

The supply of unpaid hours

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Aims: The principal aim of this paper is to investigate whether employees in the caring occupations within the public sector perform differently from employees in other sectors in the supply of unpaid hours. It also provides empirical evidence on whether self-selection or institutional effects explain the differences in the supply of unpaid hours between individuals in public caring sector, private caring sector, public non-caring sector and private non-caring sector.

Methods: We construct a pooled dataset using the British Quarterly Labour Force Survey data between 1999 and 2005. The General Methods of Moments is employed to analyse the p cross-sectional data to overcome the endogeneity problem. We then construct a balanced panel dataset to explore the reason for the difference in the supply of unpaid hours between employment sectors. Ordinary Least Squares estimation is used in the specifications.

Findings: Employees in the public caring sector spend the longest hours on unpaid work. Each week they spend 1.43 hours more on unpaid work than employees in the private non-caring sector. Further evidence provides support for the hypothesis that the higher level of supply of unpaid hours in the public caring sector is due to self-selection.

1. Introduction

Financial incentives are increasingly used to explicitly motivate workers in social services provision (Dixon, 2004; Marshall and Smith, 2003). The successful development of such social policies require an clear understanding of what motivates social service providers and how they respond to the external interventions (Le Grand, 1997). There is a large body of literature suggesting that individuals employed in public organizations are characterised by different motives compared to workers in private organizations (David J. Houston, 2000; Gabris and Simo, 1995; Perry and Wise 1990; Staats, 1988). Public employees are more likely to place a higher value on the intrinsic reward of doing good work and feelings of accomplishment (Perry, 1996; Staats, 1988; Schuster, 1974; Kilpatrick, Cummings and Jennings, 1964). However, private-sector workers value the reward motivators more, such as high income and short working hours (Crewson, 1997). In addition to the employment sector, there is evidence that the choice of occupation is associated to workers' motivation. The relationship between the pro-social behaviours in workplace and the caring occupations is found in literature (Gregg et al., 2011; Francois, 2003; Le Grand, 1997). These general beliefs about the difference in the working motivation between employees in public/private sectors and occupations are often used to explain why it is relatively challenging to apply financial incentives to remunerate employees in the public caring sector.

The principal aim of this paper is to investigate whether the working motivation of employees in the caring occupations within the public sector is different from other workers. We do this by examining the differences in their supply of unpaid work.

Two competing hypotheses may explain why high levels of supply in unpaid hours can be found amongst employees in public caring sector: self-selection or institutional effects. Employees from one organisation may differ from employees in another as a result of attraction-selection-attrition (Wright, 2001; Schneider, 1987). Employees are attracted to workplaces where the colleagues share the same values, work ethics, personality and other attributes. Similarly organisations tend to select individuals who would fit well with their pre-existing employees. Both effects lead to the perfect matching of employees to workplaces that are sympathetic to their values (Delfgaauw and Dur, 2010).

In contrast, the systematic variation in characteristics across sectors has been attributed to institutional effects. It is argued that when a new worker joins a work group, she will adjust her effort to match the group norm (Akerlof, 1982). The working norm of individuals working

in the same organization converges over time, leading to the consolidation of organizational culture. This alignment of the institutional features and individuals' motivation has been shown in the literature (Shields, M.A and Ward, M. 2001; Aronsson G, 1999; Hall, Schneider and Nygren 1970; Rosenberg, 1957).

The second aim of this paper is to explore whether it is the institutional effect or self-selection that dominates individuals' decisions in supplying unpaid hours.

2. Data

The data for this study were obtained from the British Quarterly Labour Force Survey (QLFS) dataset. It is a sample survey of the households living at private addresses in the UK. All family members in the selected households are interviewed for five consecutive quarters. It is a rolling sample - in each quarter one-fifth of the sample is let go and a similar number of new samples brought in. One-fifth of the sample will be interviewed for the first time (wave one), another one-fifth will be interviewed for the second time (wave two), so on and so forth.

In our dataset, there are twenty five waves of the QLFS spanned the period from the autumn quarter of 1999 to the autumn quarter of 2005. The first wave and the fifth wave data are employed, as individuals were only asked about their income in these two waves. As union membership may be an important determinant of the working hours and this information is only collected in autumn, only the autumn data is employed in the analyses (Gregg et al., 2011; Bell and Hart, 1999). All subjects in our dataset were aged over 16 and in employment.

The overall sample has 42,054 observations drawn from waves one and five, with 21,229 taken from wave one and 20,825 from wave five. The first wave data between 1999 and 2005 is employed for the cross sectional analysis. It is used to examine whether employees in public caring sector perform differently from employees in other sectors in the supply of unpaid hours. The statistics are summarised in Table 1.

