The UK Gender Pay Gap 1997–2015: What Is the Role of the Public Sector?[*]

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The Labour Force Survey is used to examine the influence of sector on the UK gender pay gap 1997–2015. The assessment is twofold: first comparing gender pay gaps within sectors and second through identifying the contribution of the concentration of women in the public sector to the overall gender pay gap. The long-term narrowing of the gender pay gap, which predominately reflects relative improvements in women's productivity-related characteristics, is found to stall in 2010 within each sector. This is considered in the context of claims that public sector austerity represents a critical turning point in progress toward gender equality at work.

Introduction

The public sector plays an important role in shaping the employment opportunities of women relative to men across many Western industrialized economies (see Anghel, de la Rica, and Dolado 2011; Fulton 2011; Karamessini 2014; Rubery 2014). In the UK women are more than twice as likely to work in the public sector as men and the relative concentration of women has increased over a decade of public sector employment growth and during the recession (Matthews 2010; Rubery and Rafferty 2013). Public sector pay premia are widely reported and these are found to be greater and more robust to the inclusion of controls for personal and employment characteristics when measured for women (Blackaby et al. 2012; Bozio and Disney 2011). This female between-sector differential is reflected in a lower gender pay gap in the public sector (Cai and Liu 2011; Chatterji, Mumford, and Smith 2011; Fuller

2005; House of Commons Women and Equalities Committee 2016; Olsen et al. 2010). For these reasons (a narrower gender pay differential and a relative employment concentration of women), it has been hypothesized that the public sector has a narrowing influence on the headline UK gender pay gap (Grimshaw 2000).

The flip side of a "protective" public sector for women is potentially a greater vulnerability to fiscal austerity and the effects of downsizing and pay restraint (Karamessini and Rubery 2014; Rubery and Rafferty 2013). Adverse relative employment and wage effects have been observed in countries that began to "rebalance" their public sectors earlier (Canada [Fuller 2005] and Ireland, Latvia, Romania, and Spain [Fulton 2011]). For the UK, the United States (Albelda 2014), and most European countries (Bettio and Verashchagina 2014), early findings did not support a disproportionate female impact. Rather, gender pay gaps continued to narrow (Bettio et al. 2013) and this may have lessened interest in questions of gender inequality. However, for many countries, fiscal austerity continues so that conclusions drawn from early findings must be treated as provisional (Rubery and Rafferty 2013). It is significant that longer term predictions were less dismissive (see Equality and Human Rights Commission 2012; Grimshaw, Rubery, and Marino 2012; Rubery 2014; Women's Budget Group 2012) with Karamessini (2014) proposing a "critical turning point," Rubery (2014) a "critical juncture," and Walby (2015) a "tipping point."

This study examines the influence of public sector employment on the gender pay gap in the UK and seeks to uncover the mechanisms underlying this impact: whether through a lower gender wage gap within the public sector and/or through a relative concentration of women in more highly paid public sector jobs. We use decomposition techniques (OB, developed by Oaxaca [1973] and Blinder [1973]) to identify the part of within-sector pay gaps due to differences in observed characteristics, or what is explained, from an unexplained component that is taken to reflect inequality in treatment. This approach is extended by including a modification of the Brown, Moon, and Zoloth (1980) method (BMZ) to consider the contribution of women's disproportionate representation in public sector employment. Further, by performing the analysis over a decade of absolute and relative growth in the public sector (1997–2009), followed by five years of austerity from 2010, it is possible to monitor change in the gender pay gap within and across sectors. The timing of this sectoral study is propitious: it provides an early empirical evaluation of the proposition that the dismantling of the public sector potentially represents a new and regressive trend in the historical development of gender equality at

work (Karamessini 2014; Rubery 2014; Walby 2015) against the UK Government's positive and ambitious rhetoric to "end the gender pay gap in a generation."[1]

The paper is structured as follows: the next section reviews the literature on inter-sector gender pay gaps, which forms a small part of two broader literatures on gender pay gaps and sector pay differentials. The following section introduces the Labour Force Survey (LFS) and the decomposition techniques applied. Results in relation to gender pay gaps and their decompositions are reported and discussed and the final section concludes with a reflection on the extent to which the evidence supports a critical turning point in gender equality at work.

