Eliciting GPs' preferences for pecuniary and non-pecuniary job characteristics

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Abstract

This study examines General Practitioners' preferences for pecuniary and non-pecuniary job characteristics in the context of choosing a general practice in which to work. A discrete choice experiment is used to test hypotheses about the nature of the utility function. Marginal rates of substitution between income and non-pecuniary characteristics are calculated. The results suggest that policies aimed at influencing General Practitioners' location choices should take account of both non-pecuniary and pecuniary factors, particularly out of hours work commitments. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

The analysis of physician behaviour has focused on the role of financial incentives in influencing behaviour and on other factors influencing incomes, such as physician density. This approach is based on the neo-classical principal-agent model which assumes (amongst other things), that the contents of workers' utility functions include leisure and the consumption of other goods and services, that income from work is important only in so far as it meets these objectives, and that workers experience disutility from work. This defines a central role for income and earnings-related incentives in influencing both the productivity of workers and their labour–leisure choices.

However, it has been recognised that this type of analysis may ignore non-pecuniary factors that influence physician behaviour and labour supply. Economists in the classical tradition argued that occupational choice is determined by relative prices and the non-pecuniary

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attributes of work, where the equilibrium wage is the valuation of the non-pecuniary attributes (Ehrenberg and Smith, 1988; Rottenberg, 1971). For example,

“In the labour markets of Adam Smith. . . workers made occupational choice in terms of comparative total net advantages, not in terms of comparative wages.” (Rottenberg, 1971)

Rottenberg argued that the *ceteris paribus* assumption in neo-classical models of occupational choice led to a heavy focus on pecuniary determinants of behaviour and that non-pecuniary factors were given less attention, not because they were less important than price, but because price fitted neatly into the more formal methods of quantitative analysis and calculus.

As well as theoretical arguments about the relevance of non-pecuniary characteristics, there is much empirical evidence from surveys in the non-economics literature about the various non-pecuniary characteristics that influence the job satisfaction and job choices of physicians (Scott, 1998). In the UK, the recent introduction of a salaried payment option for GPs and changes to the financing and organisation of out of hours care by GPs were designed to address low morale, stress and job dissatisfaction, and consequent problems of recruitment and retention. Such policies, however, do not fit easily with the traditional economic model of incentives based in principal-agent theory.

For these reasons, this paper takes a broader approach based on non-pecuniary job characteristics. In labour economics, a ‘job characteristics’ approach has been used in the context of testing the theory of compensating wage differentials (e.g. Sandy and Elliott, 1998). These studies have attempted to examine the role of pecuniary and non-pecuniary job characteristics, and have been most successful when attempting to value the risk of death or injury at work, to produce estimates of workers’ willingness to pay for risk reductions. (Gronberg and Reed, 1994; Herzog and Schlottmann, 1990; Kniesner and Leeth, 1991). However, few advances have been made when attempting to value other job characteristics (Cavalluzzo, 1991; Arai, 1994).

Although such an approach is not new in labour economics, it has yet to be incorporated into empirical work on physician behaviour. The basic income/leisure framework has been extended to include other arguments in the physician’s utility function. The most notable is the inclusion of various definitions of patients’ interests or ‘ethical’ concerns in the utility function (e.g. Evans, 1974; Feldstein, 1970; Zweifel, 1981; Dionne and Contandriopoulos, 1985). Others have suggested (though without explicit models), that factors such as autonomy, reputation and intellectual satisfaction may help to explain physician behaviour (Kristiansen, 1994). Other studies have included social norms and peer pressure as determinants of physician behaviour (Encinosa et al., 1997). However, these extensions have not been directly measured or tested in empirical work, which continues to be dominated by the role of financial incentives in influencing behaviour. Presumably, the reason for this is the difficulty in measuring these ‘psychological’ phenomena and the lack of secondary data sources that contain information about these variables. As a consequence, there is little evidence about what factors motivate GPs, and their implications for GPs’ decisions.

The aim of this paper is to contribute empirically to the debate on physician preferences. The paper uses a ‘job characteristics’ framework, taken from economic theories of occupational choice and compensating wage differentials, to examine the pecuniary and

non-pecuniary arguments in the GPs' utility function. The study is set in the context of GPs choosing a practice in which to work, and so the policy implications are concerned with the distribution of GPs and their location choices. A discrete choice experiment is used to test hypotheses about the contents of the utility function and to estimate GPs' monetary valuations of non-pecuniary job characteristics.

2. A model of practice choice

The model concentrates on GPs' choice of practice in which to work as a mechanism for revealing their preferences for pecuniary and non-pecuniary job characteristics. It is assumed that the utility function is defined over bundles of job characteristics (z) and leisure activities (L), with each bundle of job characteristics representing a particular practice in which the GP could potentially work.