A balanced panel data is constructed by employing the first wave and fifth wave data. The sample contains 13,734 observations from 6,867 individuals. It is applied to test whether self-selection or institutional effects explain the differences in the supply of unpaid hours between individuals in different employment sectors. The number of respondents by employment sector and wave is summarised in Table 2.

Table 1: Statistics summary for the first wave data between 1999 and 2005

Variables	Mean	SD	Minimum	Maximum	Observations
Working Hours					
Unpaid hours*	3.27	6.08	0	97	21229
Paid overtime*	3.16	5.94	0	95	21229
Contracted hours*	34.33	9.28	0	97	21229
Employment Sectors					
Private caring sector	1	0	1	1	1228
Education	1	0	1	1	302
Health and social work	1	0	1	1	926
Public caring sector	1	0	1	1	3599
Education	1	0	1	1	1878
Health and social work	1	0	1	1	1721
Private non-caring sector	1	0	1	1	14165
Public non-caring sector	1	0	1	1	2237
Job Characteristics					
Hourly wage	12.61	11.20	1.09	660.69	21229
Log hourly wage	2.34	0.58	0.09	6.49	21229
SD of log hourly wage	0.41	0.11	0	1.41	21229
Second job	1	0	1	1	857
No second job	1	0	1	1	20372
Manager	1	0	1	1	9524
No manager	1	0	1	1	11705
Job tenure	9.04	8.64	0	54	21229
Part time work	1	0	1	1	3387
Full time work	1	0	1	1	17842
Complexity of the job (high)	1	0	1	1	6875
Complexity of the job (median)	1	0	1	1	10589
Complexity of the job (low)	1	0	1	1	3765
Permanent job	1	0	1	1	20428
Non-permanent job	1	0	1	1	801
England	1	0	1	1	17754
Non England	1	0	1	1	3475
Number of employees > 25	1	0	1	1	13676
Number of employees ≤ 25	1	0	1	1	7553
Personal Characteristics					
Age	39.71	10.97	16	77	21229
Female	1	0	1	1	9329
Male	1	0	1	1	11900
Long term illness	1	0	1	1	16492
No long term illness	1	0	1	1	4737
Number of children under 16	0.66	0.95	0	6	21229
Single/Divorced/Widowed	1	0	1	1	8090
Married/Married but living separately	1	0	1	1	13139
Degree or above	1	0	1	1	7453
School or equivalent	1	0	1	1	9351
No/other qualification	1	0	1	1	4425
White	1	0	1	1	20294

Non white	1	0	1	1	935
Union	1	0	1	1	7649
Non union	1	0	1	1	13580
Year					
1999	1	1	1	1	3385
2000	1	1	1	1	3167
2001	1	1	1	1	3285
2002	1	1	1	1	2979
2003	1	1	1	1	2939
2004	1	1	1	1	2792
2005	1	1	1	1	2682

1.* Number of hours per week

Table 2: Number of respondents by employment sector and wave between 1999 and 2005

Sector, first interview	Sector, fifth interview			
	Public caring sector	Private caring sector	Public non-caring sector	Private non-caring sector
Public caring sector	1215	23	13	5
Private caring sector	45	295	1	12
Public non-caring sector	10	1	745	50
Private non-caring sector	10	15	52	4375
Number of observations	6867			

3. Empirical strategy

We categorised employees according to whether they were employed in the private or the public sector. Employees are further categorised according to whether they were employed in caring occupations. Francois (2003) defined the caring industries as those with “...in the delivery of caring services where the service provided often has a public good component. Examples of such services are childcare, medical care, education and care for the aged.” The key characteristic of caring occupations employees is that they work with people in need of care or guidance. We therefore categorised the occupations as caring or non-caring sectors by the industry they worked in (*inds92m*). Healthcare, education and social work are classified as caring occupations. All the other occupations are categorised as non-caring. 22.74% of the observations in our dataset come from the caring occupations. Finally, the four employment sectors used in this paper are: public caring sector, public non-caring sector, private care sector and private non-caring sector.

Two steps are employed to investigate whether employees in the caring occupations within the public sector perform differently from others in the supply of unpaid hours. First, the unpaid hours provided by employees from the four employment sectors are plotted over time. Second, econometric modelling is used to analyse employees' supply of unpaid hours, using employment sector as one of the explanatory variables. The econometric analysis is presented in details in Section 3.1. One explanation for people spending a lot of time on unpaid work is if their contracted hours and paid overtime are short. Section 3.2 presents the econometric specification to test whether this explanation holds. Section 3.3 addresses the question of whether high number of unpaid hours worked in some occupation groups is due to self-selection or institutional effects.

