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Determinants of General Practitioners' Wages in England

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Summary

We analyse the determinants of annual net income and wages (net income/hours) of general practitioners (GPs) using data for 2,271 GPs in England recorded during Autumn 2008. The average GP had an annual net income of £97,500 and worked 43 hours per week. The mean wage was £51 per hour. Net income and wages depended on gender, experience, list size, partnership size, whether or not the GP worked in a dispensing practice, whether they were salaried or self-employed, whether they worked in a practice with a nationally or locally negotiated contract, and the characteristics of the local population (proportion from ethnic minorities, rurality, and income deprivation). The findings have implications for discrimination by GP gender and ethnicity, GP preferences for partnership size, incentives for competition for patients, compensating differentials for local population characteristics. They also shed light on the attractiveness to GPs in England of locally-negotiated (Personal Medical Services) versus nationally-negotiated (General Medical Services) contracts.

Keywords. Physician; Family; General practitioner; Income; Wages; Contract.

1. Introduction

There were 33,364 general practitioners (GPs) working for the National Health Service (NHS) in England in September 2007 (Information Centre, 2008). Most GPs (82%) are independent contractors organised in small partnerships, often owning their practice premises. Each practice has a list of registered NHS patients. Practices are paid under one of two contracts: the General Medical Services (GMS) contract; and, the Personal Medical Services (PMS) contract. Under the former, GPs supply services to the NHS under a nationally agreed contract; under the latter, services are provided via a locally negotiated contract intended to meet the local health needs of the population served. In 2006, 37% of GPs were in practices with a PMS contract.

Under the GMS contract, GPs are paid by a mixture of capitation, lump sum allowances, items of service, and quality incentives. Capitation payments vary with the age and gender of patients, the morbidity of the areas in which they live, and with the proportion of patients in nursing homes. Under the Quality and Outcomes Framework (QOF) practices are rewarded according to their performance against 135 quality indicators (NHS Employers, 2006). GPs have to meet all practice expenses from their gross income. The basic structure of the contract is negotiated between the NHS Confederation (the employers) and the British Medical Association (the doctors' trade union) with the total national level of pay determined annually by the independent Doctors and Dentists Review Body taking account of recruitment and retention targets and the NHS budget. GPs can influence their practice income via the number of registered patients, items delivered under fee-for-service, and achievement of quality indicators. Additionally, where there is no local pharmacy, GPs are permitted to dispense the medicines they prescribed. Dispensing practices can make a profit from dispensing since they receive a dispensing fee per item and are reimbursed for the drugs they buy at a rate which often exceeds the price they pay.

Under a PMS contract, the practice receives a lump sum in exchange for agreeing to provide the services they would have provided under the GMS contract, plus additional services for particular patient groups. Unlike the GMS contract, the terms of the PMS contract are negotiated between the practice and the local Primary Care Trust. The amount received is typically the amount the practice would have received under GMS, plus an addition intended to cover the cost of the extra services. Most PMS practices take part in the QOF but a lump sum is deducted from their QOF remuneration to reflect the fact that they may also be being paid under local PMS arrangements for services remunerated under the QOF. As under GMS, each practice has to meet its expenses from its gross income.

The 18% of GPs who are not independent contractors are employees of GMS or PMS practices and paid by salary.

The way in which the pay of GPs varies with their contract type, as well as other personal, practice, and patient characteristics has considerable relevance for policy (Wordsworth et al., 2004), and has also received much attention in the media (see, e.g., BBC website, 2008a, 2008b). However, research on GPs' pay is sparse. The little evidence that exists is based on the UK-wide GP Earnings and Expenses Enquiry (EEQ) published each year by the Technical Steering Committee of the NHS Information Centre for Health and Social Care (GP Earnings and Expenses Enquiry, 2008). This is used to support the GP contract negotiations between the NHS Confederation and the British Medical Association. It focuses predominantly on univariate analyses of mean annual gross income, expenses and net income earned by GPs, stratified by whether GPs are contracted or salaried, their contractual status (PMS versus GMS), and their dispensing status. The EEQ does not generally include multivariate analyses of GP earnings, nor does it consider hours worked or wages.

In the light of this paucity of information, the aim of this paper is to investigate the determinants of GP net income and wages. We consider the implications of our analysis for a number of policy questions:

- Government plans for the NHS require a substantial increase in the supply of labour from GPs (Department of Health, 2000). In 2007, 42% of GPs were female (NHS Staff 1995-2005 database, 2008). There is evidence of gender and ethnic pay discrimination in other labour markets (see, e.g., Bell and Ritchie, 1998; Connolly and Gregory 2002, 2007). Since pay has a substantial influence on labour supply it is of interest to know if female or ethnic minority GPs are paid less than otherwise similar male and white GPs.