GPs choose a practice at the beginning of their career as a GP or when they change jobs throughout their career. GPs can only choose one bundle of job characteristics given that they can only choose one practice at a time, and so the alternatives in the choice set are mutually exclusive, with z exogenous at the time the choice is made.¹ Hence, we are concerned with an indirect utility function that indicates the maximised utility to be obtained in a practice with characteristics z (Peitz, 1995; Truong and Hensher, 1985).

Each practice in the choice set therefore comprises a bundle of job characteristics (z) faced by the n th GP. With two practices (i and j), y_n^* is a latent variable representing the difference in utility between the practices being compared. Since it is the choice that is observed rather than the difference in utility, y_n^* is binary. Therefore, $y_n = 1$ if $y_n^* > 0$ and 0 else, and

$$y_n^* = (\alpha + \beta z_i + \partial s_n + \varepsilon_{in}) - (\alpha + \beta z_j + \partial s_n + \varepsilon_{jn}) \quad (1)$$

where α , β and ∂ are coefficients, s are socio-economic characteristics reflecting influences on tastes and ε is the random component of utility accounting for the analyst's inability to accurately observe individual's behaviour (Manski, 1977; McFadden, 1974a,b). Further, assume that there are taste variations, such that the marginal utility of z depends on s :

$$\beta = \pi + \lambda s_n \quad (2)$$

This gives

$$y_n^* = (\alpha + \pi z_i + \lambda s_n z_i + \partial s_n + \varepsilon_{in}) - (\alpha + \pi z_j + \lambda s_n z_j + \partial s_n + \varepsilon_{jn}) \quad (3)$$

The discrete choice experiment used to estimate the model presents each GP with several pairs of scenarios. Multiple observations from each GP means that errors are not independent and so an error term μ_n capturing random variation across GPs is included

$$y_n^* = (\alpha + \pi z_i + \lambda s_n z_i + \partial s_n + \varepsilon_{in} + \mu_n) - (\alpha + \pi z_j + \lambda s_n z_j + \partial s_n + \varepsilon_{jn} + \mu_n) \quad (4)$$

¹ z becomes endogenous only *after* the GP has chosen the practice in which they want to work.

Taking differences for each pairwise choice (k), the equation to be estimated becomes

$$y_{kn}^* = \pi z_k + \lambda s_n z_k + \varepsilon_{kn} \quad (5)$$

Terms common to both indirect utility functions drop out of the model (i.e. α , ∂s_n , and μ_n).

However, the inclusion of a constant term (α) and error term across respondents (μ_n) can be used to test for mis-specification due to unobservable attributes and unobservable interaction terms between GPs' socio-economic characteristics and attributes. The constant term can be interpreted as the difference in the average utility of scenario i and j , caused by the use of a constant scenario, left/right bias or an omitted dummy variable that is a function of other included attributes (Scott, 2000). The model to be estimated then becomes

$$y_{kn}^* = \alpha + \pi z_k + \lambda s_n z_k + \varepsilon_{kn} + \mu_n \quad (6)$$

This model was estimated using random effects probit regression. A full model was estimated including main effects and interaction terms for which hypotheses existed. This was then reduced to a more parsimonious model by excluding variables, one at a time, with P -values greater than 0.10.

3. Methods

The stated preference technique of a discrete choice experiment was used to estimate the indirect utility function. The job characteristics and their definition were derived from existing economic models of GP behaviour and the non-economics literature, including surveys of factors influencing job satisfaction and job choice (Scott, 1997). Interviews with three full-time GP principals and from a random sample survey of 100 full-time GPs in England, conducted as part of pilot work to this study, further confirmed that the attributes we selected were relevant (see Fig. 1 and Table 1).

Seven attributes were included. The first was the net income offered by the practice. This was defined in terms of changes in income. If absolute income levels had been used, then results might have been sensitive to the GPs current level of income which varied across GPs. The levels were therefore defined as a reduction in income, no change in income, and as an increase in income. The interval between the levels is important to ensure some trading takes place. Too small an interval will mean that GPs do not consider the difference between levels to be important. Too large an interval may result in a dominant preference for income, where GPs are not prepared to trade income at all, and always choose the scenario with the highest level. In the first pilot questionnaire, GPs were asked when choosing a practice, how much income they would be prepared to forgo to work fewer hours per week, to have a lower list size, to spend fewer hours on administration, and to develop special interests. The mean amount of income GPs were willing to trade across these characteristics was £2668. The interval between income levels was therefore set at £2500.

The second attribute was list size per full-time equivalent GP which was used as an indicator of the intensity of work, but may also be valued for its effect on patients' health status and income. A lower list size per GP is related to more time spent with patients, which has in turn been shown to be related to higher patient satisfaction and quality of care (Stewart,

Imagine you have decided to move practices and are choosing a practice in which to work. You have been offered two full time positions. You have been interviewed by the practices and negotiated terms and conditions. In each of the four questions below, you are asked to choose between two practices. Each practice differs with respect to a number of characteristics.