3.1 Modelling the number of hours spent on unpaid work

The number of unpaid hours is modelled as a function of employment sector, job characteristics, personal characteristics and year dummy. The empirical model is specified as the following:

$$Y_{it} = \beta_1 + X_{1i}\beta_2 + X_{2i}\beta_3 + X_{3i}\beta_4 + X_t\beta_5 + \varepsilon_{it}, \quad \varepsilon_{it} \sim N(0, \sigma_\varepsilon^2) \quad (1)$$

where $i = 1, \dots, n$; $t = 1, \dots, 7$

Y_{it} is the number of unpaid hours worked by individual i during the reference week of wave one, which we use as the proxy measure for the supply of unpaid hours. X_{1i} is a $n \times 3$ matrix for employment sector, X_{2i} is a $n \times 10$ matrix for the job characteristics. X_{3i} is a $n \times 7$ matrix for the personal characteristics. X_t is the year dummy. ε_{it} is the error term.

Wage might be an endogenous variable in modelling unpaid hours. Unpaid hours worked in the past may have a positive influence on payment today. Employers might reward hard working employees by paying them a higher salary or appoint them to positions with better rewards. As these workers have an innate tendency to supply unpaid hours, one may therefore observe that the hourly wage for the paid working hours is positively correlated to the number of unpaid hours worked in the current period.

We conducted the Durbin-Wu-Hausman test to examine whether the log hourly wage is an endogenous variable in modelling the unpaid hours. The null hypothesis for the test is that an OLS estimator yields consistent estimates. A rejection of the null indicates that the log hourly

is an endogenous regressor in the model and Instrumental Variables (IVs) techniques are required.

Once the result suggests that the IVs technique is appropriate, we need to construct IVs to deal with endogeneity issue in log hourly wage. Two commonly used IVs estimation methods are Two Stage Least Squares Estimation (2SLS) and the Generalized Method of Moments (GMM). The choice, however, depends on how the errors are distributed. A further test is applied to decide whether the 2SLS is preferable to the two-step GMM.

In the 2SLS estimator, the errors are assumed to be independently and identically distributed. If the estimated errors show that heteroskedasticity is present, the coefficients estimated using the 2SLS estimator are consistent but inefficient, then the more general GMM should be used to produce consistent and efficient estimates. The Pagan and Hall test (1983) is applied to model unpaid hours using the 2SLS estimator to test for the presence of heteroskedasticity.

The initial choice of IVs for log hourly wage includes whether the *job is a full time or part time*, whether individuals have long term illness or not, number of children under 16 and marriage status. These are likely to be weak IVs as they may also be correlated with the supply of unpaid hours. A more reliable instrument is the *location of the workplace*. It reflects the difference of wages between individuals work in England and the rest of the UK. It is not likely to correlate with the supply of unpaid hours. Other strong candidates for the instrument variable are the *years of work experience at the current job* and the *experience squared*. These two variables have been used as the proxy for income in modelling the total NHS hours worked per week by hospital consultants (Ikenwilo and Scott, 2007). The initial list of instruments was based on our expectations of the relationship between the IVs and the endogenous regressor.

3.2 Modelling the number of hours worked in total

The specification of modelling the total working hours is presented by equation (2). We employ the same dataset that is used for the analysis in section 3.1.

$$Y_{2i} = \beta_1 + X_{1i}\beta_2 + X_{2i}\beta_3 + X_{3i}\beta_4 + X_{4i}\beta_5 + \varepsilon_{it}, \quad \varepsilon_{it} \sim N(0, \sigma_\varepsilon^2) \quad (2)$$

where $i = 1, \dots, n$; $t = 1, \dots, 7$

Y_{2i} is measured by two variables. First it is proxied by the combination of the contracted hours and the number of unpaid hours during the reference week of wave one. Second, it is

measured by the combination of the weekly contracted hours, paid overtime and unpaid hours. This model employs the same set of independent variables as modelling the unpaid work in equation (1). The only difference is that the specification in Section 3.2 employs the log hourly wage rather than the IVs.

The Ordinary Least Square (OLS) estimator is applied to model the two dependent variables.

3.3 Self-selection or institutional effects

We take a three-steps approach to examine whether the high level of supply in unpaid hours is the result of self-selection or institutional effects. First, we examine whether there is a difference in the supply of unpaid hours in the first wave between respondents who left the public caring sector in the fifth interview and those who stayed in the public caring sector in the first and the fifth interviews. The significant difference between the two groups of respondents in the supply of unpaid hours could be used as the evidence of self-selection. A regression is conducted using subsample of employees who worked in the public caring sector in the first wave. In more details, the distribution of the respondents between the four employment sectors is presented by the third row of Table 2. The second column refers to the stayers (1215). The third, fourth and fifth columns are about switchers (23, 13, and 5). The specification is presented by equation (3). The OLS estimator is applied.

