employees >£29,000 per year	-	-	-	-	0.000	4.84	0.000	4.83
Racial tensions at the workplace	-	-	-	-	-	-	0.007	0.22
Discrimination at the workplace	-	-	-	-	-	-	0.016	0.83
Bad conditions concerns at workplace	-	-	-	-	-	-	-0.013	-0.98
Agree that your job is secure	-	-	-	-	-	-	-0.013	-1.32
Indifferent about job security	-	-	-	-	-	-	-0.019	-1.83
Log Likelihood	-15642	-15606	-14985	-14982				
Sample	10085	10085	10085	10085				

Notes: The omitted categories are age less than 25, single, no children, free of long-term health condition, no qualifications, sales, does not work at home, permanent job, not a trade union member, with current firm more than 10 years, does not agree that 'my job requires that I work very hard', does not agree that 'I never seem to have enough time to get my job done', has not undertaken any employer-funded off-the-job training in last 12 months, manager does not frequently ask my views about changes to work practices, no equal opportunities policy at the workplace, manufacturing sector, multi-workplace firm, no owner manager, no problems filling vacancies in last 12 months, no problems due to racial harassment at the workplace in last 12 months, no problems due to discrimination at the workplace in last 12 months, no problems due to bad working conditions at the workplace in last 12 months and disagree with the statement 'I feel my job is secure in this workplace'. '-' means that the variable is not included in model. The standard errors have been adjusted for workplace clustering.

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