

PAY DIFFERENTIALS, DISCRIMINATION AND WORKER GRIEVANCES *

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ABSTRACT: We examine the relationship between race and sex differentials in pay and the occurrence of grievance and Employment Tribunal actions by workers. Anti-discrimination policy relies mainly on workers to initiate proceedings, so this relationship is vital for the effectiveness of policy. There is a concern that vulnerable groups are often reluctant to take action. Using an econometric earnings model that allows for race- and gender-specific employer effects, we find little evidence from British WERS98 data of any association between pay differentials and the grievance process, suggesting that grievance and tribunal procedures are not very effective anti-discrimination instruments.

KEYWORDS: discrimination, grievances, employment tribunals, WERS, multi-level models

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1 Introduction

Anti-discrimination policy is an important element of labour market intervention by government. Yet it is an extremely difficult area in which to devise policies that are effective in reducing apparent discrimination without also being damaging to the efficient working of the labour market. In the USA, explicit sex discrimination in pay was made illegal by the 1963 Equal Pay Act, and more broadly defined discrimination on grounds of sex, race, colour, religion or national origin was made illegal in pay, promotion, hiring and firing by the 1964 Civil Rights Act. In Britain, policy developed in a similar way. The 1970 Equal Pay Act (implemented in 1975) made formal sex discrimination in collective pay bargains illegal; it was further extended by the 1975 Sex Discrimination Act. The 1965 Race Relations Act was initially concerned mainly with public order issues, but was extended to cover direct discrimination in employment in 1968. The 1976 Race Relations Act broadened the scope of the legislation to cover indirect discrimination in a very similar way to the American Civil Rights Act, and gave individuals the right to apply directly for redress. The British Equal Opportunities Commission and Commission for Racial Equality, and the system of Employment Tribunals, perform an enforcement function similar to that of the Equal Employment Opportunity Commission in the USA.¹

Within a short time of the introduction of this legislation in the 1970s, the bulk of openly discriminatory practices were largely eliminated and this accounts for the sharp permanent reduction in pay differentials that we observe in time-series data at that time (see Freeman (1973), Card and Krueger (1989) for the USA and Zabalza and Tzannatos (1985) for the UK). After this first phase, most remaining discriminatory practices are indirect or disguised in some way, and come within the scope of the broader definitions of discrimination used by the later legislation (and which hinge on ill-defined concepts like comparable worth). Disputes now relate mostly to discriminatory treatment alleged to be received by individual employees in spite of the ostensibly non-discriminatory formal practices adopted by their employers. Thus judgements tend to deal more with arguable individual cases than with explicit contractual terms affecting large numbers of workers, and they are

¹See Bourn and Whitmore (1996) for an account of British law and its similarities with American legislation.

more likely to involve individual redress and compensation than the simple banning of discriminatory practices. Moreover, current anti-discrimination policy relies heavily on the willingness of individual workers to initiate action.

There is a delicate balance to be struck in the design of policy. If the expected costs of Tribunal action brought by workers is too high, then equal pay legislation may reduce demand for labour from the disadvantaged groups, thus worsening their labour market prospects (Pudney, 1999). On the other hand, if the legal apparatus is too formidable for the most disadvantaged individuals to contemplate, then policy will be ineffective since the most serious cases will often not be brought forward for redress.

In this study we examine evidence on the propensity of workers to make use of anti-discrimination processes and the relationship of this propensity to ‘objective’ measures of disadvantage. Pay differentials are used as the main indicators of race/gender disadvantage. The early empirical literature on race and gender pay differentials predominantly used regression analysis applied to data on individual employees to estimate differences in earnings that appear attributable only to the race or gender characteristics of an individual, rather than to education and other attributes underlying true productivity. Recently, the characteristics of the employer have been brought more to attention, with the increasing availability of data sources that generate information simultaneously on the employee and the employer (see Haltiwanger, *et al* (1999) for recent examples). These matched datasets constitute an important advance. True discrimination stems from a source such as the preferences of managers, the prejudices of customers or the social culture of the workplace. As such, it relates to the establishment as a whole rather than any particular individual’s situation. Consequently, it is commonality of adverse experience for particular ethnic/gender groups within establishments that is the important issue. The availability of information on workers clustered within establishments allows the commonality of treatment to be examined.

This aspect of discrimination leads naturally to the class of multi-level random-effects statistical models that are currently receiving a great deal of attention (see Goldstein (1995) for a survey and Aitkin and Longford (1986) and Anderson and Aitkin (1985) for typical applications in the statistical literature). The standard methodology is extended here by using the occurrence of internal grievance cases and external Tribunal cases as additional indicators of perceived discrimination. This leads to a novel type of

model involving firm-level random effects and a complex nonlinear system of multiple outcome indicators. We use this model to assess the strength and nature of the relationship between apparent discrimination in pay and workers' readiness to resort to some form of grievance proceedings.

We begin in section 2 with a very simple illustrative model. We then describe in sections 3 and 4 the matched survey data used for this modelling exercise and the econometric framework for the analysis. Section 5 presents the model estimates and uses simulation to summarise their implications.

2 The grievance process

Consider a representative employee. This individual's human capital is such that he or she could expect to earn a wage w . However, he or she is employed by a firm whose pay policy may systematically differ from the labour market in general, so that the relevant wage with the current employer would be $w + f$. A high-wage firm will have $f > 0$ and a low wage firm will have $f < 0$. However, now suppose that this person is a member of a disadvantaged group. Employers in general pay individuals of this type a wage $w - \mu$, where μ is the average degree of pay discrimination in the labour market. The employer of our hypothetical individual may be more or less discriminatory than the market in general, so the individual is actually receiving a wage $w - d$.

Define $P(d)$ to be the probability of success for this individual if he or she initiates a grievance/tribunal procedure, where $P'(d) > 0$. Assume that there are no costs associated with making a complaint and that a successful case always results in the elimination of all pay discrimination for this individual, so that his or her pay after a successful complaint will be $w + f$. If a case is initiated but proves unsuccessful, the complainant has two options: to remain with the same employer suffering the same level of discrimination d as before, but also a degree of unpleasant 'stigma' S . The other option after an unsuccessful complaint would be to quit, in which case he or she could expect to suffer the market average level of discrimination, μ . Thus the individual is faced with a choice between the following four courses of action.

Table 1 Options and expected payoffs (relative to w)

Option	Expected payoff
<i>Status quo</i>	$f - d$
<i>Immediate exit</i>	$-\mu$
<i>Initiate grievance and remain if unsuccessful</i>	$P(d)f + (1 - P(d))(f - d - S)$
<i>Initiate grievance and quit if unsuccessful</i>	$P(d)f + (1 - P(d))(-\mu)$

Assume the worker chooses the option with the greatest expected payoff. First note that, if $(f + \mu) < 0$ the worker will always choose to leave the firm rather than initiate a grievance.² Thus we need only consider the case $(f + \mu) > 0$, when exit is never optimal. Then a grievance will be initiated if and only if one or other of the following two conditions is satisfied:

$$S < \min \left\{ f - (d - \mu), \frac{Pd}{(1 - P)} \right\} \quad (1)$$

$$d > \max \{ f + \mu - S, (1 - P)(f + \mu) \} \quad (2)$$

Condition (1) relates to the case where an unsuccessful complainant will remain with the firm and suffer the resulting stigma, while condition (2) relates to those who would quit the firm in the event of an unsuccessful complaint.

Figures 1 and 2 show the way the outcome of this decision would vary with the firm's wage premium f , its degree of discrimination d and the stigma S anticipated by the worker. If the subjective assessment of stigma $S \in (0, \infty)$ is regarded as randomly distributed across individuals, then we can infer from figures 1 and 2 the way in which the probability of a grievance action is related to d and f . The shaded areas correspond to regions in which an action will

²Note however that he or she will accept the status quo if $(f + \mu) < 0$ and there is very strong *positive* discrimination with $d < (f + \mu)$.

be initiated. Vertical shading corresponds to condition (1), while horizontal shading corresponds to condition (2) ('stayers' and 'quitters' respectively).