- Between 1997 and 2007 the percentage of single handed GP practitioners fell from 31% to 26% and the average number of GPs per practice increased from 3.08 to 4.04 between 1997 and 2007 (Information Centre, 2008). Government policy has been accused of attempting to reduce the number of single handed practitioners (Smith, 2004). We investigate whether the trend to larger practices might be explained in part by the impact of practice size on GP income.
- There is policy concern over inequalities in the geographical distribution of GPs, and there has been little change in the extent of inequality over the past 30 years (Gravelle and Sutton, 2001; Hann and Gravelle, 2004). One reason might be that the remuneration system does not provide sufficient pay differentials to compensate GPs for working in less attractive areas. We therefore examine the extent to which GPs' pay varies with the characteristics of the areas in which they work.
- From 1998 GPs have been able to choose between the traditional nationally negotiated GMS contract and a locally negotiated PMS contract. By 2007, 37% of GPs had opted to switch to the PMS contract. We investigate whether PMS GPs had higher incomes, thus possibly explaining this trend and whether the incentives to switch to a PMS contract were aligned with aims of the introduction of the PMS contract.
- Part of the rationale for remunerating GPs via capitation fees is that they encourage GPs to compete for patients by providing better quality care. But the power of the incentive will depend on how net income varies with the number of patients. Hence we investigate whether GPs in practices with longer lists per GP have higher net incomes.
- Salaried GPs have increased rapidly as a proportion of the GP workforce, from 3% in 2001 to 18% in 2007 (Information Centre, 2008). We investigate how their pay and hours differ from those of GPs who hold partnerships in their practices.

We undertake three types of analysis. First, we use multiple regression analysis to investigate how GP, practice, and local population characteristics affect GPs' net incomes and hours. Second, we calculate hourly wages (net income/hours) and estimate multiple regression models of the relationship between wages and individual, practice, and local population characteristics. Third, we examine in more detail the way in which the type of practice contract (PMS versus GMS) affects GP wages. We decompose the observed log wage differentials due to the contract into the portion due to differences in characteristics (providing information on the characteristics of practices who had switched to PMS) and the portion due to differences in coefficients (providing information on the incentives for practices with given characteristics to switch).

In the next section we describe the data used in our analysis. In section 3 we describe and explain the methods and the results are in section 4. Section 5 concludes.

2. Data

Our main source of data is the NPCRDC's fifth National GP Worklife Survey on income and hours (hereafter the Worklife Survey). The Worklife Survey is a national postal survey of GPs' in England undertaken in the Autumn of 2008. The questionnaire covered personal, practice and job characteristics, and included questions on annual income and hours worked per week. The dataset contains information from 2,569 GPs representing 54% of the target sample. After the exclusion of missing values for income and some of the local population characteristics the final estimation sample size was 2,271.

The survey data were linked to a dataset of local population and area characteristics. This included the proportion of the population in non-white ethnic groups taken from the 2001 Census (Census 2001 database, 2008), the income deprivation domain from the Indices of Deprivation 2004 (ID 2004; Office of the Deputy Prime Minister, 2004), and rurality, based on the Rural Definition developed by the Department for Environment, Food and Rural Affairs (Defra, 2005). These variables were attributed to practices based on the proportion of the registered practice population resident in each middle layer super output area from the 2007 Attribution Dataset (Attribution dataset of GP registered populations, 2008). The result was a unique dataset for statistical analysis containing data on GPs' annual income and hours, their individual characteristics, the characteristics of the practices in which they work, and characteristics of the local populations and areas.

3. Methods

3.1 Determinants of net income

GPs were asked to report the total individual annual income they received from their job as a GP before taxes but after deducting allowable expenses (i.e., their net income). The data were recorded in eight bands of width £25,000, starting from £0-£25,000 and with the top band of £175,000+ being open-ended. We examined the determinants of GP net income using interval regression on individual, practice and local population characteristics and area type. The covariates were:

1. Individual GP characteristics: gender; ethnicity; and experience (years of 'Reckonable Service' defined as equivalent years of NHS clinical service; Department of Health, 2005).
2. Practice characteristics: list size; partnership size; whether or not the practice is designated as a dispensing practice; and, whether or not it has a PMS contract.
3. Local population characteristics: ethnicity (proportion of the population from an ethnic minority); and, income deprivation (proportion of the population receiving state benefits on the grounds of low income; ID 2004).
4. Area type: three variables representing settlement size (urban; rural town; village, hamlet or isolated dwelling).

We compared the results of the interval regression with a linear regression model using estimated mean incomes for each GP based on their income band. Mean incomes within each band were estimated by assuming the income data were distributed according to a truncated normal distribution. The mean and standard deviation of the normal distribution were obtained from an interval regression on a constant term. All GPs in the same income band were allocated the same mean income value.

3.2 Estimating wages

Since income increases with hours worked (Gravelle and Hole, 2008) we calculated hourly earnings, or wages. Data were recorded in the Worklife Survey on hours worked on average per week doing GP-related work, including out-of-hours work. These figures were multiplied by the number of weeks worked per year reported by each GP to obtain average yearly hours. We calculated GP wages by dividing net annual income by average yearly hours.

3.3 Determinants of wages

We analysed the determinants of GP wages by linear regression of the estimated GP wage variable on the same covariates as those used in the net income model.

3.4 Decomposing wage differentials by contract type (GMS versus PMS)

The results from the wage regression shows that GPs in PMS practices earn more than those in GMS practices all else equal. We explored these differences in more detail with variants of the Blinder-Oaxaca decomposition (Blinder, 1973; Oaxaca, 1973) of the difference in the mean log wage between PMS and GMS GPs. We ran separate log wage equations for GPs working in PMS and GMS practices

$$\log y_i^j = \alpha^j + x_i^j \beta^j + \varepsilon_i^j, \ j = 1, 2 \tag{1}$$

where i indexes GPs and j indexes contract type (j = 1 for PMS, j = 2 for GMS). log y is the natural logarithm of the estimated GP wage variable, α is a constant term, x is a vector of individual, practice and local population characteristics and area types that affect GP wages, β is a vector of coefficients and ε is an error term. We estimate (1) by least squares so that $\overline{\log y}_i^j = \overline{x}_i^j \hat{\beta}_i^j$.