Inter-Sector Differences in the Gender Pay Gap

The literature on gender-based differentials in earnings is long established (see Altonji and Blank 1999; Blau and Kahn 2001). Recent developments have made use of linked employee–employer data to include workplace characteristics as covariates that have been found to have an important role, in addition to individual characteristics (Chatterji, Mumford, and Smith 2011). The public sector is particularly distinctive in terms of its workplace characteristics and there is evidence across a variety of different countries that gender pay gaps in the public sector are smaller than in the private sector (see Olsen et al. 2010; Blackaby et al. [2012] for evidence for the UK; Anghel, de la Rica, and Dolado 2011; Arulampalam, Booth, and Bryan 2007; The World Bank [2012] for Europe; and Gunderson 1980; Borjas [2003] for the United States). Explanations include a set of direct drivers in the form of distinctive public sector characteristics embracing cultural values (Beaumont 1981; Blanchflower and Bryson 2010), more highly developed equality practices (Chartered Institute of Personnel and Development [CIPD] 2007; Hoque and Noon 2004), and compressed pay structures (Grimshaw 2000) and indirect effects arising from women's concentration within the public sector combined with its pay premium compared to private sector work (Chatterji, Mumford, and Smith 2011; Lucifora and Meurs 2006; Rubery and Rafferty 2013).

Taking the indirect contributions first, it is a consistent finding across time and across countries that public sector workers as a whole enjoy a pay premium as compared to their private sector counterparts (Blackaby, Murphy, and O'Leary 1999; Bozio and Disney 2011; Lucifora and Meurs 2006).

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[1] "My one nation government will close the gender pay gap" (Prime Minister's Office, Press Release, 14 July 2015).

Explanations of higher pay in the public sector reported in Cai and Liu (2011) and Fuller (2005) revolve around monopoly power, lower exposure to market forces, vote maximization, and the greater role for stakeholder (employee) preferences, including through trade union representation. Empirically, the size and significance of public sector pay premia are sensitive to the country in which they are measured (Lucifora and Meurs 2006), for whom and where on the distribution they are measured, model specification, and time period of study (Blackaby et al. 2012). Public sector pay premia are greatest in countries in which private sector employers have the greatest discretion over pay (i.e., countries that are relatively unregulated and nonunionized); within countries they are greatest for the low paid, for women, and in models with fewer controls. Employment segregation is also a source of differential outcomes and women's over-representation in relatively high paying occupations in a relatively high paying sector feeds through into a lower gender pay gap (Chatterji, Mumford, and Smith 2011; Grimshaw 2000).

In terms of direct effects, the notion of the public sector as a "good" and "fair" employer (Beaumont 1981; Blanchflower and Bryson 2010) extends back to the formation of the civil service in the mid-nineteenth century and is suggestive of both higher pay generally and lower pay differentials for equality groups. For Canada, "public sector employers face a certain expectation to be 'pace setters' in terms of providing equitable employment opportunities" (Fuller 2005: 410). These values are reflected and realized through an environment that is more conducive to female employment (including superior minimum standards in low skilled work and career opportunities in professional occupations) and a lower gender pay gap (see, for example, Cai and Liu 2011; Chatterji, Mumford, and Smith 2011; Rubery and Rafferty 2014). As an example, the management of equality and diversity through recruitment and selection, monitoring equality outcomes, provision for flexible working, and family-friendly practices are important in reducing gender pay differentials (Chatterji, Mumford, and Smith 2011). Equality policies are more evident in the public sector (CIPD 2007) where they are more likely to be accompanied by substantive supporting practices (Hoque and Noon 2004).

Industrial relations institutions independently affect pay gaps (Blau and Kahn 2003) and are more inclusive in the public sector in terms of collective bargaining and union density. The countervailing power of unions (Bach and Winchester 2003) is associated with higher wages while centralized pay-setting is associated with compressed earnings distributions and smaller intergroup differences in cross-country comparisons (Blau and Kahn 2003; Gornick and Jacobs 1998) and so too in a public–private sector comparison for the UK (Grimshaw 2000). Stricter regulatory controls apply to public sector pay; for example, the Single Status Agreement (1997) and the NHS Agenda for

Change (2004) impose common pay structures for employees in local government and the health sector (outside top clinical grades) (see Grimshaw, Rubery, and Marino [2012] for details of pay determination for other public sector groups), and additional statutory duties require all public service organizations to take proactive action to redress patterns of disadvantage, to promote equality, and to eliminate discrimination in employment and recruitment practices. A recent literature points to a positive and strengthening association between unionization and workplace equality practices (Blanchflower and Bryson 2010), especially in the public sector (Olsen et al. 2010; Rubery 2014) perhaps reflecting the additional leverage afforded to unions in negotiations over equality issues from stricter regulation (see Hoque and Bacon 2014).