$$Y_{3i} = \beta_1 + S_i^{private_care} \beta_2 + S_i^{public_non_care} \beta_3 + S_i^{private_non_care} \beta_4 + X_{1i} \beta_5 + X_{2i} \beta_6 + X_t \beta_7 + \varepsilon_{it}, \quad \varepsilon_{it} \sim N(0, \sigma_\varepsilon^2) \quad (3)$$

where $i = 1, \dots, n$; $t = 1, \dots, 7$

Y_{3i} is the number of unpaid hours that individual i supplied during the reference week of wave one, given that he or she was employed in the public caring sector in the first wave. Individuals who work in the public caring sector in the first and fifth waves are treated as the baseline group. Individuals who worked in the public caring sector in wave one may switch to any of the other three employment sectors: private caring sector ($S_i^{private_care}$), public non-caring sector ($S_i^{public_non_care}$) or the private non-caring sector ($S_i^{private_non_care}$). X_1 denotes the job characteristics for individual i . X_2 denotes the personal characteristics. X_t is the year dummy. ε_{it} is the error term.

Second, we investigate whether respondents who switched to public caring sector in the fifth wave work more unpaid hours in the first wave compare to those who did not work in the public caring sector in the first and fifth waves. The significant difference between the two

groups of respondents in the supply of unpaid hours could be used as the evidence of self-selection. A regression is conducted using subsample of employees who worked in the public caring sector in the fifth wave. The distribution of the respondents between the four employment sectors is presented by the fourth, fifth and sixth rows of Table 2. The baseline group is shown by the second column. Other switchers are presented by the third, fourth and fifth columns. The specification is presented by equation (4). The OLS estimator is applied.

$$Y_{4i} = \beta_1 + S_i^{public_non_care} \beta_2 + S_i^{private_non_care} \beta_3 + S_i^{private_care} \beta_4 + X_{1i} \beta_5 + X_{2i} \beta_6 + X_i \beta_7 + \varepsilon_{it}, \varepsilon_{it} \sim N(0, \sigma_\varepsilon^2) \quad (4)$$

where $i = 1, \dots, n; t = 1, \dots, 7$

Y_{4i} is the number of unpaid hours that individual i supplied during the reference week of wave one, given that he or she was *not* employed in the public caring sector in the first wave. Individuals who switched to work in the public caring sector in the fifth wave are the baseline group. Individuals who did not work in the public caring sector in the first and fifth waves may work at any of the other three employment sectors in the fifth wave: public non-caring sector ($S_i^{public_non_care}$), private non-caring sector ($S_i^{private_non_care}$) and private care sector ($S_i^{private_care}$).

Third, we use the balanced panel data to explore whether individuals who switched employment sector in the fifth wave have their supply of unpaid hours changed in order to fit the group norm. A significant change in the supply of unpaid hours as the result of switching employment sector could be used as an evidence of the institutional effect. A fixed effect OLS regression was employed. The specification is presented by equation (5).

$$Y_{5iw} = \beta_1 + S_i^{public_non_care} \beta_2 + S_i^{private_non_care} \beta_3 + S_i^{private_care} \beta_4 + X_{1iw} \beta_5 + X_{2iw} \beta_6 + X_i \beta_7 + \varepsilon_{it}, \varepsilon_{it} \sim N(0, \sigma_\varepsilon^2) \quad (5)$$

where $i = 1, \dots, n; t = 1, \dots, 7; w = 1, 5$

Y_{5iw} is the number of unpaid hours that individual i supplied during the reference week of wave w . Individuals who switched to the public caring sector in the fifth wave are treated as the baseline group. Other switchers may move to any of the other three employment sectors in the fifth wave: public non-caring sector ($S_i^{public_non_care}$), private non-caring sector ($S_i^{private_non_care}$) or private care sector ($S_i^{private_care}$). X_{1iw} is the time variant personal characteristics. X_{2iw} is the time variant job characteristics.

3.4 Variables

Total working hours is the sum of paid and unpaid hours. The paid hours is the combination of contracted hours and paid overtime.

Hourly wage is calculated using four variables: gross payment (*gross99*), adjusted by the period covered (*prsprd*), contracted hours and paid overtime. It is then adjusted by the Retail Prices Index to exclude the impact of inflation. The hourly wage is calculated by equation (6):

$$\text{Hourly Wage} = \frac{\frac{\text{Gross Payment}}{\text{Period Covered}}}{\text{Contracted Hours} + \text{Paid Overtime}} \quad (6)$$

Salary expectations: There was no direct question about employees' salary expectations in the survey; the standard deviation of log hourly wage, stratified by the age group, occupation and year is used as the proxy for this effect.¹

Job tenure is generated by using the difference between the respondent's age at the time of the survey and the age that he or she completed full time education. If the respondent was recorded as having no education, then this age was arbitrarily recorded as 16 years old.

Complexity of the work is derived using the major occupation group (*sc2kmmj*). It ranks from 1 to 3 according to the complexity of the work.

Whether the job is permanent and *whether individuals have a second job* are included as job characteristics. In addition, there are variables which record whether individuals had any *managerial duties* and *the size of the workplace*.