- Assume all other characteristics of the practices (and local amenities in the area) are the same
- Please answer all four choices
- In each question, Practice A is the same and Practice B is different
- Each question is different
- There are no right or wrong answers

Q1. Which practice would you prefer? (please tick box below)

	Practice A	Practice B
Opportunities to develop special interests and/or academic work	No	Yes
List size per full time equivalent partner	1400	1400
Total daytime hours worked per week	35	45
Change in income per year (after tax)	£2500 less	£2500 less
Time spent on administration per week	10	10
Out of hours arrangements	1 night per week and 1 weekend in 6	No nights or weekends on call
Use of guidelines for certain areas of care	Yes	No

Prefer practice A ☐ (please tick one box) ☐ Prefer practice B

Fig. 1. Example of a discrete choice.

1995). More patients on the list also generate more income under the current capitation system of GP payment in the UK. The interviews with GPs suggested it was interpreted as a measure of workload, rather than opportunities to increase patients' utility or income. List size per GP was determined from the mean list size of full-time GPs in England (2051).

Time spent on administration was also used as an indicator of the intensity of work. The fourth and fifth attributes were daytime hours at work and the amount of work out of hours. The levels for daytime hours worked per week (and hours spent on administration) per week were determined from the most recent national survey of GP workload conducted by the

Table 1

Job characteristics and levels used in scenarios

Job characteristic	Levels used in final questionnaire
Opportunities to develop special interests and/or academic work	Yes No
List size per full-time equivalent GP	1400 2000 2600
Total daytime hours worked per week	35 40 45
Change in income per year (after tax)	£2500 less No change £2500 more
Time spent on administration per week	7 10 13
Out of hours arrangements	No nights or weekends on call One night per week and one weekend in six Two nights per week and one weekend in four
Use of guidelines for certain areas of care	Yes No

Department of Health (Department of Health, 1994). Out of hours work was defined along two dimensions as the number of nights on call per week and the number of weekends on call, hence dummy variables were created to reflect the categorical but ordered nature of this variable (see Table 1). From the interviews and from previous surveys, this is the way most GPs would define the amount of work they do out of hours (Electoral Ballot Reform Services, 1992).

The sixth attribute was opportunities within the practice for the GP to invest in human capital, i.e. to undertake further postgraduate education, academic work or to have a special interest (Beardow et al., 1993; Roswell et al., 1995). This was interpreted as a proxy for intellectual satisfaction (Kristiansen, 1994). The final attribute was the extent to which clinical guidelines and peer review (e.g. through audit) are operational in the practice. This was included to reflect a concern for clinical autonomy. Whether the practice used guidelines or provided opportunities for the development of special interests were coded as binary variables.

The effect of GPs' current job characteristics, experience, age, sex, and other characteristics on the marginal valuations of each attribute were examined by including interaction terms in the regression model (Eq. (3)). This included examining whether the marginal utility of income falls as actual income increases, and whether it was influenced by other characteristics such as age and experience. Furthermore, it involved testing whether the marginal valuation of an extra hour at work (i.e. the value of leisure time) increased by marital and family status, and by out of hours workload.

The regression coefficients can be interpreted as scale transformations of the marginal utility of each attribute (Fowkes and Wardman, 1988). Of specific interest is the marginal utility of income and the marginal utility of time at work. The list size per GP and the existence of guidelines are both expected to have a negative effect on utility. The existence of opportunities to invest in human capital is expected to have a positive effect on utility.

The extent to which GPs trade-off income for the other job characteristics gives an estimate of the monetary valuation of those characteristics. This is given by the marginal rate of substitution (MRS) between income and each of the other attributes (Small and Rosen, 1981; Propper, 1995). Trade-offs amongst other characteristics can also be estimated. This can be used in the reduced regression model to estimate the monetary valuation for specific sub-groups of GPs defined through the interaction terms. The MRS have important policy implications as, combined with the cost of altering each attribute, they can be used to find the most cost-effective policy to change GP utility and hence practice choices. The model can also be used to predict which set of job characteristics generates the highest utility, and used to predict the effect of changes in characteristics on utility.

The levels for each attribute were organised into scenarios using a factorial experimental design. A full factorial design produced $3^5 \times 2^2 = 243 \times 4 = 972$ scenarios. A fractional factorial design produced 18 scenarios. This ensures an orthogonal design, i.e. that levels are varied independently thus minimising multicollinearity. One scenario was chosen to be constant (see 'Practice A' in Fig. 1), and the other 17 compared with it. Seventeen scenarios were too many for an individual to complete, and given the expected low response rate from GPs, the 17 scenarios were split randomly across four questionnaires, with three questionnaires with four choices and one with five. The four versions of the questionnaire were randomly allocated to each GP.

The questionnaire was piloted a second time on a random sample of 100 English GPs with a 30% response rate. As a result, a different comparator scenario was chosen since 90% of respondents were choosing scenario B, and the definition of the out of hours attribute was altered on the basis of more accurate information on the amount of out of hours care of GPs from the questionnaire.