Data and Empirical Procedures

Data from the LFS, the largest household survey in the UK, which contains comprehensive information on personal and employment-related characteristics consistently over time, are pooled from April–June 1997 to October–December 2015. The LFS is a quarterly survey with a rotational panel design such that, in every quarter, 20 percent of individuals are in their first wave and 20 percent are in their fifth and final wave. Our sample is restricted to individuals in wave 1 or wave 5 because, from 1997, earnings data are collected at these two points. The sample is further restricted to include only working-age employees whose information is not provided by a proxy interview.[2] Hourly pay (E_{it}) is derived from gross weekly pay in the respondent's main job on the basis of total usual hours worked (including overtime) and the standard LFS filter is applied so that the maximum hourly wage is £99. Nominal values are deflated using the monthly Retail Price Index and are measured in 2009 prices.

Employees are classified as working in the public (PUB) or private sector (PRIV) based on a series of questions about the nature of their employer. The public sector is defined as that owned, funded, or run by central or local government and the private sector comprises everything outside this definition, including the voluntary sector.[3] Self-reported information from the LFS overestimates the size of the public sector relative to the National Accounts

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[2] We also estimated the model on a sample restricted to full-time employees and these results are presented in Online Appendix Figures OA1–OA5. While the level of the raw gap and the explained (within) components are considerably smaller the unexplained differential is similar to that among all workers. Further, the sectoral differences remain pronounced, the between component remains negligible, and key trends identified over time are evident, albeit they are less pronounced in absolute terms.

[3] Guidance is provided for those who are unsure how to classify their organization to reduce measurement error.

definition (Hicks and Lindsay 2005) and, following Dolton and Makepeace (2011), those in universities, polytechnics, or other grant-funded educational establishments, and those who are temporary agency workers, are classified to the private sector. Of the total sample ($N = 684,551$) 29.9 percent work in the public sector according to this definition, which is about 2.5 percentage points lower than the original LFS definition. There have been a small number of formal sectoral reclassifications over the sample period, including, for example, the movement of Lloyds Banking Group to the public sector in 2008 and its return to the private sector in 2014. Provided employees are aware of such changes, they will be captured by the self-reported nature of the LFS measure, although we acknowledge that this will cause small changes in the composition of public and private sector employment over time.[4]

The analysis is organized in several stages. First, the unadjusted gender pay gap is estimated for the entire economy and by sector. Second, these gaps are adjusted for differences in characteristics to identify the contribution that is unexplained and may therefore reflect unequal treatment (see Weichselbaumer and Winter-Ebmer [2006] on the interpretation of the unexplained component). Third, and reflecting the concentration of women in public sector employment, the contribution of within-sector gender pay gaps is distinguished from the contribution of sector employment composition in determining the overall gender pay gap. Results are presented for the entire period (1997–2015) and separately by year to examine changes in the gender pay gap and its determinants across time.

Within-sector gender pay differentials.   The influence of gender on hourly pay is examined by including a dummy variable for male (M_{it}) into an earnings equation estimated, first for the overall economy, and then separately by sector (S_{it}) after controlling first for personal characteristics including: potential experience (and experience squared), marital status, highest qualification, and region of work, then second for work-related characteristics including: temporary contracts, part-time employment, tenure (and tenure squared), and workplace size (x_{it}).[5] Due to multiple reclassifications between 1997 and 2015, we are constrained to capture occupational effects using variables for managerial

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[4] The main reclassifications (see Office for National Statistics 2016) are as follows: Q4 2008 the move of the Royal Bank of Scotland and Lloyds Banking Group into the public sector, Q1 2012 the move of English Colleges to the private sector, Q4 2013 the move of Royal Mail to the private Sector, Q1 2014 the return of Lloyds Banking Group to the private sector.