The difference in mean log wages can be decomposed as

$$D = \overline{\log y}^1 - \overline{\log y}^2 = \left(\alpha^1 - \alpha^2 \right) + \underbrace{\left(\overline{x}^1 - \overline{x}^2 \right) \beta^*}_{E} + \underbrace{\left[\overline{x}^1 \left(\hat{\beta}^1 - \beta^* \right) + \overline{x}^2 \left(\beta^* - \hat{\beta}^2 \right) \right]}_{U} \tag{2}$$

where β^* is the vector of coefficients which would be obtained if the two types of GP were treated identically (Neumark, 1988). Various specifications of β^* have been proposed in the literature. Neumark (1988) proposed that β^* be obtained as the coefficients from estimating the model $\log y_i = x_i\beta_i + \varepsilon_i$ on pooled data. Other suggestions can be taken as special cases of $\beta^* = \lambda\hat{\beta}^1 + (1-\lambda)\hat{\beta}^2$. Oaxaca (1973) suggested that β^* could be either $\hat{\beta}^1$ or $\hat{\beta}^2$, i.e., $\lambda = 1$ or $\lambda = 0$. Reimers (1983) suggested that $\lambda = 0.5$ and Cotton (1988) that $\lambda = n^1/(n^1 + n^2)$, where n^j is the number of individuals in each group. We present decompositions based on all of these specifications of β^*.

The second term on the right hand side of (2) can be interpreted as the part of the wage differential due to differences in the variables or observed individual, practice and local population characteristics and area type characteristics across the two groups weighted by the appropriate returns. It is the explained part of the observed differential, *E*. The third term is the unexplained component, *U*. It has two elements. The first is sometimes referred to as the majority group advantage because it measures the extent to which the coefficients in the high-wage group are greater than those for the appropriate comparator group. Conversely, the second element is sometimes referred to as the minority group disadvantage. *E* provides information about the differences between PMS and GMS practices and hence about which kinds of practice were most likely to have switched. For example, it indicates whether or not PMS practices have more deprived populations. *U* provides information about the incentives for practices of different types to switch. For example, it indicates whether or not the reward for switching was higher in practices with more deprived populations.

The first term on the right hand side of (2) is the part of the wage differential arising due to differences in the constant terms. This is presented separately from the other components of the decomposition because it is determined both by differences in the effects of the unobserved variables and by the differences in their means.

In addition to calculating the magnitude of *U* and *E* we also compute the contribution to these of each of the covariates included in the log wage model. A number of the covariates are categorical variables. Oaxaca and Ransom (1999) show that the decomposition of the unexplained component *U* into the separate effects of the covariates suffers from an identification problem if the model includes one or more dummy variables: the attribution of the discrimination component to specific variables is not invariant to the choice of reference category for the dummy variables. We adopt the solution proposed by Yun (2005), which involves transforming the coefficients on the dummy variables using a deviation contrast transform.

The statistical significance of the components of the decomposition was based on standard errors derived using the approach suggested by Jann (2008).

4. Results

Table I presents summary statistics for key variables included in the analyses. The mean annual net income (Std. Dev.) was £97,540 (£33,645). Mean hours worked per week were 43.3 (13.0) and mean wages were £50.67 (£16.30). Summary statistics for and definitions of the covariates are in the Appendix (Table A1). Around 88% of GPs were white, 39% were female, the average list per GP was 1,656 patients, and the modal partnership size was five. Most GPs (82%) were located in urban practices.

Table I. Variable means and definitions for key variables (*N* = 2,271).

Variable	Mean	Std.Dev.	Definition
Net income	97,540	33,645	Total individual income before taxes but after deducting allowable expenses
Hours	43.3	13.0	Total hours worked per week
Wages	50.67	16.30	Hourly wages (net income/(total average hours worked per week *weeks worked per year))
Log wages	3.88	0.31	Natural logarithm of hourly wages