Sample size was determined on the basis of the analysis of sub-groups, with a minimum figure of between 30 and 100 individuals for *each* sub-group of interest (Permain et al., 1991). Previous conjoint analysis studies that have examined the effect of socio-demographic characteristics on preferences have sampled between 100 and 150 individuals and found that the numbers of respondents in some (but not all) sub-groups have been insufficient for meaningful analysis (Chakraborty et al., 1993; Vick and Scott, 1998). Thus, a figure of 300 (150 from Scotland and 150 from England) was sufficient to enable the data to be analysed by sub-group. Assuming an initial response rate of 30% a random sample of 1000 GPs (500 in England and 500 in Scotland) was required to obtain at least 300 responses. Two reminders were sent, at two week intervals. The questionnaire was administered during June and July 1999.

The sample frame was all full-time GPs in England (at 1st October 1997) and in Scotland (at 1st April 1998). Two random samples of 500 were drawn from England and Scotland, respectively. Each sample was stratified by whether the GPs worked in a practice with either three or fewer FTE partners, or four or more FTE partners. For those who worked in

practices with three or fewer FTE partners, the number sampled was increased by a factor of 1.5 to reflect an anticipated low response rate from this group. The final sample used was 624 GPs in England and 582 GPs in Scotland. Scottish and English data were pooled for analysis and differences between them tested for in the regression models. For analysis, data were weighted to be representative of all full-time GPs in England and Scotland, with respect to the number of partners.

4. Results

The overall response rate after two reminders was 70% (848/1206). However, 65 questionnaires were returned uncompleted, reducing the number of usable responses to 783 (65%). Furthermore, of the 65 returned incomplete, 15 GPs had retired, nine GPs no longer worked at the practice, two were on maternity leave, two were on sabbatical, and one address was 'not accessible'. Of the questionnaires that reached the respondent, the response rate was therefore 66.5% (783/1177). Non-responders were more likely to come from practices with fewer partners (3.48 versus 3.85 partners, P -value = 0.002), and with a smaller list size (3808 versus 4193 patients, P -value = 0.047). However, practices with three or fewer partners were oversampled by a factor of 1.5 and data re-weighted to be representative nationally in terms of the number of partners. Descriptive statistics of the samples are presented in Table 2.

Results for the random effects probit model are shown in Table 3. The sample size was 3255 observations and 773 GPs, after the deletion of missing values for the dependent variable. All coefficients were statistically significant, except special interests and hours of administration. These, therefore, had no effect on the choice of practice. The signs of coefficients were all of the expected direction, except that for guidelines. The signs reflect the effect of a change in the attribute on utility. It appears that GPs preferred a practice that used guidelines, had a lower list size, had a lower number of daytime hours worked per week, offered a higher change in income, and had a lower out of hours workload. These broadly confirm the theoretical validity of the technique. In particular, GPs' utility was increasing in income, and decreasing with time spent at work.

The positive and significant constant in the model suggests either that GPs were considering attributes not in the model, or that there was 'right' bias, where GPs were more likely to favour 'Practice B'. This may also be due to the existence of a constant scenario. The value of ρ , measuring the correlation between responses from the same GP, is statistically significant suggesting that a random effects specification was appropriate and there were unobserved interactions between GP characteristics and attributes.

Table 3 also shows the marginal rate of substitution between each job characteristic and the change in income. A positive sign indicates what GPs would be willing to pay to have more of the characteristic, and a negative sign indicates how much income GPs would be willing to accept to have more of the characteristic. An increase in the amount of out of hours work yielded very high monetary valuations. These are dependent on the change in the amount of out of hours care. The levels for this attribute were set to cover the realistic range of out of hours care undertaken by GPs, as specified in the second pilot questionnaire. This is also confirmed by the descriptive statistics in Table 2.

Table 2
Descriptive statistics^{a,b}

Variable	England (<i>n</i> = 350)	Scotland (<i>n</i> = 429)	Pooled sample (<i>n</i> = 780)
<i>Personal characteristics</i>			
Age (mean, range)	45.3 (26–68)	44.5 (28–63)	44.9 (26–68)
Female (%)	23.6	30.6	27.4
Number of children under 16 years old	1.21 (0–5)	1.11 (0–5)	1.16 (0–5)
Marital status (%)			
Single	6.3	8.2	7.4
Married	89.1	85.7	87.2
Cohabiting	1.8	2.8	2.3
Separated	0.5	1.5	1.1
Divorced	2.1	1.2	1.6
Widowed	0.2	0.5	0.4
Self assessed health status (%)			
Excellent	34.1	38.1	36.3
Good	46.3	48.3	47.4
Fair	15.6	11.6	13.4
Poor	4	1.9	2.8
Amount of stress in last few days at work (%)			
(1) No stress	8.9	11.5	10.3
(2)	25.2	24	24.5
(3) Moderately stressed	35.3	38.8	37.2
(4)	18.1	18.5	18.4
(5) Very stressed	12.5	7.2	9.6
Years working as a doctor (mean, range)	20.8 (6–43)	20.4 (5–39)	20.6 (5–43)
Years in current job (mean, range)	13.1 (1–37)	13.3 (0.5–37)	13.2 (0.5–37)