Age, *age squared*, *ethnicity*, *qualifications*, *whether individual is a member of trade union or staff association* and *gender* are included as independent variables.

Year dummy is included to control for the effect of the time trend.

4. Results

4.1 Trends by employment sector

Figure 1 shows that between 1999 and 2005 employees in the public caring sector worked more unpaid hours than those in the other three sectors. Their supply of weekly unpaid hours

¹ The four age groups are categorized by age band. Groups one to four include employees aged between 16 and 30 years old, 30 and 45 years old, 45 and 60 years old, and aged above 60 years old respectively. There is a change of minor occupation group coding in 2001. For 1999 and 2000, the proxy used for the minor occupation variable is *socminm* with 77 categories and two digits. From 2001 to 2005, the proxy used for the minor occupation variable is *sc2kmmn* with 81 categories and three digits.

was between five and seven hours per week. Employees in the public non-caring sector worked the least number of unpaid hours - an average of 2.37 hours per week.

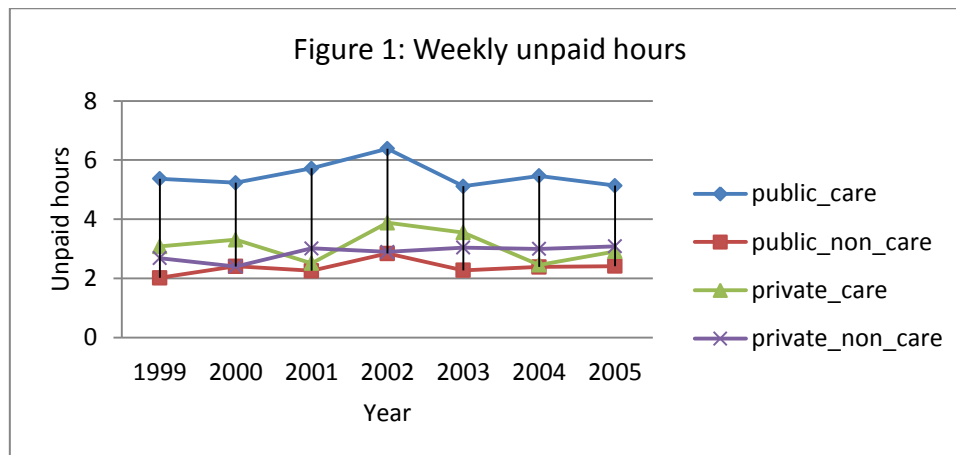
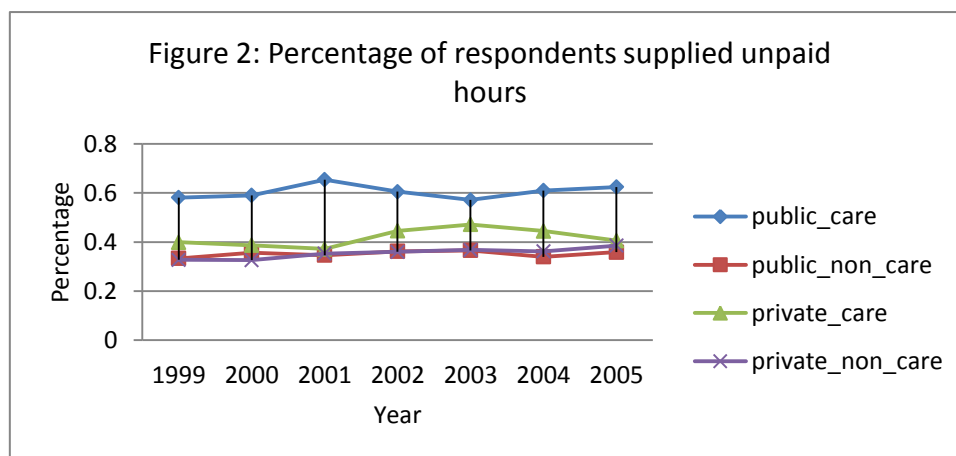


Figure 2 shows that employees in the public caring sector were most likely to provide unpaid hours, with between 50% and 70% of them supplying unpaid hours. Employees in the public non-caring or private non-caring sectors were least likely to work unpaid (between 30% and 40%), compared to around 40% of employees from the private caring sector worked unpaid.



4.2 Modelling the number of hours spent on unpaid work

The results from the Durbin-Wu-Hausman Chi-square test and the Pagan-Hall general test suggest that the GMM estimator fits the data better than the 2SLS or the OLS.

The *geographical location of the workplace*, whether the respondent has long term illnesses, the number of children under 16 and the marriage status are chosen as the IVs for the log hourly wage. The results from the C statistics test suggest that the four IVs are exogenous variables. Hansen J statistics (p-value = 0.288) confirm that the four IVs satisfy the orthogonality condition jointly. Results from the first stage regression using the GMM

estimator showed that all the four IVs are highly correlated with the log hourly wage. The F statistics ($F = 29.17$, $\text{Prob} > F = 0.0000$) show that the four IVs are jointly correlated with log hourly wage. The results of using the GMM estimator are presented in Table 3.