The implications of this simple model are clear. The probability of action rises smoothly as the firm's degree of discrimination d increases, until it reaches a critical level d^* , at which point the probability of action jumps to 1. However, the firm's general level of pay is also relevant. For a given degree of firm-specific discrimination, figure 2 shows that, as the general wage premium f rises from a very low value, the probability of action stays at 1 until a critical value $f^* = d/(1 - P) - \mu$ is reached, at which point there is a quantum reduction to a lower fixed level. This negative relation implies that it is easier for high-wage firms to get away with discrimination than it is for low-wage firms, since the employees of high-wage firms have more to lose by complaining. This would suggest that we might find a positive correlation between f and d in a cross-section of employers.

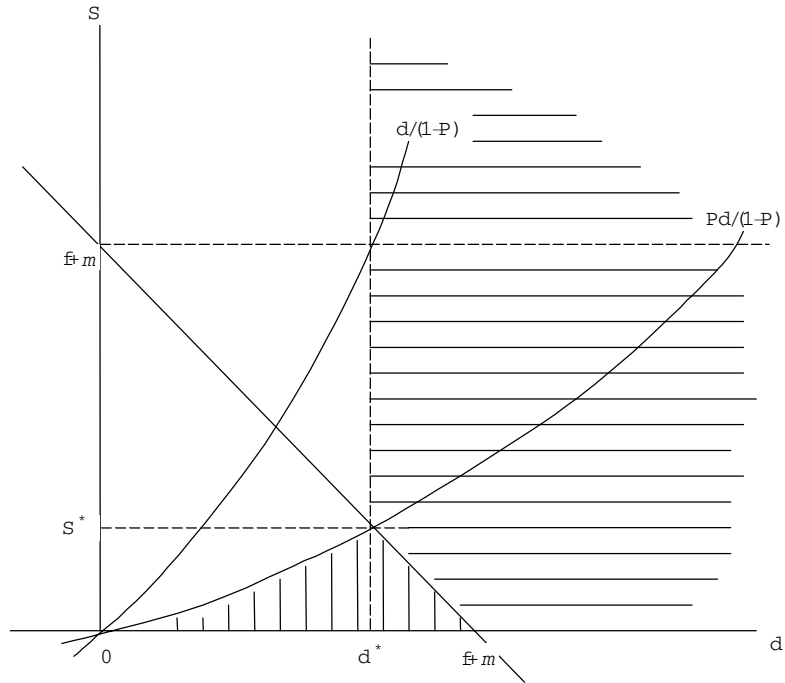


Figure 1: The relationship between the use of grievance procedures and firm-specific excess discrimination

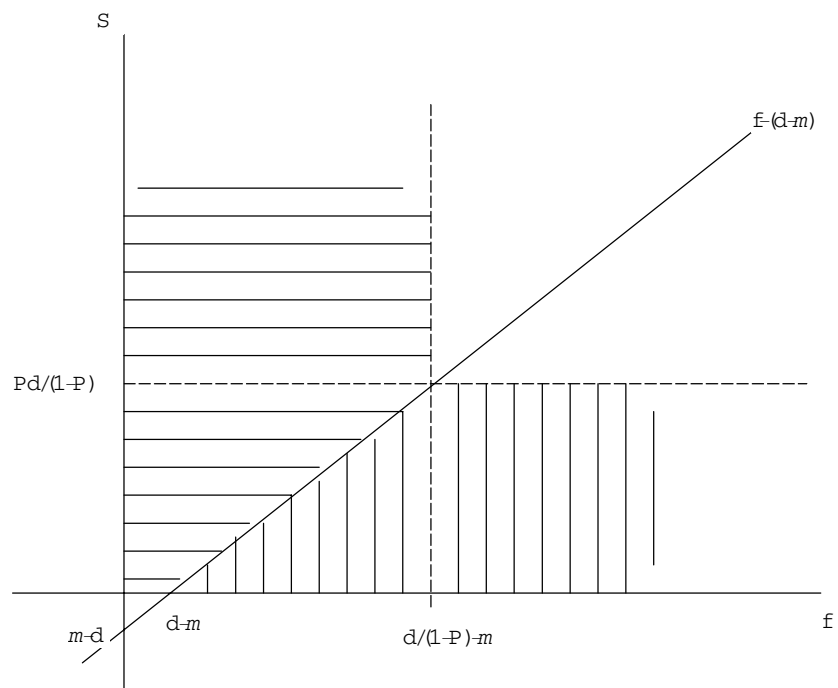


Figure 2: The relationship between the use of grievance procedures and the firm-specific wage premium

This model is, of course, far too simple to apply directly to data but it does indicate the nature of the relationship we might expect to find in data on the wage determination and grievance processes. It also makes clear that worker-initiated action bears only an indirect relationship with a firm's degree of discrimination. If the labour market in general is discriminatory (μ large), if stigma is great or if the probability of success at tribunal is low, then the relationship between an individual's experience of discrimination and his or her resort to anti-discrimination measures may be very weak indeed. We discuss possible omissions from and extensions to this conventional view of the grievance process in section 5 when the empirical results are discussed.

3 The WERS data

Our data are taken from the 1998 Workplace Employment Relations Survey (WERS). WERS is essentially a conventional stratified survey of establishments, drawn from the population of establishments with 10 or more employees. The official register of businesses known as the Inter-Departmental Business Register (IDBR) is used as a sampling frame, and within the IDBR, establishments with 10 or more workers account for some 82.9% of the population of individual employees (Cully 1998b). Fieldwork was carried out in October 1997-June 1998, with a target sample of 3192 workplaces, yielding 2729 in-scope contacts. The main form of contact was through face-to-face interviews with the 2193 managers who agreed to cooperate: a response rate of 80%. In addition to the manager of the establishment, an interview was conducted with a worker representative (often a union official), and with a random sample of up to 25 members of the workforce. Of the 44,078 worker questionnaires issued, 28,323 were returned, implying a 64% response rate. The worker questionnaires used a self-completion format, without direct interviewer involvement.

We make use of both management and worker questionnaire responses in this research. The former are used to give information on the nature of the workplace, business conditions and the employer's experience of discrimination-related grievances. The worker questionnaires are used to generate information on ethnicity, gender, educational attainment, age, experience and occupational class. We use the subsets of establishments and workers who supplied complete information on critical variables, and we restrict atten-

tion to full-time employees only. This results in a sample of 20,660 observed workers who are linked to a set of 2160 sampled firms. The sample characteristics of the establishments are summarised in Table 2. Both weighted and unweighted averages are given: note the sample bias in favour of large establishments. Sample characteristics of employees are given in Appendix Table A1.

Table 2 Sample means of establishment characteristics
(unweighted averages; weighted averages in parentheses)

Variable	Mean* (no grievance)	Mean* (at least 1 grievance)	Variable	Mean* (no grievance)	Mean* (at least 1 grievance)
Proportion of women	0.501 (0.541)	0.463 (0.445)	Workforce	214.9 (54.1)	981.9 (248.0)
Proportion ethnic minority	0.047 (0.038)	0.091 (0.150)	Union coverage	0.341 (0.244)	0.401 (0.223)
Proportion part-time	0.269 (0.325)	0.196 (0.177)	Company < 5 years old	0.112 (0.105)	0.075 (0.066)
Proportion managerial	0.227 (0.239)	0.230 (0.274)	Non-plc company	0.323 (0.460)	0.209 (0.521)
Proportion technical	0.079 (0.054)	0.101 (0.055)	Public sector	0.293 (0.247)	0.443 (0.270)
Proportion sales staff	0.105 (0.138)	0.065 (0.084)	Foreign ownership	0.110 (0.070)	0.126 (0.135)
Proportion clerical	0.170 (0.149)	0.222 (0.296)	Production sector	0.198 (0.161)	0.139 (0.077)
Proportion skilled	0.101 (0.113)	0.093 (0.092)	Part of large firm	0.378 (0.274)	0.453 (0.221)
Proportion over 50	0.154 (0.150)	0.160 (0.147)	Recent staff cuts	0.397 (0.259)	0.512 (0.456)
Proportion under 21	0.067 (0.082)	0.048 (0.080)	Local market	0.336 (0.396)	0.269 (0.288)
			Competitive market	0.565 (0.591)	0.527 (0.494)

* Of the 2,160 establishments, 9.3% (3.8% weighted) experienced an internal grievance or Tribunal action based on alleged discrimination.