Table 2 (Continued)

Variable	England (<i>n</i> = 350)	Scotland (<i>n</i> = 429)	Pooled sample (<i>n</i> = 780)
<i>Practice characteristics</i>			
List size per FTE partner	2059 (27–4638)	1465 (280–3273)	1732 (27–4638)
Number of FTE partners	3.7 (1–14)	4 (1–10.25)	3.8 (1–14)
Single handed (%)	11.1	7.5	9.1
Percentage in receipt of deprivation payments for more than 10% of population	15.2	23.8	19.9
Receiving rural practice payments (%)	25.7	40.8	34
Percentage in a practice using guidelines	78.5	83.6	81
<i>Current out of hours arrangements (%)</i>			
Single handed (on-call for all)	0	2.8	1.1
Rota in your practice	3.2	10.1	6.9
Rota with at least one other practice	4.6	12	8.2
Co-operative with emergency centre	56.7	65.7	61.5
Deputising service	19.5	4.5	11.9
A mix of the above and a deputising service	14.6	5.2	10.1
<i>Current job characteristics</i>			
Percentage with work-related special interests	82	77	79
Percentage reporting opportunities to develop special interests/academic work	79	79	79
Percentage doing teaching/academic work	46	54	50
Day time hours worked per week (mean, range)	45.60 (4–105)	40.67 (4–90)	41.98 (4–105)
Hours of administration per week (mean, range)	8.82 (0–42)	7.75 (0–53)	8.23 (0–53)

Table 2 (Continued)

Variable	England (<i>n</i> = 350)		Scotland (<i>n</i> = 429)		Pooled sample (<i>n</i> = 780)	
	GMS only	Total income	GMS only	Total income	GMS only	Total income
Income after tax (%)						
£20,000–30,000	7.9	4.5	17.1	8.6	13	6.8
£30,000–40,000	22.7	10.6	32.9	28.7	28.4	20.6
£40,000–50,000	35.1	24.7	38.3	33.5	36.9	29.6
£50,000–60,000	20.9	27.1	9.1	20	14.3	23.2
£60,000–70,000	9.8	20.4	2.6	6.9	5.8	12.9
£70,000–80,000	2.2	6.9	0	1	1	3.7
Over £80,000	1.4	5.7	0	1.3	0.6	3.3
Number of nights per week on call (%)						
None	24.8		25.4		25	
One night or less	66		59.5		62.5	
Between one and three nights	5.1		8.9		5.6	
Over three nights	3.8		6		4.8	
Number of weekends on call (%)						
None	17.6		22.2		20	
Up to one in four	42.8		46.6		44	
Over one in four and up to one in eight	33.8		26.4		29.7	
Over one in eight	6.4		4.7		5.7	

^a Based on weighted data.^b Based on the number of non-missing responses.

Table 3
Regression results

Variable	β (S.E.)	Monetary value of job characteristics (£) (S.E.) MRS (β_x/β_1) ^a
Constant	0.790 (0.170)*	–
Change in annual income (β_1) ^b	0.095 (0.021)*	–
List size per GP (β_2) ^b	–1.145 (0.076)*	–£12 (0.090) per extra patient
Time on administration (β_3) ^c	–0.005 (0.016)	–£1.1 (0.029) per extra hour per year
Special interests (β_4)	0.003 (0.076)	£35 (0.832) to develop interests
Guidelines (β_5)	0.330 (0.074)*	£3477 (24.53) to use guidelines
Daytime hours at work (β_6) ^c	–0.055 (0.010)*	–£13 (0.019) per extra hour per year
Out of hours dummy 1 ^d	–1.285 (0.087)*	–£13,533 (95.42) for a change from no on call to the first level
Out of hours dummy 2 ^d	–1.871 (0.031)*	–£19,708 (138.9) for a change from the first level to the second level
ρ	0.419 (0.031)*	
–2 log likelihood	–1336	
Likelihood ratio test (χ^2 , df)	901 (8)*	
Pseudo R^2 (%)	40	
Percentage 1's predicted correctly	76	
Percentage 0's predicted correctly	87	

^a Standard errors for the monetary valuations were calculated from a Taylor series approximation to the variance of a function of random variables (see Propper, 1995; Kmenta, 1986, p. 486).

^b The independent variables for income and list size were scaled down by a factor of 1000 before analysis, and re-scaled to calculate monetary valuations.

^c Since these variables were hours per week, MRS was divided by 46.5 working weeks per year to reflect the value of one extra hour per year.

^d Out of hours care were coded as two dummy variables. The first reflects the marginal valuation of a change from no out of hours care to the first level. The second reflects the marginal valuation of a change from the first to the second level. A third situation of no change was used as the omitted dummy variable.

* $P < 0.0001$.