Table II. Determinants of net income, hours and wages

	Annual net income: Interval regression using banded net income			Annual net income: OLS regression based on mean net income in each band			Weekly hours: OLS regression			Wages: OLS regression		
	Coef.	t	% effect or elasticity	Coef.	t	% effect or elasticity	Coef.	t	% effect or elasticity	Coef.	t	% effect or elasticity
Female	-27,548	-21.54	-28.2%	-26,380	-21.47	-27.0%	-10.974	-22.45	-25.4%	-1.70	-2.48	-3.4%
Experience	6,288	1.84	0.09	6,052	1.85	0.08	1.999	1.38	0.04	-0.36	-0.19	0.03
Experience squared	-1,086	-1.33		-1,047	-1.34		-0.580	-1.67		0.48	1.05	
Salaried	-38,257	-17.56	-39.2%	-36,651	-17.51	-37.6%	-10.694	-10.97	-24.7%	-9.38	-8.07	-18.5%
List per GP/1000	6,972	4.47	0.12	6,683	4.49	0.11	1.538	2.05	0.06	2.53	2.34	0.08
Partnership size: 2 [a]	-5,579	-1.45	-5.7%	-5,239	-1.44	-5.4%	-4.751	-3.06	-11.0%	2.53	1.20	5.0%
Partnership size: 3 [a]	-9,361	-2.56	-9.6%	-8,843	-2.54	-9.1%	-6.050	-4.17	-14.0%	1.66	0.84	3.3%
Partnership size: 4 [a]	-9,151	-2.61	-9.4%	-8,628	-2.60	-8.8%	-5.327	-3.76	-12.3%	1.18	0.62	2.3%
Partnership size: 5 [a]	-10,033	-2.82	-10.3%	-9,428	-2.80	-9.7%	-4.899	-3.43	-11.3%	0.56	0.29	1.1%
Partnership size: 6 [a]	-10,157	-2.81	-10.4%	-9,550	-2.78	-9.8%	-5.765	-3.96	-13.3%	1.56	0.79	3.1%
Partnership size: 7 [a]	-9,892	-2.54	-10.1%	-9,308	-2.51	-9.5%	-7.391	-4.90	-17.1%	3.19	1.56	6.3%
Partnership size: 8 [a]	-11,856	-2.76	-12.2%	-11,151	-2.73	-11.4%	-5.662	-3.16	-13.1%	0.70	0.31	1.4%
Partnership size: 9 [a]	-5,497	-1.07	-5.6%	-5,057	-1.03	-5.2%	-7.669	-3.67	-17.7%	6.66	2.36	13.2%
Partnership size: 10 [a]	414	0.06	0.4%	515	0.08	0.5%	-3.351	-1.35	-7.7%	4.28	1.00	8.4%
Partnership size: 11+ [a]	-3,653	-0.57	-3.7%	-3,293	-0.53	-3.4%	-1.174	-0.41	-2.7%	-1.17	-0.35	-2.3%
Dispensing practice	12,496	7.13	12.8%	11,919	7.10	12.2%	2.950	3.98	6.8%	3.23	3.32	6.4%
Ethnic minority GP	-4,906	-2.44	-5.0%	-4,668	-2.42	-4.8%	1.063	1.30	2.5%	-3.39	-3.08	-6.7%
PMS practice	9,036	7.39	9.3%	8,603	7.35	8.8%	-0.719	-1.50	-1.7%	5.38	7.89	10.6%
Ethnic minorities	29,648	4.30	0.02	28,275	4.29	0.02	4.679	1.68	0.01	9.27	2.66	0.01
Income deprivation	-39,370	-4.13	-0.05	-37,441	-4.10	-0.05	-2.386	-0.64	-0.01	-16.06	-3.23	-0.04
Rural town [b]	-1,793	-0.87	-1.8%	-1,746	-0.88	-1.8%	-2.080	-2.66	-4.8%	1.56	1.38	3.1%
Village [b]	7,817	2.40	8.0%	7,407	2.39	7.6%	-2.953	-2.66	-6.8%	6.47	3.88	12.8%
Constant	97,669	16.24		97,405	16.97		49.956	20.81		42.84	12.29	
N		2,271			2,271			2,271			2,271	
R^2					0.3623			0.2792			0.1138	

The t-values are based on robust standard errors.
For dummy variables the percentage effect is calculated as 100*coefficient/mean net income.
For continuous variables the elasticity is calculated as (coefficient*variable mean)/mean net income.
For the experience variables the combined elasticity is the sum of the elasticities for experience and experience squared evaluated at the mean experience.
[a] The omitted category is "Partnership size: 1".
[b] The omitted category is "Urban".

4.1 Determinants of net income, hours and wages

Table II reports results for the two regression models for annual net income. The magnitudes and significance levels of the coefficients are similar in both models. Working in a PMS practice increased net income by about £9,000 (9%) per annum. The income gain from working in a dispensing practice was £12,000 (12%) per annum. Salaried GPs have income which is around £37,000 (38%) lower than the income of self-employed GPs.

The coefficient on list per GP suggests that for every additional patient per GP net income increased by nearly £7. The elasticity of annual net income with respect to list per GP was about 0.11. The relationship between experience and annual net income is inverse U-shaped (joint sig. of experience variables P=0.0263), with the turning point occurring at 29 years of experience.

The coefficients from the analysis of average weekly hours worked are also reported in Table II. They are plausibly signed. Female GPs work 11 hours (25%) less than male GPs and salaried GPs work 11 hours (25%) less than self-employed GPs. The correlation between experience and hours is non-significant conditional on the other variables in the model (joint sig. of experience variables P=0.1350). GPs in practices with more patients per GP work longer hours. Even after controlling for list size per GP, GPs in single-partner practices work the most hours per week, but their hours are not significantly longer than those in the largest partnerships. PMS GPs work slightly fewer hours per week than GMS GPs, though the difference is non-significant. GPs working in urban practices worked significantly longer hours than those in rural towns, and villages or smaller settlements.

Figure 1 uses the results from Table II to illustrate the relationship between partnership size and mean annual net income and hours, conditional on the other factors included in the regression models. The conditional values were computed by fixing the other variables in the model at their sample mean values and computing the linear prediction of annual net income and weekly hours for each partnership size. The results show that GPs in single-partner practices worked the longest hours and had the highest annual net incomes. Net income and hours also are relatively high in the largest partnerships.