Table 3: Cross sectional analysis of unpaid hours

Dependent Variable Independent Variables	Number of unpaid hours worked			
	OLS	Standard error	GMM	Robust standard error
Employment Sectors				
Private non-caring sector (baseline)				
Public caring sector	1.34**	0.12	1.43**	0.14
Public non-caring sector	-0.70**	0.12	-0.73**	0.11
Private caring sector	0.26	0.16	0.64**	0.25
Job Characteristics				
Log hourly wage	2.11**	0.08	4.50**	1.11
Salary expectations (SD_lnwage)	-0.26	0.36	-1.36**	0.65
Job tenure	-0.06**	0.01	-0.08**	0.02
Job tenure2	0.00**	0.00	0.00**	0.00
Complexity of the job (high, baseline)				
Complexity of the job (median)	-3.64**	0.10	-2.94**	0.35
Complexity of the job (low)	-3.94**	0.14	-2.81**	0.55
Manager	0.94**	0.08	0.64**	0.16
Non-permanent job	-0.80**	0.19	-0.80**	0.19
Number of employees more than 25	-0.41**	0.08	-0.75**	0.17
Second job	-0.44**	0.18	-0.38*	0.20
Personal Characteristics				
Degree or above (baseline)				
Middle School or equivalent	-0.97**	0.09	-0.27	0.33
No/Other qualification	-1.03**	0.12	-0.06	0.46
Male	0.01	0.08	-0.43*	0.22
Age	-0.02	0.02	-0.15**	0.06
Age2	0.00	0.00	0.00**	0.00
White	-0.25	0.17	-0.35*	0.19
Member of Union	-0.22**	0.09	-0.34**	0.10
Married	-	-	IV	IV
Number of children under 16	-	-	IV	IV
Long term illness	-	-	IV	IV
No England	-	-	IV	IV
Constant	2.27**	0.48	-0.47	1.29
Number of individuals	21229		21229	
R-squared	0.2766			
Adjusted R-squared	0.2757			
Centered R-squared			0.2483	
Uncentered R-squared			0.4173	

1. * significant at 10%; ** significant at 5%.
2. Year Dummies are included in both of the specifications.

Employment sector: The results of the OLS and GMM models reported in Table 3 are consistent with one another. The GMM model shows that employees in the public caring sector provide 1.43 hours more unpaid work each week than employees in the private non-caring sector. Employees in the public non-caring sector contribute 0.73 fewer hours of unpaid work per week than those in the private non-caring sector and employees in the private caring sector provide 0.64 hours more unpaid work than the baseline.² These results are all statistically significant at 5% level.

Job characteristics: The results from the GMM model suggest that the log hourly wage has positive effect on employees' supply of unpaid work. One unit increase in the log hourly wage is associated with an increase in time that individuals spend on unpaid work by 4.5 hours per week. The salary expectations have a negative effect on unpaid hours. One unit increase in the salary expectations decreases the supply of working unpaid by 1.36 hours. Longer job tenure is associated with fewer unpaid hours: the marginal effect of an extra year job tenure is to decrease the supply of working unpaid by 0.08 hours per week. Occupations with high complexity are associated with more unpaid hours worked. On average, workers employed in occupations with low and moderate complexity spend almost 3 hours less each week on unpaid work than employees with highly complex jobs. Managerial responsibilities were found to have a positive effect on the supply of working unpaid hours, with managers spending 0.64 hours more than non-managers on unpaid work. On average, permanent job holders spend 0.8 hours more on the unpaid work than the temporary contract holders. Employees working at a workplace with more than 25 employees supplied 0.75 hours less unpaid work each week. The above coefficients of job characteristics are statistically significant at 5% level.

Personal characteristics: The results from the GMM model also suggest that age has a negative effect on the supply of unpaid hours, with each additional year decreasing the supply of unpaid by 0.15 hours. Union membership reduces the supply of unpaid hours by 0.34 hours per week. The coefficients of age and union were found to be statistically significant at 5% level.

4.3 Modelling the total working hours

² To use Tobit model confirmed the effects of the employment sectors on the supply of unpaid hours that derived from the GMM model.

The results from Table 4 suggest that employees in the public caring sector spend 1.25 hours less each week on contracted hours and unpaid overtime than employees in the private non-caring sector. The results from modelling the combination of contracted hours, paid overtime and unpaid hours suggests that employees in public caring sector worked 1.92 hours less than employees from the private non-caring sector each week. These results are statistically significant at 5% level.