The figures in Table 2 suggest some systematic differences between establishments that report recent experience of internal grievance or external tribunal action and those that do not. Grievances tend to be encountered by employers with relatively high proportions of ethnic minority staff, but not high proportions of female staff. These employers also tend to have

few part-time staff, and a high degree of trade union coverage. The public sector experiences a disproportionately large volume of allegations of discrimination. However, all of these apparent influences are obscured by one dominant factor: the effect of establishment size. It seems self-evident that the more employees a firm has, the more likely it is to experience a complaint in any given period. Thus large establishments can be expected to appear to be more subject to complaints of discrimination simply because they have a greater exposure to risk of complaint. The importance of this effect is underlined by the difference in the average workforce size of establishments that receive complaints and those that do not: 982 compared to 215. This also obscures the impact of other factors; for example, unionised and public sector establishments tend to be large and will thus be subject to a higher risk of complaint. It is clearly important to interpret the WERS data in the context of a statistical model that makes reasonable allowance for this size effect.

4 The econometric model

4.1 The wage model

Our basis for estimating the employer-specific degree of race and gender disadvantage is a conventional wage equation that incorporates human capital variables, together with job and employer descriptors. In formal terms, the wage model is as follows:

$$y_{ih}^* = \mathbf{x}_{ih}\boldsymbol{\beta} + u_{0h} + \sum_{r=1}^R \xi_{ih}^r u_{rh} + \nu_{ih} \quad (3)$$

$$y_{ih} = j \quad \text{iff} \quad y_{ih}^* \in [C_{j-1}, C_j) \quad (4)$$

where y_{ih}^* is the log of normal annual pay for the i th sampled worker in the h th sampled establishment. However, pay is not exactly observable in WERS: instead, we only observe the interval (indexed by j) within which pay lies. $(-\infty, C_1, \dots, C_{J-1}, \infty)$ are the known pre-determined (log) limits of these J intervals. The categorical variable $y_{ih} \in \{1 \dots J\}$ indicates the relevant range, and the pair of variables $\{Y_{ih}^L, Y_{ih}^U\}$ record its bounds, $\{C_{y_{ih}-1}, C_{y_{ih}}\}$. \mathbf{x}_{ih} is

the row vector of relevant covariates; ξ_{ih}^r is a binary indicator equal to 1 if individual i in establishment h is a member of the r th disadvantaged group and 0 otherwise. The variable u_{0h} is the general unobserved effect specific to establishment h and, with its mean removed, can be interpreted as the firm-specific wage premium f of section 2. The variable u_{rh} is the unobservable specific to the r th disadvantaged group ($r = 1 \dots R$) at establishment h . If we take the contentious step of interpreting it as the (negative of) the firm's degree of pay discrimination practised against group r , then u_{rh} can be regarded as the analogue of $-d$ in section 2. Finally, ν_{ih} is an individual-specific random disturbance, assumed to have a normal distribution. The parameters of the model are the coefficient vector β , and the residual variance $\text{var}(\nu_{ih}) = \sigma^2$, together with any parameters that determine the form of the distribution of \mathbf{u}_h .

Define the shorthand: $\mathbf{y}_h = \{y_{1h} \dots y_{n_h h}\}$, $\mathbf{X}_h = \{\mathbf{x}_{1h} \dots \mathbf{x}_{n_h h}\}$, $\Xi_h = \{\xi_{ih}^r, r = 1 \dots R; i = 1 \dots n_h\}$ and $\mathbf{u}_h = \{u_{1h} \dots u_{Rh}\}$. Then the conditional probability of the pay levels of the sampled workers at establishment h is:

$$\Pr(\mathbf{y}_h | \mathbf{X}_h, \Xi_h, \mathbf{u}_h) = \prod_{i=1}^{n_h} \left[\Phi \left(\frac{Y_{ih}^U - m_{ih}}{\sigma} \right) - \Phi \left(\frac{Y_{ih}^L - m_{ih}}{\sigma} \right) \right] \quad (5)$$

where Φ is the distribution function of the standard normal and $m_{ih} = \mathbf{x}_{ih}\beta + u_{0h} + \sum_r \xi_{ih}^r u_{rh}$ is the conditional mean function of y_{ih}^* .

4.2 The grievance process

We assume that workers can express their discontent in two ways: internally, by making a formal complaint to the employer through a grievance procedure; or externally, by making use of the Employment Tribunal system. Formalised internal grievance procedures are now a near-universal element of internal labour markets: 94% of WERS-sampled establishments reported that they had such a procedure. They are thus an important part of the 'voice' that can be used by workers as an alternative to 'exit' (Freeman, 1980).

Variations in establishment size prevent any simple interpretation of data on the incidence of grievances. Even with an equal probability of complaint from each individual, the probability of an establishment being grievance-free in any period declines geometrically with the size of the workforce. Despite the fact that grievances are observed only at the establishment level, it is

important to work from individual-level foundations to avoid being misled by this size effect.

Although it is possible for workers to make a tribunal application with no preliminaries, we view this as a sequential two-stage process with internal grievances (implicit or explicit) preceding more serious external tribunal proceedings. Assume that we identify two disadvantaged groups ($r = 1, 2$): women and a composite ethnic minority group. There is a direct correspondence between each group and a specific type of grievance: women can initiate grievances on grounds of sex discrimination and ethnic minority individuals on grounds of race discrimination.³

For any member of the r th disadvantaged group, the probability of an internal grievance is modelled as a probit:

$$\begin{aligned} P_{rh} &= \Pr(\text{grievance of type } r \mid \mathbf{z}_h, \mathbf{u}_h) \\ &= \Phi(\mathbf{z}_h \boldsymbol{\gamma}_r + \psi_{1r} u_{0h} + \psi_{2r} u_{rh}) \end{aligned} \quad (6)$$

where \mathbf{z}_h is a row vector of observed establishment characteristics and $\boldsymbol{\gamma}_r$ and ψ_{jr} are parameters. Thus P_{1h} is the probability that an individual drawn at random from the female section of the workforce will be found to have initiated a grievance citing sex discrimination within the 1-year reference period, and P_{2h} is the analogous probability for ethnic minority employees and race-related cases. Given these processes for the generation of internal grievance cases, we assume that there is a fixed probability that any grievance case will develop into a formal tribunal action:

$$\Pr(\text{tribunal} \mid \text{grievance}, \mathbf{z}_h, \mathbf{u}_h) = Q \quad (7)$$

where Q is a fixed parameter.⁴

Assume that we can observe only whether or not any grievance of each type has been experienced in the reference period, not their number. Assuming individual independence, the resulting probability structure for either type of discrimination case is:

$$\Pr(\text{no grievance or tribunal case} \mid \mathbf{z}_h, \mathbf{u}_h) = (1 - P_{rh})^{n_{rh}} \quad (8)$$

³Although it is possible for men to take action on grounds of sex discrimination and for whites to act on race discrimination, these are rare occurrences. Note that the ethnic minority and female groups may overlap, provided we allow the possibility that an ethnic minority female can simultaneously initiate both types of grievance.