[5] Union membership is only collected in a single (October–December) quarter each year and is only available in the datasets from 2006 and, as such, we are unable to control for it throughout the analysis. As expected union members are concentrated in the public sector and, while there is greater variation in the estimates of the unexplained gender pay gap as a consequence of the smaller sample size, the sectoral difference remains evident (see Online Appendix Figure OA6).

and supervisory responsibilities although an additional specification (2001–2010) is estimated which controls for occupation.[6] Details of all variables and their means (by gender and sector) are presented in Appendix Table A1. Consistent with existing evidence, public sector workers have, on average, higher qualification levels and longer tenure than those in the private sector and, regardless of sector, women have shorter job tenure than men and are more likely to be employed part time.

Despite having a comprehensive set of control variables it is possible that unobserved influences on wages, such as effort, public service motivation (DeLeire, Enami, and Moynihan 2011), or risk aversion (Pfeifer 2010) are correlated with sector choice introducing bias into the ordinary least squares (OLS) estimates of sector differentials. The impact on estimates of the gender wage gap within sectors is not clear but because the LFS does not contain clearly reliable instruments for sector choice, as in Blanchflower and Bryson (2010) and Cai and Liu (2011), we are not able to control for the potential endogeneity of public sector employment.

The natural logarithm of earnings is regressed on the explanatory variables for the entire period and separately by year as follows:

$$\text{Overall} \quad \ln E_{it} = \mu M_{it} + \boldsymbol{x_{it}\beta} + \varepsilon_{it} \quad i = 1, .., N; \quad t = 1997, .., 2015 \quad (1)$$

$$\text{Within Sector} \quad \ln E_{it} = \mu_S M_{it} + \boldsymbol{x_{it}\beta_S} + \varepsilon_{it} \quad S = \text{PUB}, \text{PRIV}; \\ i = 1, .., N_S; \quad t = 1997, .., 2015 \quad (2)$$

where i indexes the individual and t the year. Each equation includes quarterly dummy variables to capture seasonal effects. The coefficient estimates vary across time in the year-specific models but this is omitted from the notation for simplicity. The within-sector analyses are performed separately for employees in the public and private sector and ε is the random error term which satisfies the standard OLS assumptions. The estimate of the coefficient of the gender variable (μ) measures the average difference in (log) earnings between males ($M_{it} = 1$) and females ($M_{it} = 0$) after accounting for differences in observable characteristics and the sector-specific coefficients (μ_S) are interpreted similarly (*within* sector S). The specification in equations (1) and (2) assumes that each characteristic has the same impact on earnings for men and women and is referred to as the "male indicator" model.

By contrast, equations (3–6) allow the impact of characteristics on earnings to vary by gender by estimating separate equations for men and women (equations [3] and [4]) and within each sector (equations [5] and [6]). This allows, for example, the return to a degree to differ between males and females. As previously, the models are estimated by year and sector as follows:

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[6] For results see footnote 11.

Overall

Men $\ln E_{it} = \mathbf{x}_{it}\boldsymbol{\beta_M} + \varepsilon_{it}$ $M_{it} = 1;\ i = 1, .., N;\ t = 1997, ., 2015$ (3)

Women $\ln E_{it} = \mathbf{x}_{it}\boldsymbol{\beta_F} + \varepsilon_{it}$ $M_{it} = 0;\ i = 1, .., N;\ t = 1997, ., 2015$ (4)

Within Sector

$$\begin{aligned} \text{Men} \quad & \ln E_{it} = \mathbf{x}_{it}\boldsymbol{\beta_{M,S}} + \varepsilon_{it} \\ & M_{it} = 1; S = \text{PUB}, \text{PRIV}; i = 1, .., N_S; t = 1997, ., 2015 \end{aligned} \quad (5)$$

$$\begin{aligned} \text{Women} \quad & \ln E_{it} = \mathbf{x}_{it}\boldsymbol{\beta_{F,S}} + \varepsilon_{it} \\ & M_{it} = 0; S = \text{PUB}, \text{PRIV}; i = 1, .., N_S; t = 1997, ., 2015 \end{aligned} \quad (6)$$

This approach facilitates an Oaxaca-Blinder (OB) decomposition of the observed gender pay gap into explained and unexplained components as follows:

Overall (Decomposition 0)

$$\overline{\ln E_M} - \overline{\ln E_F} = \underbrace{(\overline{\mathbf{x_M}} - \overline{\mathbf{x_F}})\,\mathbf{b_F}}_{\text{Explained}} + \underbrace{\overline{\mathbf{x_M}}(\mathbf{b_M} - \mathbf{b_F})}_{\text{Unexplained}} \quad (7)$$