Table 4: Total working hours

Employment sector	contracted hours+unpaid hours (standard error)	contracted hours+unpaid hours+paid overtime (standard error)
Public caring sector	-1.25 (0.23)**	-1.92 (0.25)**
Private caring sector	-1.77 (0.32)**	-2.17 (0.35)**
Public non-caring sector	-1.71 (0.24)**	-2.38 (0.27)**
Private non-caring sector (baseline)	-	-
Number of individuals	21229	21229
R-squared	0.2438	0.2268
Adjusted R-squared	0.2429	0.2259

1. * significant at 10%; ** significant at 5%.

4.4 Self-selection or institutional effects

The coefficients reported in Table 5 capture the differences in the supply of unpaid hours in the first wave between individuals who stayed in the public caring sector in fifth wave and those who switched from public caring sector to other employment sectors in the fifth wave. The coefficients of the three employment sectors are negative and statistically insignificant.

Table 5: Performance of switchers in the supply of unpaid hours – individuals who worked in public caring sector in the first wave

Switched to the following sectors in the fifth wave	With full set of independent variables		Without full set of independent variables	
	Coefficients	standard error	Coefficients	standard error
Private caring sector	-0.52	1.78	-0.66	2.18
Public non-caring sector	-0.69	2.91	-4.94	3.50
Private non-caring sector	-0.32	1.35	-2.95	1.64
Public caring sector (baseline)	-	-	-	-
Sample for baseline group	1215		1215	
Sample for switchers	45		45	
R-squared	0.3583		0.0042	
Adjusted R-squared	0.3453		0.0018	

1. * significant at 10%; ** significant at 5%.

The coefficients reported in Table 6 capture the differences in the supply of unpaid hours in the first wave between individuals who switched to work in public caring sector in the fifth wave and those who never worked in the public caring sector in the two waves. The results show that individual who did not work in the public caring sector in the first and fifth waves worked less unpaid hours in the first wave than those who switched to work in public caring sector in the fifth wave. The coefficients of the three employment sectors are statistically significant at 5% level when the other controlled variables are not included. Only the coefficient of the private non-caring sector is insignificant at 10% level when the full set of independent variables is included.

Table 6: Performance of switchers in the supply of unpaid hours – individuals who did not work in public caring sector in the first wave

Switched to the following sectors in the fifth wave	With full set of independent variables		Without full set of independent variables	
	Coefficients	standard error	Coefficients	standard error
Private caring sector	-1.52**	0.67	-2.71**	0.77
Public non-caring sector	-1.11*	0.65	-2.37**	0.74
Private non-caring sector	-0.44	0.70	-1.68**	0.81
Public caring sector (baseline)	-	-	-	-
Sample for baseline group	65		65	
Sample for others switchers	5546		5546	
R-squared	0.2658		0.0031	
Adjusted R-squared	0.2625		0.0025	

1. * significant at 10%; ** significant at 5%.

The results from the balanced panel data analysis are presented by Table 7. The coefficients of the employment sectors show the difference in supplying unpaid hours between individuals who switched to public caring sector and other three employment sectors. The three coefficients of the employment sectors are not statistically significant at 10% level.

Table 7: Balanced panel data analysis

Dependent variable	Number of unpaid hours worked	
	Coefficients	standard error
Private caring sector	0.29	0.56
Public non-caring sector	-0.41	0.72
Private non-caring sector	0.39	0.70
Public caring sector (baseline)	-	-
Number of individuals	6867	
Sample	13734	

1. * significant at 10%; ** significant at 5%.

2. The full set of independent variables is included in the specification.

5. Discussion

The hypothesis that employees in the public caring sector worked more unpaid hours than employees in other sectors is supported by the figure illustrations and econometric tests. There are three explanations for this result.

First, it could be driven by the short supply of paid hours. This explanation is supported by our results. Results in Table 4 suggest that employees in the public caring sector worked fewer hours than those worked in the private non-caring sector when the paid hours are taken into account.

The second explanation is the adoption of the efficiency wage in the public caring sector. The efficiency wage refers to a situation in which wages are not linked to current output; instead employers pay workers higher wages to induce effort (Scott and Farrar, 2003; Malcolmson, 1999). The effects of the efficiency wage include reducing employee turnover and the associated costs for employers, rewarding unobserved job characteristics and employee skills, and improving employee morale (Akerlof, 1982). Our data suggests that hourly wages for employees in the public caring sector are highest amongst the four sectors. The high level of supply in unpaid hours found in employees in the public caring sector may be due to the use of efficiency wage.

The third explanation is the self-selection. If the high level of supply in unpaid hours is the result of the institutional effect, individuals are expected to perform differently while they switching to different employment sectors. There is no such evidence from the panel data analysis. In contrast we found that there is no significant difference in the supply of unpaid hours between individuals who switch to public caring sector and those who switch to the other three employment sectors. It is arguable that the results may be affected by the small number of observations and the short period of time that our dataset covered.