⁴Note that Q could be specified as another probit involving explanatory variables. However, evidence presented below suggests that variation in Q is not significant.

$$\Pr(\text{tribunal case} | \mathbf{z}_h, \mathbf{u}_h) = 1 - (1 - P_{rh}Q)^{n_{rh}} \quad (9)$$

$$\Pr(\text{grievance, no tribunal case} | \mathbf{z}_h, \mathbf{u}_h) = (1 - P_{rh}Q)^{n_{rh}} - (1 - P_{rh})^{n_{rh}} \quad (10)$$

where n_{rh} is the number of workers of group r who are employed by establishment h .

In fact the WERS questionnaire only partially observes this distribution, since sex- and race-related grievance cases are not observed separately (although Tribunal cases are). This further complication is discussed in Appendix 2. In general terms, if g_h is used to represent the observed combination of grievance/tribunal incidents, expressions analogous to (8)-(10) combine to give the conditional model $\Pr(g_h | \mathbf{z}_h, \mathbf{u}_h)$.

4.3 Stochastic specification

Since \mathbf{u} is unobserved, estimation must be based on the distribution marginalised with respect to the random effects. Let F be the distribution function of the random effects. Then the distribution of the endogenous variables conditional on the observable covariates is:

$$\Pr(\mathbf{y}_h, g_h | \mathbf{X}_h, \mathbf{z}_h, \mathbf{\Xi}_h) = \int \Pr(\mathbf{y}_h | \mathbf{X}_h, \mathbf{\Xi}_h, \mathbf{u}) \Pr(g_h | \mathbf{z}_h, \mathbf{u}) dF(\mathbf{u}) \quad (11)$$

A variety of parametric and non-parametric approaches are available for estimating the distribution F and evaluating the multiple integral in (11). We use the finite mixture approach, in which F is specified as a general discrete distribution with a finite number of mass points, whose location and associated probabilities are treated as parameters to be estimated. Thus:

$$\Pr(\mathbf{y}_h, g_h | \mathbf{X}_h, \mathbf{z}_h, \mathbf{\Xi}_h) = \sum_{s=1}^S \Pr(\mathbf{y}_h | \mathbf{X}_h, \mathbf{\Xi}_h, \mathbf{u}^s) \Pr(g_h | \mathbf{z}_h, \mathbf{u}^s) \pi^s \quad (12)$$

where the R -dimensional vectors \mathbf{u}^s and the probabilities π^s ($s = 1 \dots S$) are unknown parameters subject only to the restrictions:

$$\pi^s \geq 0 \quad (13)$$

$$\sum_{s=1}^S \pi^s = 1 \quad (14)$$

which are imposed by expressing the π^s as multinomial logit functions of a set of $S - 1$ underlying parameters.

If the number of mass points S is left to be determined freely by the data, then this is the semi-parametric method advocated by Lindsay (1981) and Heckman and Singer (1984). However, an alternative hybrid approach is also widely used, where the number of mass points is treated formally as a fixed number determined using conventional specification choice methods based on hypothesis testing procedures or indicators such as the Akaike Information Criterion (see Pudney, Galassi and Mealli, 1998). We use this quasi-parametric approach here. The model was estimated by maximising numerically a log-likelihood based on the distribution (12)⁵.

5 Estimates

5.1 The wage equation

The full set of wage equation estimates are given in Tables 3(a)-(e). The basic wage model is an interval regression for the log wage, defined as the respondent's normal weekly pay. Only full-time workers (over 30 hours per normal week) are included in the sample. The explanatory variables fall into four groups and their sample properties are given in Tables 2 and A1. *Individual attributes* include age, time spent in the current job, educational attainment, trade union membership and health status, as well as gender and race which are the main focus of the analysis. *Job attributes* are represented by the incumbent's occupational class and also by a distinction between temporary and permanent employment. *Workforce composition variables* summarise the profile of the stock of workers employed by the establishment at the time of the survey. These record the profile of the establishment's workforce in terms of ethnicity, gender, occupation and age. *Other establishment attributes* include the size of the workforce, union coverage, company age, legal status, sector and product market conditions.

Our final specification of the impact of individual ethnicity and gender turns out to be quite simple. We began with an 8-category breakdown formed from the interaction of the two gender groups with the following four ethnic groups: Black (Afro-Caribbean and African); Indian; Pakistani and Bangladeshi; and Other. When estimated as a simple interval regression (with no random establishment effects), the intercepts for these eight groups

⁵Computation was done in GAUSS, using the MAXLIK procedure.

could be represented adequately by three dummy variables. Two of these distinguish females and a separate ethnic minority group. The third indicates ethnic minority women and thus captures an interaction effect, which is important since there is a significantly smaller race differential among women than among men (see Bayard *et. al.*, 1999). In this context, the ethnic minority group is defined as the set of Blacks, Indians and Pakistani/Bangladeshis. The restrictions embodied in this simplification can (just) be accepted at the conventional 5% significance level, despite the large sample size. The computed value for the corresponding Wald $\chi^2(4)$ test was 8.67, implying a P-value of 7.0% (a robust covariance matrix estimate was used to take account of sample clustering within firms). Since there was virtually no difference between the restricted and unrestricted models in the estimates of other coefficients, this simplification was judged to be acceptable. It is also particularly convenient, since it allows us to work with a single disadvantaged racial group.

The stochastic specification for the random effects was arrived at by testing down from an initial specification involving $S = 12$ mass points. The tests were done using a likelihood ratio criterion with a conservative 20% significance level. It proved impossible to estimate more than 10 mass points without duplication and the testing sequence stopped at $S = 9$. In contrast with the experience of Pudney, Galassi and Mealli (1998) in a different context, this specification fits considerably better than a Gaussian distribution. The latter was estimated by simulated maximum likelihood, using 100 replications, antithetic variance reduction and 2nd-order bias correction. Comparing estimators of the wage equation alone using the Akaike Information Criterion, the finite mixture model gave a value of 32.98, compared to 33.07 for the Gaussian model, so the former is preferred.⁶

For comparison, column 1 of Table 3 gives the results from a simple individual-level wage model without employer effects. Column 2 of the table gives the results for the random-effects wage equation estimated separately from the grievance model, using a likelihood based on the distribution (5). Column 3 of the table gives the analogous results for the full simultaneous model (11). The last two models involve three establishment-specific unob-

⁶We also estimated the full model under the Gaussian stochastic specification. We do not present the results in detail here, but the conclusions were qualitatively similar to those produced under the finite mixture specification (see section 5). Thus the results do not appear to be sensitive to stochastic specification.

servables: a general effect u_{0h} ; a female-specific effect u_{1h} ; and an ethnic minority effect u_{2h} . These three sets of results are broadly similar and consistent with prior expectations. There are positive returns to job tenure and union membership. The age profile is inverse U-shape with a maximum at around 45 years of age. Unmarried status and work-relevant health problems are both associated with a significant wage premium. Returns to educational attainment are around 6% for each of the successive stages up to university degree level, which has an incremental return of around 10%. The characteristics of the job are also important influences, with a large wage disadvantage associated with temporary jobs and low status occupations.

The matched WERS dataset allows us to include covariates which describe the nature of the establishment in some detail. Workplaces employing high proportions of female, part-time, young or old staff tend to pay relatively low wages, whilst those with high concentrations of ethnic minority workers tend to pay higher than normal wage levels in general. Thus an ethnic minority worker employed by a ‘mainly white’ establishment can expect to be paid less than he or she would receive in a more mixed establishment. Exactly the same would apply to a white worker. There is significant evidence that the occupational profile of an establishment is related to its wage-setting behaviour. In particular, establishments with a high proportion of unskilled labour tend to pay relatively low wages to all its employees (including those who are not unskilled). Union coverage within the workplace (defined as the proportion of the workforce believed by management to be union members) generates a small but significant wage premium for both members and non-members, amounting to a 2% earnings difference between establishments with complete and zero union coverage. Firm size has a positive influence on wages, while public sector employment involves a moderate pay disadvantage. Establishments with a high degree of foreign-ownership tend to pay considerably higher than standard wages. The business conditions faced by the employer also play a significant role. Establishments whose main product market is local rather than regional, national or international are associated with generally low pay levels. There is also evidence of rent sharing, with highly competitive product market conditions implying slightly lower wage levels.