The results from the wage regression are also in Table II. Female GPs had significantly lower wages than male GPs, but the magnitude of the difference was quite small at just over 3%. The experience
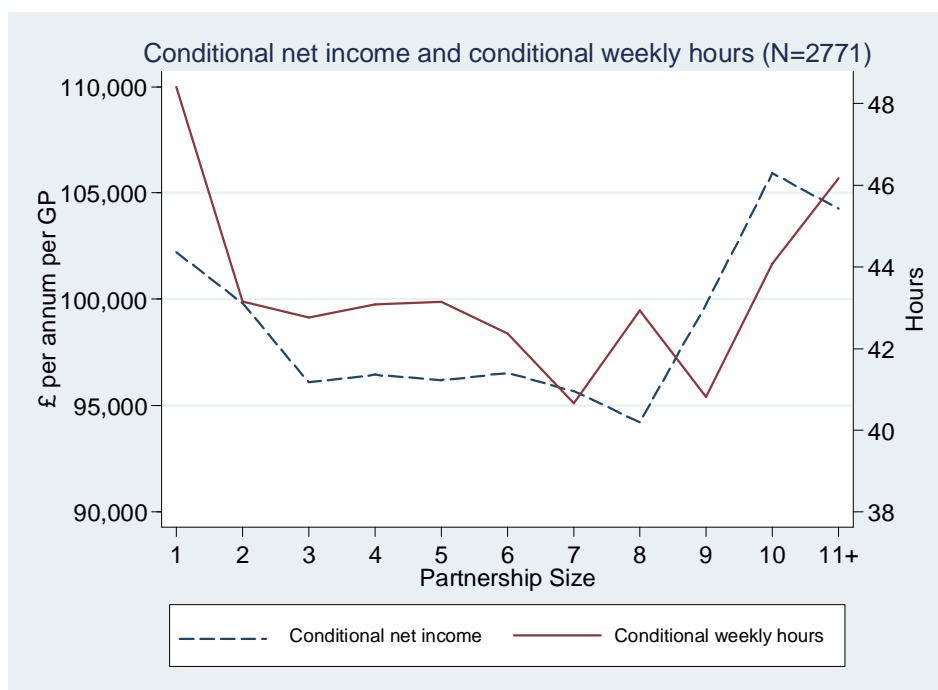

Figure 1. Conditional mean annual net income and weekly hours by partnership size calculated at the sample mean values of the covariates

variables are individually non-significant, but jointly significant (P=0.0005), demonstrating a U-shaped relationship between wages and experience. Salaried GPs earn £9 an hour (19%) less than non-salaried GPs. Being from an ethnic minority has a statistically significant negative effect on wages.

PMS GPs earned significantly higher wages than GMS GPs, with a wage premium of £5 per hour (11%). Working in a dispensing practice also had a positive effect (6%) on wages.

More patients per GP led to significantly higher wages (elasticity 0.08). A large component of GP income varies directly with the number of patients on the list, and while hours worked increase with list size, this is offset by an even greater increase in annual net income. Conditional on list size and the other covariates, single handed GPs have the lowest wages, but the effect is generally non-significant.

There were higher wages for GPs working in more rural areas or areas with larger proportions of the population from ethnic minorities. GPs in practices in areas with more deprived populations had significantly smaller wages.

The pattern of effects (signs, significance and percentage effects) of the covariates on wages is broadly similar to their effect on net income, indicating that the estimated impacts of the covariates are robust to the specification of remuneration. The main differences are with the effects of gender, experience, and partnership size. Female GPs had much lower annual net income than their male counterparts but only slightly lower wages because they work substantially fewer hours. The relationship between experience and annual net income is inverse U-shaped, while in the wage model it is U-shaped. This difference is due to the relationship between experience and hours, which is also inverse U-shaped, and which offsets the effect of experience on annual net income. Single-handed GPs had much higher annual net income than other GPs and slightly lower wages because they work more hours than other GPs.

4.2 Decomposing wage differentials by contract type (GMS versus PMS)

Mean wages (log wages) earned by PMS and GMS GPs were £53.06 (3.921) and £48.66 (3.839) yielding a mean wage (log wage) differential of £4.40 (0.082). The log wage models used in the decomposition are presented in Table III. There are a number of differences between the models for PMS and GMS GPs. In the GMS model organisational characteristics (including list size per GP, partnership size and dispensing status) are more important determinants of log wages than in the PMS model. In the PMS model, the significant determinants of wages are personal characteristics of the GP (including gender and ethnicity) and population and area characteristics (including deprivation, ethnicity and rurality).

Comparison of the mean characteristics of the model covariates for PMS and GMS GPs shows that PMS GPs are more likely to be salaried, less likely to be in dispensing practices, and more likely to be in areas where populations are more deprived, areas with a higher proportion from ethnic minorities, and in urban areas.

The summary results of the decompositions are in Table IV. See the Appendix (Table A2) for more detailed decompositions by variable. The summary results show how different assumptions about the appropriate comparator coefficients (β^*) affect the apportionment of the overall differential between the explained (due to differences in mean characteristics) and unexplained (due to differences in coefficients) components. The decomposition into explained and unexplained components is relatively insensitive to the value of the comparator coefficients β^*, and the explained component is negative in every case (range -0.019 to -0.014). Thus the explained component takes the opposite sign to the total difference. The unexplained component is generally positive and accounts for around 4% of the total difference. The difference in the constant terms more than accounts for the total difference, being 0.097 in all models.