GPs would be willing to pay (i.e. give up an increase in income) nearly £3500 to work in a practice with guidelines. The use of guidelines was expected to have a negative effect on utility as it was thought to reduce clinical autonomy. Guidelines may not have therefore been valued because of their effect on autonomy, but for their effect on the quality of care. If so, this suggests that GPs are willing to trade-off income to increase quality of care. However, the type of guidelines (evidence-based or internal to the practice based on consensus) was not specified in the questionnaire and GPs may attach different values to different types of guidelines. Furthermore, the existence of guidelines may also reflect concerns about avoiding litigation, which may be related to income and reputation as arguments in the utility function.

The value of an extra hour at work per year of £13 is quite low, but this is because it reflects the marginal opportunity cost of an extra hour at work (i.e. the value of leisure time) which is usually lower than the value of time at work (Wardman, 1998). GPs had a stronger disutility for an extra hour of usual daytime work, than for an extra hour of administration. This may reflect a perception that additional administration was a substitute for other work within the same total hours.

The current capitation payment GPs receive for each patient registered with them is £9 (after tax of 40%) for patients under 65, slightly lower than the valuation found in this study (£12). The results of the reduced regression model with interaction terms shows how the marginal valuation of each attribute differed across GP and current practice characteristics (Table 4). For the reduced model, a likelihood ratio test of the joint statistical significance of the excluded variables failed to reject the null hypothesis that the coefficients of excluded variables were equal to zero ($\chi^2 = 22$ (74 df); $P > 0.05$), thus favouring the restricted model. In the reduced model, guidelines, special interests and hours of administration drop out of the model, and therefore had no influence on the choice of practice once differences in GP and practice characteristics were accounted for. However, guidelines and special interests do appear in the interaction terms, indicating that they were important only for a sub-group of GPs. Monetary valuations for the specific sub-groups of GPs are shown in Table 5. The monetary valuations for sub-groups of GPs indicate the relative strength of preference and provide an indication of how much GPs would be willing to pay (or willing to accept) to work in a practice with a specific job characteristic.

GPs with total annual after-tax incomes between £60,000 and £70,000 placed a higher value on each extra pound, compared to those earning between £20,000 and £40,000. It would be expected (generally) that people on low incomes value an extra pound more highly than people on high incomes. However, it is just as plausible that GPs earning above a certain amount find income very important to them, compared to GPs who earn less and perhaps place a higher value on non-pecuniary job characteristics.

The more time GPs had spent working as a doctor, then the lower the value placed on each extra pound increase in income. GPs who were single handed or who received deprivation payments for at least 10% of their patients were more likely to prefer a practice with a higher list size, compared to GPs in group practice or GPs not in receipt of deprivation payments, respectively. Deprivation payments are an extra source of income.

GPs who were married or cohabiting preferred more hours at work during the day, compared to other GPs. Those who were in England or who received rural practice payments preferred fewer hours at work, thus placing a higher value on leisure time. However, GPs who spent more time on administration were more likely to prefer a practice with longer working hours per week, although this may reflect a selection effect.

Those GPs who had a special interest were more likely to value a practice that used guidelines, compared to GPs who did not have a special interest. This was also the case for female GPs. For those with special interests, this may reflect increased knowledge about specific clinical areas and an appreciation of the value of information on how to manage certain illnesses. They may therefore regard general practices that use guidelines as having a higher quality of care provided to patients.

Working in a practice that offered opportunities to develop special interests/academic work was preferred by GPs who had been a doctor for a relatively short period of time, compared to GPs who had been doctors for longer. GPs with special interests were more likely to value a practice that offered opportunities to develop special interests/academic work, which may again reflect selection effects. This partly confirms the hypothesis that intellectual satisfaction was important in the GPs' utility function (Kristiansen, 1994).

Table 4
Regression results for model with interaction terms (reduced model)

Variable	β	S.E.
Constant	0.870	0.213***
Change in annual income	0.188	0.056**
List size per GP	−1.368	0.113***
Daytime hours at work	−0.145	0.035***
Out of hours 1	1.106	0.283**
Out of hours 2	−2.382	0.703**
Change in annual income $\times$ income (£60,000–£70,000) ^a	0.093	0.040*
Change in annual income $\times$ years working as a doctor	−0.005	0.002*
List size per GP $\times$ deprivation payments ^b	0.253	0.142
List size per GP $\times$ single handed ^c	0.690	0.197**
Daytime hours at work $\times$ married or cohabiting ^d	0.073	0.031*
Daytime hours at work $\times$ rural ^e	−0.029	0.017
Daytime hours at work $\times$ hours of admin	0.005	0.001**
Daytime hours at work $\times$ England ^f	−0.039	0.017*
Guidelines $\times$ special interests ^g	0.394	0.105**
Guidelines $\times$ female ^h	0.422	0.207*
Special interests $\times$ years working as a doctor	−0.024	0.007**
Special interests $\times$ special interests ^g	0.754	0.178***
Out of hours 1 $\times$ female ^h	−0.467	0.203*
Out of hours 2 $\times$ female ^h	−0.888	0.287**
Out of hours 1 $\times$ single handed ^c	0.576	0.301
Out of hours 1 $\times$ co-op ⁱ	−0.693	0.191**
Out of hours 2 $\times$ co-op ⁱ	−0.484	0.228*
Out of hours 1 $\times$ deputising ⁱ	−0.933	0.263**
Out of hours 2 $\times$ deputising ⁱ	−0.986	0.311**
Out of hours 1 $\times$ health status	−0.311	0.082**
Out of hours 1 $\times$ England ^f	−0.386	0.169*
Out of hours 2 $\times$ age	0.061	0.012***
Out of hours 2 $\times$ married or cohabiting ^d	−1.077	0.350**
Out of hours 2 $\times$ daytime hours at work	−0.018	0.008*
ρ	0.389	0.045***
−2 log likelihood	−848	
Likelihood ratio test (χ^2 , df)	715 (29)	
Pseudo R^2 (%)	46	
Percentage 1's predicted correctly	79	
Percentage 0's predicted correctly	85	