Table 3(a) Wage equation: personal characteristics

Parameter	Simple interval regression	Random-effects wage model	Simultaneous model
Job tenure / 10	0.062 (0.005)	0.071 (0.004)	0.071 (0.004)
TU member	0.066 (0.007)	0.059 (0.005)	0.059 (0.005)
Age / 10	0.430 (0.022)	0.413 (0.008)	0.429 (0.008)
(Age / 10) ²	-0.046 (0.003)	-0.044 (0.001)	-0.046 (0.001)
Unmarried	-0.092 (0.006)	-0.081 (0.005)	-0.078 (0.005)
Low school qualification	0.068 (0.009)	0.060 (0.008)	0.062 (0.008)
Intermediate school qualification	0.134 (0.008)	0.120 (0.006)	0.122 (0.006)
Higher school qualification	0.172 (0.009)	0.161 (0.007)	0.162 (0.008)
University degree	0.289 (0.010)	0.269 (0.008)	0.270 (0.008)
Postgraduate degree	0.354 (0.014)	0.340 (0.010)	0.341 (0.010)
Vocational qualification	-0.023 (0.005)	-0.013 (0.004)	-0.012 (0.004)
Health problem	-0.045 (0.010)	-0.036 (0.009)	-0.036 (0.009)
Ethnic minority woman	0.117 (0.027)	0.126 (0.027)	0.113 (0.026)

Table 3(b) Wage equation: job characteristics

Parameter	Simple interval regression	Random-effects interval regression	Simultaneous model
Temporary job	-0.120 (0.018)	-0.103 (0.012)	-0.102 (0.012)
Managerial / professional	0.564 (0.013)	0.548 (0.008)	0.549 (0.008)
Technical	0.322 (0.014)	0.302 (0.009)	0.304 (0.009)
Clerical	0.117 (0.013)	0.104 (0.008)	0.106 (0.008)
Craft / skilled manual	0.176 (0.013)	0.178 (0.009)	0.181 (0.010)
Service occupation	0.280 (0.022)	0.203 (0.009)	0.206 (0.010)
Sales	0.137 (0.021)	0.141 (0.010)	0.143 (0.010)
Operative	0.020 (0.014)	0.040 (0.009)	0.044 (0.009)

Table 3(c) Wage equation: workforce composition effects

Parameter	Simple interval regression	Random-effects interval regression	Simultaneous model
Proportion of women	-0.211 (0.026)	-0.191 (0.020)	-0.177 (0.020)
Proportion ethnic minority	0.225 (0.046)	0.209 (0.040)	0.202 (0.037)
Proportion part-time staff	-0.284 (0.034)	-0.269 (0.022)	-0.280 (0.022)
Proportion managerial staff	0.164 (0.023)	0.188 (0.018)	0.184 (0.019)
Proportion technical staff	0.077 (0.027)	0.141 (0.024)	0.155 (0.024)
Proportion sales staff	0.235 (0.035)	0.196 (0.023)	0.204 (0.023)
Proportion clerical staff	0.247 (0.025)	0.276 (0.019)	0.278 (0.018)
Proportion skilled manual staff	0.010 (0.025)	0.015 (0.023)	0.021 (0.023)
Proportion staff over 50	-0.210 (0.044)	-0.156 (0.032)	-0.147 (0.033)
Proportion staff under 21	-0.426 (0.075)	-0.316 (0.040)	-0.301 (0.041)

Table 3(d) Wage equation: other establishment characteristics

Parameter	Simple interval regression	Random-effects interval regression	Simultaneous model
ln(employment)	0.027 (0.004)	0.022 (0.003)	0.026 (0.003)
Union coverage	0.011 (0.016)	0.002 (0.014)	0.004 (0.014)
Company < 5 years old	-0.017 (0.014)	-0.020 (0.011)	-0.017 (0.011)
Non-plc private status	-0.009 (0.012)	-0.018 (0.009)	-0.015 (0.009)
Public sector	-0.039 (0.013)	-0.021 (0.011)	-0.018 (0.011)
Degree of foreign ownership	0.113 (0.015)	0.136 (0.013)	0.137 (0.013)
Production sector	0.003 (0.012)	-0.015 (0.011)	-0.012 (0.011)
Part of large firm	-0.004 (0.009)	0.006 (0.008)	0.000 (0.009)
Recent staff cuts	-0.013 (0.009)	-0.013 (0.007)	-0.013 (0.007)
Local product market	-0.023 (0.011)	-0.033 (0.009)	-0.027 (0.009)
Highly competitive market	-0.033 (0.009)	-0.028 (0.009)	-0.025 (0.009)

5.2 The random effects distribution

Our preferred specification is a 9-point trivariate discrete distribution for the establishment effects. The implied means, standard deviations and correlations of the three establishment effects $u_{0h} \dots u_{2h}$ are given in Table 4. The means of the race- and gender-specific effects are similar and imply an average pay disadvantage of around 16% for both women and ethnic minorities. However, the positive coefficient estimated for the interaction dummy variable (in Table 3(a) above) implies that ethnic minority females face an average pay disadvantage of roughly 21% rather than the 32% that would be implied by cumulation of the separate gender and ethnicity effects. Another way of putting this is to say that racial pay differentials are on average 17% for men but only 5% for women. The variances of the firm effects are all clearly significant. The variance of the general establishment effect is almost double that of the gender effect and three times that of the race effect. The significant negative correlation $\hat{\rho}_{02}$ implies that high-wage firms tend to have a higher degree of racial disadvantage. This finding was rationalised theoretically in section 2 where we showed that high-wage firms can expect to be less vulnerable to discrimination complaints. However, for this explanation to be empirically plausible, we need to show that high-wage firms do indeed experience a relatively low rate of grievance.

Table 4 Wage equation: random effects

Parameter	Simple interval regression	Random-effects interval regression	Simultaneous model
Mean of general effect (u_0)	4.326 (0.055)	4.347 (0.028)	4.285 (0.029)
Mean of female effect (u_1)	-0.161 (0.006)	-0.166 (0.020)	-0.153 (0.021)
Mean of race effect (u_2)	-0.175 (0.019)	-0.164 (0.006)	-0.166 (0.006)
Std dev (u_0)	-	0.158 (0.005)	0.158 (0.005)
Std dev (u_1)	-	0.105 (0.025)	0.102 (0.033)
Std dev (u_2)	-	0.096 (0.008)	0.095 (0.009)
$\hat{\sigma}$	0.298 (0.003)	0.258 (0.001)	0.259 (0.001)
<i>Correlations</i>			
$\hat{\rho}_{01}$	-	0.005 (0.189)	0.012 (0.235)
$\hat{\rho}_{02}$	-	-0.392 (0.056)	-0.393 (0.056)
$\hat{\rho}_{12}$	-	-0.320 (0.278)	-0.290 (0.344)

5.3 The grievance process

Tables 5 (a,b) give estimates of the grievance processes. The first set of results, in column 1 are arrived at by applying probit analysis to explain the distinction between establishments with or without a reported grievance or tribunal action. Note that this model takes no account of the misleading size effect and it also ignores any impact of unobservable firm effects. The Wald χ^2 test on the coefficients is highly significant and their pattern is broadly consistent with the crude sample differences shown in Table 2, with establishment size, ethnic profile and public sector being particularly important.