The higher observed wages of PMS GPs in the sample is explained in small part by the unexplained component and mainly by the difference in the constant terms. With respect to the unexplained component, this suggests that on average a GP working in a PMS practice with identical characteristics to a GP working in a GMS practice would have earned higher wages than the GMS GP.

Table III. Log wage models by contract type (GMS versus PMS)

	PMS				GMS				Pooled	
	Coef.	**t**	**Mean**	**$x\beta$** [c]	**Coef.**	**t**	**Mean**	**$x\beta$** [c]	**Coef.**	**t**
Female	-0.046	-2.23	0.382	-0.017	-0.025	-1.46	0.395	-0.010	-0.035	-2.68
Experience	-0.010	-0.18	2.171	-0.021	0.014	0.29	2.128	0.031	0.004	0.1
Experience squared	0.012	0.98	5.359	0.066	0.001	0.1	5.187	0.006	0.006	0.72
Salaried	-0.249	-7.15	0.105	-0.026	-0.172	-4.77	0.077	-0.013	-0.209	-8.36
List per GP/1000	0.036	1.20	1.580	0.057	0.064	2.92	1.720	0.110	0.047	2.65
Partnership size: 2 [a]	0.049	0.84	0.080	0.004	0.102	1.8	0.092	0.009	0.077	1.9
Partnership size: 3 [a]	-0.011	-0.20	0.120	-0.001	0.122	2.28	0.171	0.021	0.066	1.75
Partnership size: 4 [a]	-0.026	-0.51	0.201	-0.005	0.116	2.21	0.200	0.023	0.054	1.47
Partnership size: 5 [a]	-0.027	-0.53	0.207	-0.006	0.099	1.88	0.207	0.020	0.042	1.14
Partnership size: 6 [a]	0.001	0.02	0.150	0.000	0.116	2.16	0.129	0.015	0.065	1.71
Partnership size: 7 [a]	0.027	0.51	0.100	0.003	0.162	2.9	0.084	0.014	0.104	2.67
Partnership size: 8 [a]	-0.019	-0.32	0.039	-0.001	0.140	2.32	0.032	0.005	0.063	1.46
Partnership size: 9 [a]	0.164	2.41	0.018	0.003	0.171	2.11	0.013	0.002	0.175	3.36
Partnership size: 10 [a]	0.009	0.10	0.017	0.000	0.260	2.0	0.006	0.001	0.107	1.49
Partnership size: 11+ [a]	-0.064	-0.69	0.010	-0.001	0.088	0.92	0.008	0.001	0.017	0.25
Dispensing practice	0.017	0.60	0.168	0.003	0.084	3.4	0.212	0.018	0.056	3.05
Ethnic minority GP	-0.105	-3.20	0.122	-0.013	-0.052	-1.76	0.121	-0.006	-0.076	-3.47
PMS									0.101	7.84
Ethnic minorities	0.410	4.31	0.082	0.034	-0.041	-0.45	0.074	-0.003	0.176	2.63
Income deprivation	-0.449	-3.22	0.137	-0.061	-0.080	-0.58	0.123	-0.010	-0.286	-2.9
Rural town [b]	0.038	1.15	0.093	0.004	0.026	0.96	0.138	0.004	0.029	1.36
Village [b]	0.166	3.38	0.049	0.008	0.110	2.87	0.071	0.008	0.128	4.29
Constant	3.892	42.69	1.000	3.892	3.594	39.69	1.000	3.594	3.694	56.9
Sum				3.921				3.839		
N	1,038				1,233				2,271	
R^2	0.1547				0.1003				0.1270	

The t-values are based on robust standard errors.
[a] The omitted category is "Partnership size: 1".
[b] The omitted category is "Urban".
[c] $x\beta$ = Coef. * Mean

Table IV. Decomposition of log wage differentials by contract type (GMS versus PMS): summary results

	$\lambda = 0$ $(\beta^* = \hat{\beta}^{GMS})$		$\lambda = 1$ $(\beta^* = \hat{\beta}^{PMS})$		$\lambda = 0.5$ $\beta^* = \dfrac{\hat{\beta}^{PMS} + \hat{\beta}^{GMS}}{2}$		$\lambda = 0.457$[a]		Pooled[b]	
	Contribution	Std. Err.	Contribution	Std. Err.	Contribution	Std. Err.	Contribution	Std. Err.	Contribution	Std. Err.
Explained	-0.0186***	0.0057	-0.0179***	0.0067	-0.0183***	0.0053	-0.0183***	0.0052	-0.0138***	0.0052
Unexplained	0.0038	0.0156	0.0032	0.0156	0.0035	0.0156	0.0036	0.0156	-0.0010	0.0154
Constant	0.0966	0.0904	0.0966	0.0904	0.0966	0.0904	0.0966	0.0904	0.0966	0.0904
Total difference	0.0819***	0.0132	0.0819***	0.0132	0.0819***	0.0132	0.0819***	0.0132	0.0819***	0.0132

Numbers may not add due to rounding error.

[a] λ = frequency weight for PMS GPs = (number of PMS GPs in the sample)/(total number of GPs in the sample).

[b] The appropriate returns are based on the pooled log wage model in Table III.

* $P<0.1$. ** $P<0.05$. *** $P<0.01$. Based on cumulative standard normal distribution applied to Contribution/Std. Err..