^a Relative to those on incomes between £20,000 and £40,000.

^b Relative to GPs not in receipt of deprivation payments for at least 10% of their patients.

^c Relative to GPs in group practice.

^d Relative to those who are single, separated, divorced or widowed.

^e Relative to GPs who do not receive rural practice payments.

^f Relative to GPs in Scotland.

^g Relative to GPs with no special interests.

^h Relative to males.

ⁱ Relative to GPs who are single-handed or in a rota.

* $0.05 \geq P \geq 0.01$.

** $0.01 > P \geq 0.0001$.

*** $P < 0.0001$.

Table 5
The effect of GP and practice characteristics on monetary valuations

Variable	Marginal valuation compared to reference category (£)	S.E. ^a
Change in annual income $\times$ income (£60,000–£70,000) ^b	0.50	0.01
Change in annual income $\times$ years working as a doctor	–26	0.24
List size per GP $\times$ deprivation payments ^c	1.35	0.05
List size per GP $\times$ single handed ^d	3.68	3.65
Daytime hours at work $\times$ married or cohabiting ^e	386	1.47
Daytime hours at work $\times$ rural ^f	–155	0.27
Daytime hours at work $\times$ hours of admin	28	1.98
Daytime hours at work $\times$ England ^g	–209	19.80
Guidelines $\times$ special interests ^h	2097	21.26
Guidelines $\times$ female ⁱ	2249	1.20
Special interests $\times$ years working as a doctor	–127	37.96
Special interests $\times$ special interests ^h	4020	23.52
Out of hours 1 $\times$ female ⁱ	–2488	47.70
Out of hours 2 $\times$ female ⁱ	–4733	29.01
Out of hours 1 $\times$ single handed ^d	–3069	34.85
Out of hours 1 $\times$ co-op ^j	–3690	24.39
Out of hours 2 $\times$ co-op ^j	–2580	46.92
Out of hours 1 $\times$ deputising ^j	–4969	49.62
Out of hours 2 $\times$ deputising ^j	–5254	15.66
Out of hours 1 $\times$ health status	–1658	19.42
Out of hours 1 $\times$ England ^g	–2056	3.07
Out of hours 2 $\times$ age	325	54.20
Out of hours 2 $\times$ married or cohabiting ^e	–5379	0.91
Out of hours 2 $\times$ daytime hours at work	–97	

^a Standard errors for the monetary valuations were calculated from a Taylor series approximation to the variance of a function of random variables (see Propper, 1995; Kmenta, 1986, p. 486). These can be used to test whether the valuations are significantly different from zero.

^b Relative to those on incomes between £20,000 and £40,000.

^c Relative to GPs not in receipt of deprivation payments for at least 10% of their patients.

^d Relative to GPs in group practice.

^e Relative to those who are single, separated, divorced or widowed.

^f Relative to GPs who do not receive rural practice payments.

^g Relative to GPs in Scotland.

^h Relative to GPs with no special interests.

ⁱ Relative to males.

^j Relative to GPs who are single-handed or in a rota.

The marginal valuation of the amount of out of hours workload was influenced by a number of GP characteristics. GPs in Scotland and GPs in poorer health were more likely to prefer a change from no out of hours work to doing some out of hours work (level 1), compared to GPs in England and those in better health, respectively. Older GPs were more likely to prefer an increase in the amount of out of hours work from the first to the second level, compared to younger GPs.

Groups of GPs who preferred less out of hours work included females, single handed GPs, those who were part of an out of hours co-operative, those who used deputising services

(again reflecting selection effects), those who were married or cohabiting, and those working longer hours during the day.

Some sub-groups of GPs had preferences for more than one job characteristic. Female GPs preferred a practice with guidelines and less out of hours care. GPs who were married or cohabiting preferred to work more during the day and less at night. GPs who had been working longer as doctors were less likely to prefer a practice with special interests or with an increase in income. Single-handed GPs were more likely to prefer a practice with a higher list size and where they did not have to undertake any out of hours work. GPs in England preferred a practice with fewer hours at work during the day and night.