In contrast, column 2 of the table gives the results of a probit analysis for the probability of a sex- or race-discrimination tribunal case estimated for the set of 201 establishments that experienced at least a an internal grievance. Here, the probit coefficients are of only marginal significance (P-value = 6%) and the assumption of a constant grievance to tribunal transition probability (equation (7) above) seems reasonable.

The last two columns of Table 5 (a,b) show the estimated grievance coefficients estimated from the simultaneous model. The residual size effect in Table 5(b) is largely eliminated. Race-related individual grievance probabilities are estimated to be insignificantly related to establishment size, whilst individual sex-discrimination grievance probabilities are significantly lower in large establishments. This is in sharp contrast with the strongly positive crude association in the sample.

Table 5(a) Grievance model: workforce composition effects

Parameter	Probit for internal discrimination grievance	Conditional probit for Tribunal case	Simultaneous model: sex discrimination grievance	Simultaneous model: race discrimination grievance
Proportion of women	-0.126 (0.281)	1.331 (0.527)	-1.082 (0.211)	0.493 (0.266)
Proportion ethnic minority	1.309 (0.319)	-0.267 (0.723)	0.263 (0.260)	-1.744 (0.360)
Proportion part-time staff	-0.729 (0.293)	-1.569 (0.611)	-0.111 (0.213)	-0.829 (0.374)
Proportion managerial staff	-0.125 (0.212)	-0.211 (0.446)	-0.149 (0.151)	-0.484 (0.244)
Proportion technical staff	-0.401 (0.288)	-0.111 (0.656)	-0.017 (0.213)	-0.894 (0.294)
Proportion sales staff	0.134 (0.254)	0.622 (0.611)	-0.027 (0.213)	0.182 (0.294)
Proportion clerical staff	0.333 (0.218)	-0.737 (0.541)	0.324 (0.181)	-0.353 (0.336)
Proportion skilled manual	0.109 (0.273)	-0.009 (0.511)	-0.139 (0.271)	0.346 (0.245)
Union coverage	-0.348 (0.140)	-0.328 (0.364)	-0.150 (0.135)	0.051 (0.181)

Table 5(b) Grievance model: other establishment characteristics

Parameter	Probit for internal discrimination grievance	Conditional probit for Tribunal case	Simultaneous model: sex discrimination grievance	Simultaneous model: race discrimination grievance
ln(workforce)	0.434 (0.037)	0.166 (0.075)	-0.096 (0.025)	-0.022 (0.042)
Company < 5 years old	-0.248 (0.161)	0.237 (0.336)	-0.179 (0.129)	-0.210 (0.151)
Public sector	0.338 (0.112)	0.510 (0.256)	0.137 (0.091)	0.321 (0.143)
Production sector	-0.374 (0.132)	0.096 (0.311)	-0.248 (0.113)	-0.027 (0.142)
Intercept	-3.361 (0.248)	-1.166 (0.514)	-4.261 (1.106)	-3.202 (2.051)
Establishment effect ($\hat{\psi}_1$)	-	-	0.500 (0.250)	0.213 (0.483)
Gender effect ($\hat{\psi}_2$)	-	-	-0.383 (0.738)	-
Race effect ($\hat{\psi}_{3r}$)			-	-0.321 (1.325)
Tribunal transition probability	-	-	0.486 (0.037)	
Sample size	2160	201	2160	
Wald test	$\chi^2(13)=182.2$	$\chi^2(13)=21.9$	-	

5.4 Implications and robustness of the results

The simple theoretical model outlined in section 2 predicts that there should be a negative impact of all three establishment effects on the probability of worker grievance. High wage firms (large u_1) should have a lower rate of grievance per individual, whereas we have found a marginally significant higher rate. As the model predicts, we have found that discriminatory firms

(small u_1, u_2) have higher grievance rates, but these effects are small and not statistically significant. We have found a significant tendency for high wage firms to have a slightly greater than expected degree of racial disadvantage, which theory does suggest as a possible implication. However, the mechanism by which this would occur requires that u_0 have a negative impact on the grievance probability and we have found the opposite.

It is not possible to assess the magnitude of the estimated impact of the establishment effects u_r by looking at the coefficients alone. We evaluate the following estimated mean grievance probabilities as functions of the general establishment effect (u_0) and the gender- and race-specific effects (u_1, u_2):

$$\pi_r(u_r) = \frac{\sum_{h=1}^H w_h n_h \Phi(\mathbf{z}_h \boldsymbol{\gamma}_r + \psi_{1r} u_0 + \psi_{2r} u_r)}{\sum_{h=1}^H w_h n_h} ; \quad r = 1, 2 \quad (15)$$

where $r = 1$ indicates sex discrimination cases and $r = 2$ indicates race discrimination cases. The variables w_h and n_h are respectively the survey weight and the size of workforce of establishment h . In figures 3-6, these mean probabilities are plotted against the relevant establishment effects, together with 90% pointwise asymptotic confidence bands which allow for the parameter estimation error.

Figure 3 shows a small and poorly determined estimated impact of the male-female pay differential on the probability of a grievance based on alleged sex-discrimination. On these figures, raising the degree of discrimination from a 0% to a 25% pay differential would only increase the grievance probability from 0.1% to 0.14%. Figure 4 shows that the evidence for an impact of pay differentials on the grievance probability is even weaker in the case of race discrimination, at least in part because the much smaller number of sampled minority workers leads to lower statistical precision. Figure 5 shows a more definite result on the general establishment effect u_0 , where moving from the bottom to the top of its estimated range results in a doubling of the probability of a grievance based on sex discrimination. This is statistically significant, but not large enough to be of much practical significance. In figure 6, there is no evidence of any impact on the probability of a race-discrimination grievance.

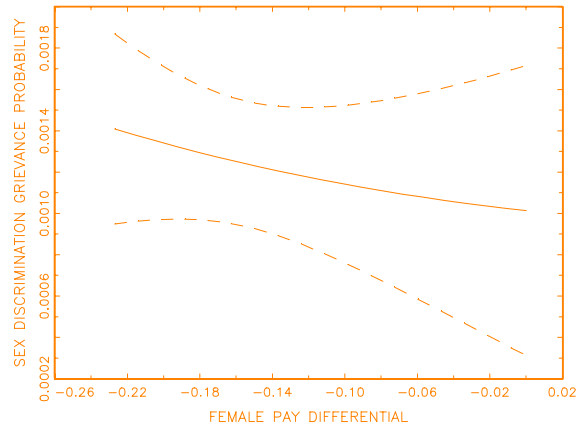


Figure 3 The impact of the gender pay differential (u_1) on the probability of expressed grievance (u_0 set at its mean; dashed lines are 90% pointwise confidence bands)

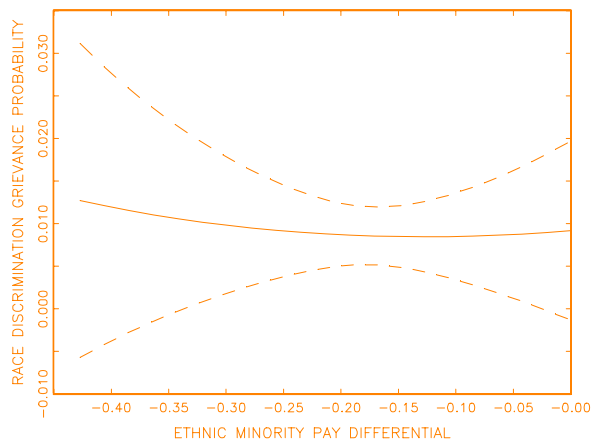


Figure 4 The impact of the racial pay differential (u_2) on the probability of a race-discrimination grievance (u_0 set at its mean; dashed lines are 90% pointwise confidence bands)