The PMS contract was intended to encourage the supply of GP services to under-served classes of patients. The results suggest that the financial incentives to achieve this goal are rather mixed (see the "Unexplained" column in Table A2 in the Appendix). The gain from switching to PMS is greater in areas with more ethnic minorities; but the rewards are smaller for PMS practices in more deprived areas.

PMS wage differentials persist even after controlling for the variables included in the model because of the difference in the constant terms which reflect both differences in the returns to unobserved characteristics and differences in those characteristics. We have a reasonably rich set of variables, so that our results raise the question of whether the high wages in PMS practices are justified by reference to the aims of health policy.

5. Concluding remarks

5.1 Caveats

Our study has several limitations, relating mainly to the data used. On the negative side, the incomes and hours data are self-reported and may be compromised by measurement error, which is a common problem with other earnings data (Elliott, 2003). The data were obtained by postal survey. While 54% is a reasonable response rate for this kind of survey, it is possible that the achieved sample is biased by selection on unobservables. However, analysis of potential bias in earlier NPCRDC Worklife Surveys suggests that such selection bias had little effect on estimated coefficients in models of GP satisfaction. (Gravelle, Hole and Hussein, 2008).

On the positive side, the survey includes both self-employed and salaried GPs and is specific to earnings directly received from medical service. This excludes, for example, private income from medico-legal work or research for the private sector. Second, in contrast to the national Earnings and Expenses Enquiry we have data on hours worked by GPs. Third, we collected data on the number of weeks worked per annum by individual GPs and can therefore allow for the way in which this might vary with GP characteristics. Finally, our analysis is based on data for Autumn 2008 and so reflects the changes in the GMS and PMS contracts that occurred in 2004, and led to a 58% average pay increase over three years (National Audit Office, 2008).

5.2 Potential policy implications

We believe our results have some potentially important implications for policy.

5.2.1 Discrimination. Female GPs have markedly lower incomes than otherwise similar male GPs and but their wages were only slightly lower (3.4%) because of their lower hours. By contrast ethnic minority GPs had lower income but similar hours to white GPs and their wages were 6.7% less. Our analysis suggests that if there is discrimination it seems to be more obvious for ethnic minority than for female GPs.

5.2.2 Salaried versus partnership GPs. Salaried GPs work fewer hours per week (25% fewer) than self-employed GPs. This should be taken into account in evaluating attempts to increase the supply of GP hours by encouraging the recruitment of salaried GPs.

5.2.3 Single handed GPs versus multi-partner practices. Between 1997 and 2007 the percentage of single handed GP practitioners fell from 31% to 26%. Our analysis sheds some light on this trend: while annual net incomes are higher for single handed practices, hours are significantly longer, which overall leads to a wage penalty for single handed GPs. Whether this incentive for increasing partnership size is appropriate depends on how the overall practice output varies with size. There is some evidence that both patient satisfaction (Crow et al, 2002) and clinical quality (Doran et al, 2006; Gravelle, Sutton and Ma, 2008) decline with practice size. Thus the private incentives for GPs to increase partnership size may be in conflict with broader social objectives.

5.2.4 Incentives for competition for patients. Both GP wages and net income are responsive to the number of patients per GP (elasticities of 0.08 and 0.12, respectively): GPs appear to have a financial incentive to compete for patients.

5.2.5 Compensating differentials. There were higher wages and net incomes for GPs working in areas with a larger proportion of the population from ethnic minorities, but GPs in practices in areas with more deprived populations had smaller wages and net incomes. The effects on wages were typically small with wage elasticities between 0.01 and -0.04, respectively. There were however large and statistically significant wage gains for GPs in practices in villages. The results suggest that pay is affected by rurality, so that the relative supply of GPs has been affected by relative geographical pay differentials.

5.2.6 PMS versus GMS contracts. Practices with PMS contracts were expected to provide more services for their patients. As Table II shows, their net incomes are greater by £9,000 per GP and, since they do not work longer hours, their wages are also higher (by 11%). Thus PMS GPs seem to have been overcompensated for the additional costs they incur. PMS contracts were meant to increase the supply of services to under-served groups of patients. The decomposition of the differences in log wages between PMS and GMS GPs in Table III shows that the financial incentives for switching from GMS to PMS may not have been well aligned with the policy objective: GPs with patients from deprived areas would have a reduced wage if they switched to PMS. In addition, the majority of the wage differential between PMS and GMS GPs is not explained by individual, practice, local population and area characteristics.

One explanation for the wage premium to PMS contracts is the self-selection of high wage-earning GMS GPs into the PMS group. Practices were more likely to opt for the PMS contract if they had been fundholders in the internal market (Gravelle and Hann, 2006), suggesting that PMS practices were more entrepreneurial than GMS GPs (Whynes, Ennew, and Feigham, 1999). But this does not mean that the PMS wage premium is due to GP characteristics rather than the contract itself: more entrepreneurial GPs are likely to be better at recognising opportunities for greater income and to be more willing to switch.

In summary, we analysed the determinants of annual net income and wages of GPs in England during Autumn 2008. Net income and wages depended on a number of factors, including gender, experience, list size, partnership size, whether or not the GP worked in a dispensing practice, whether or not they were salaried, whether or not they worked in a PMS practice, and the characteristics of the local population (proportion from ethnic minorities, rurality, and income deprivation). Our research has a number of potential policy implications. Compared with previous studies, it also highlights the importance of undertaking multivariate analyses and of considering hours worked and wages in addition to net income when analysing GPs' earnings.