The results provide further evidence to support our explanation for the self-selection. We find that the supply of unpaid hours in the first wave is significantly higher for individuals who switch to work in public caring sector in the fifth wave than those who did not work in public caring sector in waves one and five. We also find that comparing to individuals who switch out of the public caring sector, individuals who stay to work in the public caring sector supplied more unpaid hours in the first wave.

A similar study has been done by Gregg et al. Gregg et al (2011) use the British Household Panel Survey dataset between 1993 and 2000 to investigate whether an individual's choice of employment sector might be associated with a propensity to supply unpaid hours. Their results suggest that employees switching from the public caring sector self-selected to work in sectors where regular working patterns are the norm. The finding is the same with the current study.

The effect of job characteristics and personal characteristics

The results from the GMM model in Table 3 suggest that the log hourly wage has a significantly positive effect on the supply of unpaid hours. A unit increase in the log hourly wage increases the number of hours spent by 4.5 hours per week. In addition to the efficiency wage that was discussed above, two phenomena could help to explain this.

One explanation is the income effect. Individuals with high hourly earnings have more money to subsidise their unpaid work and are therefore in a position to provide more unpaid hours than low income individuals. The positive effect of the income on the supply of unpaid hours could also be explained as that employees with high income derive greater utility from working unpaid than those with low incomes. Therefore, they are more willing to contribute unpaid hours to work than others.

The standard deviation of log hourly wage, which is used as a proxy for salary expectations, is found negatively associate with employees' supply in unpaid hours. We implemented another two regressions to check the result. When the sample is restricted to public sector employees, the salary expectations are shown to be significantly negatively associated with the supply of unpaid hours. However, when we use the sample with private sector employees only, the results suggests a significantly positive effect of the salary expectations on the supply of unpaid hours. Our results suggest that the negative effect of the salary expectations is dominated by the observations in the public sector.

The marginal effect of job tenure is to decrease the supply of unpaid hours by 0.08 hours per week. One explanation for this is that the productivity of employees increases as they amass work experience. Higher productivity during contracted hours means there is less need to work overtime or unpaid. The other explanation is that employees with long work experience usually tend to be higher up on the career ladder. The opportunity costs of supplying unpaid hours are high. Also they are less motivated to work unpaid for promotion. One further

explanation is that experienced employees who are familiar with the running of the organisation know best how to avoid working unpaid.

The coefficients of the job complexity show that there is an association between the complexity of the jobs and employees' supply of unpaid hours. One explanation is that individuals with complex jobs can derive more enjoyment from work than those with simple jobs, and therefore willing to spend more time on unpaid work. The other explanation is that more uncertainty may attach to the time required in order to complete the complex tasks than the simple ones. Therefore, individuals with complex jobs may work more unpaid hours than those undertake relatively easy jobs.

The management responsibility is used to control for the effect of being a leader on individuals' time allocation. Managers on average provide 0.64 hours more unpaid work each week than the non-manager employees. It could be explained as the result of the enjoyment from work, self-norm and social norm. Managers usually engage in complicated tasks; therefore, they are likely to derive more satisfaction and enjoyment from work than the non-manager employees. Furthermore, many of those who become managers have a personal belief in the value of working hard. This value incentivises individuals to supply unpaid hours both before their promotion and after it. Managers may also be motivated by social norm. For example, they may provide unpaid hours in order to impress their boss and other managers or to maintain their reputation as excellent employees.

Whether the job is permanent or temporal is included to control for the effect of individuals' long term commitment to their jobs. Employees with permanent contracts provide 0.8 hours more unpaid work than individuals in temporary contracts. The result could be explained as that individual with permanent contract may feel more secure with the job and therefore more willing to commit to the work.

Employees in workplaces with more than 25 staff work 0.75 hours less in unpaid work than those at workplaces with 25 employees or fewer. This result might be accounted for by the free riding effect. Employees in big units have a stronger incentive to free ride as their free riding behaviours are less easily observed in large workplaces. This can be a particular problem in incentive schemes where rewards are based on group rather than individual performance. The other possible explanation is that working efficiency is generally higher among employees in big units than in small ones, for example because of better management practices. Consequently, there is no need for employees to work unpaid hours. The last

explanation is the increasing returns to scale for labour input. Again, employees in large workplaces have less need to supply unpaid hours than those in small workplaces.

Union members spend 0.34 hours less on unpaid work each week than non-members. Unions are founded by employees in order to collectively voice their members' concerns about work related issues and to protect their rights as employees. Unions can negotiate better employment contracts and terms with employers on behalf of employees and prevent their rights being trampled by employers.

6. Conclusion

This draft paper provides evidence that employees in the public caring sector work longer unpaid hours on average than employees in other sectors. We also find that among many other factors, one of the explanations for the high level of supply in unpaid hours in public sector, in particular those who provide care, is the self-selection rather than the institutional effects.

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