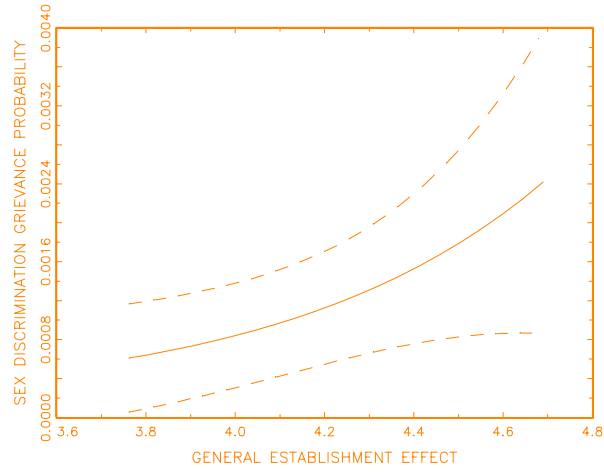


Figure 5 The impact of the general establishment effect (u_0) on the probability of a sex discrimination grievance (u_1 set at its mean; dashed lines are 90% pointwise confidence bands)

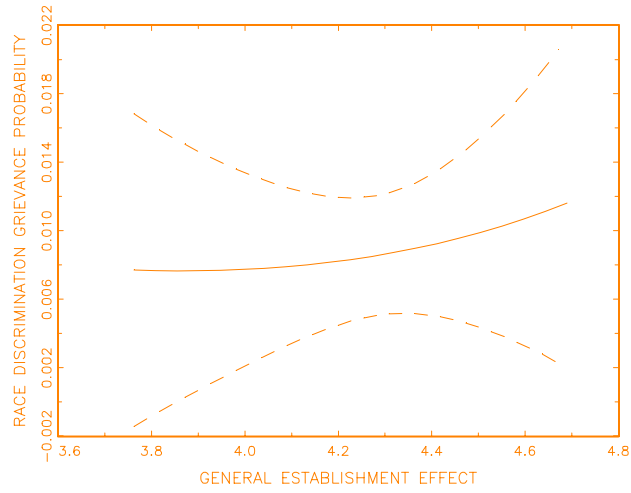


Figure 6 The impact of the general establishment effect (u_1) on the probability of a race discrimination grievance (u_2 set at its mean; dashed lines are 90% pointwise confidence bands)

What might be the explanation for these unexpected results? The theoretical model of section 2 is clearly too simple in several respects. One is that it ignores the costs incurred by complainants when they initiate an action. In purely financial terms, this assumption is quite realistic. In a 1992 survey of cases (Department of Employment, 1994), the median total cost to an employer of a tribunal case (including time, fees and compensation) amounted to £1500 and £2300 for sex and race discrimination cases respectively, compared to only £49 as the median cost to an employee. However, there are undoubtedly other intangible costs that could be important. If a fixed cost C is introduced into the model, then the curves $d/(1 - P)$ and $Pd/(1 - P)$ are replaced by $(d - C)/(1 - P)$ and $(Pd - C)/(1 - P)$. Thus the two curves shown in figure 1 are shifted downwards and become shallower. This has the effect of increasing the critical value of d at which the probability of grievance becomes positive and raising the relative frequency of quitting following an unsuccessful complaint. However, the major implications of the theory are not changed and costs of action seem unlikely to be responsible for the counter-intuitive results we have found.⁷

Another possible extension to the model brings into consideration the process of job matching. If there are systematic differences between individuals in their readiness or ability to lodge a grievance, it is likely to be the more educated, able or ambitious workers who have the greatest propensity to use grievance procedures in any given situation.⁸ If there is also some tendency for the labour market to assign such individuals to high-wage firms, then this might generate the association that we have found in the data. To pursue this further would require us to distinguish between worker-specific unobservables and true firm effects (see Abowd, Kramarz and Margolis, 1999). We are unable to do this empirically, since WERS does not yield repeated observations on workers and we cannot observe the earnings of each worker with

⁷If financial costs were large and if workers act on an expected utility rather than an expected gain basis, this conclusion could change. Workers employed by high-wage firms may be systematically wealthier than others and thus more prepared to absorb costs, resulting in a countervailing tendency towards higher rates of grievance for high-wage firms. However, this would depend critically on the nature of preferences and the structure of costs and rewards. It seems implausible that this effect could be strong enough to account for our results.

⁸Although they would also have better exit options, which would tend to reduce the grievance probability.

a sequence of employers. Consequently we have no way of separating firm effects from firm-averages of individual worker effects. If firms identified as high-wage firms tend to be so because they hire and retain high-productivity workers and if high productivity workers have in turn a higher propensity to take action for any given degree of discrimination, then we might indeed expect to observe the results that have emerged from the WERS data.

A third related issue is quitting behaviour. Exit without resort to complaint procedures may be the preferred option of many victims of discrimination. Since WERS does not yield direct observations on turnover at the individual level, this cannot be studied directly. However, it does suggest that individual job tenure and the variables used to describe the gender and ethnicity composition of the workforce may be endogenous to the discrimination/grievance process. A reduced-form approach would treat these as jointly-determined variables and omit them from the wage equation and the grievance model. To implement this, the grievance model has been re-specified as a single probit for the binary distinction between establishments experiencing any discrimination-based grievance or tribunal action and those experiencing no such complaints. This probit includes all establishment descriptors except for the gender and ethnic composition variables. We take account of the firm size effect as follows:

$$\begin{aligned} & \Pr(\text{grievance or tribunal} \mid z, u_0, u_1, u_2) \\ &= 1 - [1 - \Phi(z\gamma^* + \psi_0^*u_0 + \psi_1^*u_1 + \psi_2^*u_2)]^n \end{aligned} \quad (16)$$

where n is the total number of employees. The results from estimation of this respecified model turn out to be remarkably similar to those presented above. The estimates of $\psi_0^* \dots \psi_2^*$ are 0.026, -0.047 and -0.050 respectively and they are separately and jointly insignificant at any reasonable significant level. Thus there is no evidence to suggest that the endogeneity of workforce composition is masking a strong link between pay differentials and grievance probabilities.

Yet another possibility, of course, is that economic models of the grievance process, emphasising the rational evaluation by individuals of alternative options, might be stressing the wrong aspect of behaviour. Grievances are rare and rather extreme events, unpleasant for all parties involved. The important aspects of behaviour may be those emphasised by the psychology, rather than the economics, of individual conflict and may have little to do with the quantifiable economic gains and losses involved.

6 Conclusions

The British system of anti-discrimination policy relies heavily on individual workers to bring forward complaints. For this system to work well, it is important that bad cases of discrimination have a high probability of being raised as matters for complaint. We have certainly found evidence consistent with the belief that labour market discrimination remains an unsolved problem. Using WERS98 data, we have found highly significant evidence of employer-specific pay disadvantage for women and members of ethnic minority groups. However, this disadvantage varies significantly across employers, so there is no blanket conclusion that can be drawn about the nature of discrimination.

Simple theoretical arguments suggest that we should observe use by workers of grievance or tribunal procedures to be increasing in the degree of pay discrimination practised by the employer and decreasing in the general wage premium (relative to the going market rate) offered by the employer. Instead, we have found little evidence of any link between the employer-specific level of pay disadvantage and the rate of grievance expressed by employees. Moreover, the rate of complaint appears to be positively, rather than negatively, related to the general wage premium paid by the employer. This suggests that resort to grievance and tribunal procedures may have more to do with the 'quality' of the firm's workforce than it does with the magnitude of the 'discrimination' problem within the establishment. It may be that high-wage firms tend to employ the kind of workers who are better able to cope with the difficult and demanding process of pressing a complaint effectively. This would in turn suggest that it is often vulnerable people whose economic position is already very weak - low-skilled employees of low-wage firms - who are least likely to be helped by the Tribunal system.