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Appendix

Table A1. Variable means and definitions for covariates (*N*=2,271)

Variable	Mean	Definition
Female	0.389	Female = 1, 0 otherwise
Experience	2.147	Years of reckonable service/10
Experience squared	5.265	Years of reckonable service/100
Salaried	0.090	Salaried GP = 1, 0 otherwise
List per GP/1000	1.656	Patient registrations per partner in practice/1000
Partnership size: 1	0.057	1 partner in practice = 1, 0 otherwise
Partnership size: 2	0.087	2 partners in practice = 1, 0 otherwise
Partnership size: 3	0.148	3 partners in practice = 1, 0 otherwise
Partnership size: 4	0.200	4 partners in practice = 1, 0 otherwise
Partnership size: 5	0.207	5 partners in practice = 1, 0 otherwise
Partnership size: 6	0.139	6 partners in practice = 1, 0 otherwise
Partnership size: 7	0.092	7 partners in practice = 1, 0 otherwise
Partnership size: 8	0.036	8 partners in practice = 1, 0 otherwise
Partnership size: 9	0.015	9 partners in practice = 1, 0 otherwise
Partnership size: 10	0.011	10 partners in practice = 1, 0 otherwise
Partnership size: 11+	0.009	11 or more partners in practice = 1, 0 otherwise
Dispensing practice	0.192	Dispensing practice = 1, 0 otherwise
Ethnic minority GP	0.122	Ethnic minority GP = 1, 0 otherwise
PMS practice	0.457	PMS practice = 1, 0 otherwise
Ethnic minorities	0.078	Proportion of population from non-white ethnic groups
Income deprivation	0.129	Proportion of population with income deprivation
Urban	0.822	Settlement size: urban (over 10,000) = 1, 0 otherwise
Rural town	0.118	Settlement size: rural town = 1, 0 otherwise
Village, hamlet or isolated dwelling	0.061	Settlement size: village, hamlet or isolated dwelling = 1, 0 otherwise

Table A2. Decomposition of log wage differentials by contract type (GMS versus PMS): decomposition by variable. (Results are shown for the case where $\lambda = 0$, $\beta^* = \hat{\beta}^{GMS}$)

	Explained $(\overline{x}^{PMS} - \overline{x}^{GMS})\hat{\beta}^{GMS}$		Unexplained $\overline{x}^{PMS}(\hat{\beta}^{PMS} - \hat{\beta}^{GMS})$		Total difference $(\overline{x}^{PMS}\hat{\beta}^{PMS} - \overline{x}^{GMS}\hat{\beta}^{GMS})$
	Contribution	Std. Err.	Contribution	Std. Err.	Contribution
Male	0.0002	0.0003	0.0064	0.0082	0.0066
Female	0.0002	0.0003	-0.0040	0.0051	-0.0038
Experience	0.0006	0.0021	-0.0527	0.1536	-0.0521
Experience squared	0.0002	0.0019	0.0603	0.0873	0.0605
Not Salaried	-0.0024**	0.0011	0.0346	0.0213	0.0322
Salaried	-0.0024**	0.0011	-0.0041	0.0025	-0.0065
List per GP/1000	-0.0090***	0.0030	-0.0448	0.0455	-0.0538
Partnership size: 1	0.0002	0.0012	0.0065**	0.0032	0.0067
Partnership size: 2	0.0003	0.0005	0.0051	0.0037	0.0054
Partnership size: 3	0.0002	0.0013	-0.0020	0.0045	-0.0018
Partnership size: 4	0.0000	0.0002	-0.0053	0.0068	-0.0053
Partnership size: 5	0.0000	0.0004	-0.0022	0.0069	-0.0022
Partnership size: 6	-0.0002	0.0006	0.0001	0.0056	-0.0001
Partnership size: 7	0.0006	0.0007	-0.0019	0.0043	-0.0013
Partnership size: 8	0.0001	0.0003	-0.0017	0.0025	-0.0016
Partnership size: 9	0.0002	0.0004	0.0020	0.0018	0.0022
Partnership size: 10	0.0016	0.0013	-0.0023	0.0022	-0.0008
Partnership size: 11	-0.0001	0.0002	-0.0004	0.0012	-0.0004
Dispensing practice	-0.0019**	0.0009	-0.0057	0.0033	-0.0076
Not dispensing practice	-0.0019**	0.0009	0.0282	0.0161	0.0263
Ethnic minority GP	0.0000	0.0004	-0.0032	0.0026	-0.0033
White GP	0.0000	0.0004	0.0232	0.0182	0.0232
Ethnic minorities	-0.0003	0.0007	0.0370***	0.0108	0.0367
Income deprivation	-0.0011	0.0020	-0.0503*	0.0276	-0.0514
Urban	-0.0030**	0.0014	-0.0196	0.0252	-0.0226
Town	0.0009	0.0009	-0.0010	0.0029	-0.0001
Village	-0.0014*	0.0008	0.0016	0.0020	0.0003
Constant					0.0966
Sum	-0.0186		0.0038		0.0819

Numbers may not add due to rounding error.
* *P*<0.1. ** *P*<0.05. *** *P*<0.01. Based on cumulative standard normal distribution applied to Contribution/Std. Err..