5. Discussion

This study has examined the preferences of GPs for the characteristics of their job, revealed through the choice of a practice in which to work. In this particular choice context, the results suggest that non-pecuniary job characteristics, particularly out of hours care, influence practice choice. Workload (proxied by list size), daytime hours at work, income and the practice's use of guidelines were also statistically significant determinants. Time spent on administration and opportunities to develop special interests (a proxy for intellectual satisfaction) were significant for some sub-groups of GPs.

The results suggest that preferences differed across sub-groups of GPs, and that they would require different policies to influence their choice of practice. For certain sub-groups, there is also evidence that preferences are related to GPs' current situation, e.g. GPs who currently use deputising services are less likely to prefer out of hours work. This suggests that their stated preferences are reflected in their current choices.

GPs obtained positive utility from certain job characteristics, especially from the use of guidelines, special interests if the GP already has special interests, daytime hours at work if the GP is married or cohabiting (but disutility from out of hours work if married or cohabiting), list size if the GP is single handed or receives deprivation payments, and from out of hours care if the GP is older.

The results should be interpreted with the following caveats. First, the model assumed that other job characteristics are constant across practices in the choice set. In answers to open-ended questions, good working relationships with partners was found to be potentially more influential than characteristics included in the model, when choosing a practice in which to work. Thus, if 'good working relationships' differs across practices in the choice set, any financial incentive suggested by our results may not be effective for some GPs. Factors that were not amenable to policy influence were not included (e.g. good working relationships and local area characteristics).

Second, it is tempting to interpret monetary valuations as an indication of the size of financial incentives that could be paid to encourage GPs to work in a practice with specific characteristics. However, such an interpretation rests on the assumptions of the theoretical model, which assumed that all GPs were 'trading-off'. This is a necessary assumption if marginal rates of substitution are to be calculated and utility functions to be defined. However, other discrete choice experiments with patients have found quite high levels

of ‘dominance’ for specific attributes, suggesting that individuals are not using compensatory decision rules. This may be because of the complexity of the questionnaire (bounded rationality) or because they genuinely have a dominant preference (Drakopoulos, 1994; Scott, 1998). This study did not examine this issue since it was felt that presenting GPs with only four discrete choices did not provide enough information on which to conclusively state that a GP who always chose the option with the ‘best level’ had a dominant preference.

Nevertheless, the existence of dominant preferences may explain the very high values for out of hours work. It should be noted that when ranking the attributes, 52% of respondents ranked out of hours care as the most important. This can be regarded as an indication of the maximum proportion of respondents with a *potentially* dominant preference for out of hours care. These GPs may have always been selecting the option with the lowest level of out of hours commitment, and ignoring other attributes. If so, then doubt must be expressed about the monetary valuations as they may overestimate the strength of preference for those who were willing to trade. Using the valuation to argue that GPs should be paid £13,500 to undertake out of hours work may therefore be misleading. Some GPs, if they have a lexicographic preference, may not be prepared to accept *any* monetary amount to undertake such work. This also applies to other characteristics. However, it is not unreasonable to expect that when choosing a practice in which to work, that GPs may trade-off increases in income to have better quantities of other attributes.

The theoretical validity of the technique is confirmed, with a positive marginal utility of income, and negative marginal utility of time at work. One questionnaire had a check for internal consistency, and only one GP out of 188 was inconsistent. Many other discrete choice experiments have reported high levels of internal consistency. One study has examined the convergent validity of conjoint analysis, by comparing it with usual hedonic methods. This found that the value of risk was not significantly different between the two approaches, and suggested that conjoint analysis may be superior in assessing the marginal valuation of safety (Gegax and Stanley, 1997).

The policy conclusions from this study relate to the locational choices of GPs, and policies aimed at reducing inequalities in the distribution of GPs. In the UK, current decisions on GP distribution are made by the Medical Practice Committee in England and Scotland. However, these decisions relate to the power to say ‘yes’ or ‘no’ to new GP practices being set up. Individual health authorities can use financial incentives through the National GP Contract (e.g. through inducement payments). Changes to the financing and organisation of out of hours care in 1995 have meant that GPs’ out of hours commitments have been considerably reduced, especially in urban areas. The effect of these policies on GPs’ location choices and inequality in distribution is, however, unclear. Additional policies could be introduced to be able to alter non-pecuniary job characteristics with the aim of influencing location choices into underserved areas. Furthermore, the analysis here does not take into account the transactions costs of switching jobs for GPs.

Information on the costs of altering each attribute, the transaction costs of switching practices, and GPs monetary valuations (WTP), would give information on the most cost-effective policy that would influence GPs’ location choices. The monetary valuations could also be used as a basis for determining the level of financial incentives required to influence location choices, given the caveats already mentioned.

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