If this highly contentious conclusion were accepted, it would imply that internal grievance procedures and external Employment Tribunals are in practice rather ineffective as anti-discrimination devices. Certainly our empirical results point in this direction and are consistent with the low success rate of discrimination-based Tribunal applications. Other legislative approaches which are less reliant upon individual complaints procedures may be more promising avenues for policy-makers to explore.

References

- [1] Abowd, J. M., Kramarz, F. and Margolis, D. N. (1999). High wage workers and high wage firms, *Econometrica*, 67, 251-334.
- [2] Aitkin, M. and Longford, N. (1986). Statistical modelling issues in school effectiveness studies, *Journal of the Royal Statistical Society (series A)*, 149, 1-43.
- [3] Anderson, D. A. and Aitkin, M. (1985). Variance components models with binary response: interviewer variability, *Journal of the Royal Statistical Society (series B)*, 47, 203-210.
- [4] Bayard, K., Hellerstein, J., Neumark, D. and Troske, K. (1999). Why are racial and ethnic wage gaps larger for men than for women? Exploring the role of segregation using the new worker-establishment characteristics database. In Haltiwanger, J. C., Lane, J.I., Spletzer, J. R., Theeuwes, J.J.M., and Troske, K.R. (eds.) *The Creation and Analysis of Employer and Employee Matched Data*, Amsterdam: North-Holland, pp.175-203.
- [5] Bourn, C. and Whitmore, J. (1996). *Anti-Discrimination Law in Britain*, 3rd edition. London: Sweet and Maxwell.
- [6] Card, D. and Krueger, A. B. (1993). Trends in relative black-white earnings revisited, *American Economic Review (Papers and Proceedings)* 83, 85-91.
- [7] Cully, M. (1998a). Guvnors, Employees and Brothers: Triangulation and Noise in Workplace Surveys. Paper presented at the International Symposium on Linked Employer-Employee Data, Bureau of the Census, Washington.
- [8] Cully, M. (1998b). A survey in transition: the design of the 1998 Workplace Employee Relations Survey. Mimeo: UK Department of Trade and Industry.
- [9] Department of Employment (1994). The 1992 Survey of Industrial Tribunal Applications, *Employment Gazette* 102 (January 1994), 21-28.

- [10] Freeman, R. B. (1973). Changes in the labor market for black Americans 1948-1972, *Brookings Papers on Economic Activity* 1, 67-102.
- [11] Freeman, R. B. (1980). The Exit-Voice Tradeoff in the Labor Market: Unionism, Job Tenure, Quits, and Separations, *Quarterly Journal of Economics*, 94, 643-673.
- [12] Goldstein, H. (1995). *Multi-Level Statistical Models*. London: Edward Ashton.
- [13] Hægeland, T. and Klette, T.J. (1999). Do higher wages reflect higher productivity? Education, gender and experience premiums in a matched plant-worker dataset. In Haltiwanger, J. C., Lane, J.I., Spletzer, J., R., Theeuwes, J.J.M., and Troske, K.R. (eds.) *The Creation and Analysis of Employer and Employee Matched Data*, Amsterdam: North-Holland, pp.231-259.
- [14] Haltiwanger, J. C., Lane, J.I., Spletzer, J., R., Theeuwes, J.J.M., and Troske, K.R. (eds., 1999) *The Creation and Analysis of Employer and Employee Matched Data*, Amsterdam: North-Holland.
- [15] Heckman, J. J. and Singer, B. (1984). A method for minimising the impact of distributional assumptions in econometric models for duration data, *Econometrica*, **52**, 271-320.
- [16] Lindsay, B. (1981), "Properties of the maximum likelihood estimator of a mixing distribution", in Tallie, C. (ed.) *Statistical Distributions in Scientific Work*, (Dordrecht, Kluwer).
- [17] Pudney, S. E, Galassi, F. and Mealli, F. (1998). An econometric model of farm tenures in fifteenth century Tuscany, *Economica*, **65**, 535-556.
- [18] Pudney, S. E. (1999). On the impact of anti-discrimination legislation. University of Leicester: Discussion Papers in Public Sector Economics, no. 99/3.
- [19] Pudney, S. E. and Shields, M. A. (2000). Gender, ethnicity and pay differentials in the British nursing profession: estimation of a generalised ordered probit model, *Journal of Applied Econometrics*, **15**, forthcoming.

- [20] Zabalza, A. and Tzannatos, Z. (1985). The effect of Britain's anti-discriminatory legislation on relative pay and employment, *Economic Journal* 95, 679-699.

Appendix 1: Sample properties of variables

Table A1 Sample means of personal characteristics
(unweighted, $n = 20,660$)

Variable	Mean
Job tenure (years)	6.98
Union member (dummy)	0.442
Age (years)	39.6
Unmarried (dummy)	0.226
Vocational qualification	0.394
Health problem	0.054
Temporary job	0.022
<i>Occupation ...</i>	
Managerial / professional	0.305
Technical	0.110
Clerical	0.205
Craft / skilled manual	0.096
Service occupation	0.055
Sales	0.043
Operative	0.100
<i>Ethnicity ...</i>	
Ethnic minority man	0.015
Ethnic minority woman	0.014
Ethnic majority man	0.559
Ethnic majority woman	0.412
<i>Highest educational qualification ...</i>	
Low school qualification (GCSE grade D or E or equivalent)	0.104
Intermediate school qualification (GCSE grade A, B, C or equivalent)	0.251
Higher school qualification (A-levels or equivalent)	0.162
University degree	0.203
Postgraduate degree	0.072

Appendix 2: Grievance probabilities

WERS yields three pieces of information relevant to the occurrence of grievance and Tribunal actions within the 12 months prior to the survey. Internal grievances based on allegations of race and sex discrimination are not recorded separately, while sex and race discrimination Tribunal cases are separated. However, within these three categories, only occurrence is observed, and not their number. Note that, in the few cases where Tribunal action is recorded without any internal grievance, we record this as an occurrence of both together. Consider a particular establishment, and either one of the disadvantaged groups. Let P_r be the grievance probabilities, as defined in (4) for group r , where $r = 1$ for women and $r = 2$ for the ethnic minority, and let Q be the conditional Tribunal probability (5). As a (good) approximation we assume that sex discrimination cases are only brought by women and race discrimination cases are only brought by members of the ethnic minority group; n_1 and n_2 are the sizes of these groups within the workforce. There are five possible observational regimes which occur with the following probabilities.

$$\Pr(\text{no grievance or tribunal case}) = (1 - P_1)^{n_1}(1 - P_2)^{n_2}$$

$$\begin{aligned} \Pr(\text{sex and/or race grievance, no tribunal case}) \\ &= \Pr(\text{no tribunal case}) - \Pr(\text{no sex or race grievance}) \\ &= (1 - P_1Q)^{n_1}(1 - P_2Q)^{n_2} - (1 - P_1)^{n_1}(1 - P_2)^{n_2} \end{aligned}$$

$$\begin{aligned} \Pr(\text{sex and/or race grievance, sex discrimination tribunal case only}) \\ &= [1 - (1 - P_1Q)^{n_1}](1 - P_2Q)^{n_2} \end{aligned}$$

$$\begin{aligned} \Pr(\text{sex and/or race grievance, race discrimination tribunal case only}) \\ &= (1 - P_1Q)^{n_1}[1 - (1 - P_2Q)^{n_2}] \end{aligned}$$

$$\begin{aligned} \Pr(\text{sex and/or race grievance, sex and race discrimination tribunal cases}) \\ &= [1 - (1 - P_1Q)^{n_1}][1 - (1 - P_2Q)^{n_2}] \end{aligned}$$

These expressions form the distribution $\Pr(g_h | \mathbf{z}_h, \mathbf{u}_h)$ which enters the full sample distribution $\Pr(\mathbf{y}_h, g_h | \mathbf{X}_h, \mathbf{z}_h, \mathbf{\Xi}_h, \mathbf{u}_h)$ and thus the likelihood function (12).