Within Sector (Decomposition 0)

$$\overline{\ln E_{M,S}} - \overline{\ln E_{F,S}} = \underbrace{(\overline{\mathbf{x_{M,S}}} - \overline{\mathbf{x_{F,S}}})\,\mathbf{b_{F,S}}}_{\text{Explained}} + \underbrace{\overline{\mathbf{x_{M,S}}}(\mathbf{b_{M,S}} - \mathbf{b_{F,S}})}_{\text{Unexplained}} \quad (8)$$

where the bar above a variable denotes the mean value and $\boldsymbol{b}$ is the OLS estimate of $\boldsymbol{\beta}$. The decomposition separates the difference in earnings between the average male and female worker into an explained and unexplained component. The former measures that part of the wage differential due to differences in the characteristics of men and women while the latter measures that part due to gender differences in the return to those attributes. In Equations (7) and (8), the explained differential is evaluated at the female returns to each characteristic and the unexplained differential is evaluated for the average man.[7]

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[7] Alternative decompositions of the earnings gap are shown in equations (9) and (10) in which the explained differential is evaluated at the male returns and the unexplained differential is evaluated for the average woman:

Overall (Decomposition 1)

$$\overline{\ln E_M} - \overline{\ln E_F} = (\overline{\mathbf{x_M}} - \overline{\mathbf{x_F}})\mathbf{b_M} + \overline{\mathbf{x_F}}(\mathbf{b_M} - \mathbf{b_F}) \quad (9)$$

Within Sector (Decomposition 1)

$$\overline{\ln E_{M,S}} - \overline{\ln E_{F,S}} = (\overline{\mathbf{x_{M,S}}} - \overline{\mathbf{x_{F,S}}})\mathbf{b_{M,S}} + \overline{\mathbf{x_{F,S}}}(\mathbf{b_{M,S}} - \mathbf{b_{F,S}}) \quad (10)$$

Alternative estimates of the unexplained gender pay gap are provided by using the male indicator model and both versions of the Oaxaca–Blinder decomposition (OB0 and OB1). Elder, Goddeeris, and Haider (2010) suggest that the OB decompositions place reasonable bounds on the actual value of the unexplained component and that the male indicator model is a useful summary of the unexplained variation that might be expected to lie between these two bounds. These estimates are used to compare the treatment of men and women between sectors and across time.

In order to pursue our second aim to distinguish between the contribution of inter-sector pay gaps and inter-sector employment distribution to the overall gender pay gap the decomposition is extended to include a modified version of the Brown, Moon, and Zoloth (1980) (BMZ) approach, which has been used in the literature to explore the influence of occupational segregation.

Between- and within-sector gender pay differentials. The mean earnings for each gender are the weighted average of the means for each sector where the weights are the fractions employed in each sector ($p_{M,S}$ for men and $p_{F,S}$ for women). The overall earnings differential between men and women is the difference between these weighted averages, which in turn can be written as follows:

$$\overline{\ln E_M} - \overline{\ln E_F} = \sum_S p_{M,S} \overline{\ln E_{M,S}} - \sum_S p_{F,S} \overline{\ln E_{F,S}} \tag{11}$$

$$\overline{\ln E_M} - \overline{\ln E_F} = \underbrace{\sum_S (p_{M,S} - p_{F,S}) \overline{\ln E_{M,S}}}_{\text{Between Sector}} + \underbrace{\sum_S p_{F,S} (\overline{\ln E_{M,S}} - \overline{\ln E_{F,S}})}_{\text{Within Sector}} \tag{12}$$

The first and second terms in equation (12) show, respectively, the between-sector differential and the within-sector differential. Suppose the gender pay gap is the same in each sector so the within differential is constant as proportions of women in each sector change. A rise in the fraction of female (male) employees in the higher paid sector will reduce (increase) the overall pay gap.[8] Holding the between differential constant, an increase in the fraction of the female workforce in the sector with the smallest gender pay gap will reduce the overall differential.[9]

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[8] The between differential can be written as: $p_{M,PUB}(\overline{\ln E_{M,PUB}} - \overline{\ln E_{M,PRI}}) - p_{M,PUB}(\overline{\ln E_{M,PUB}} - \overline{\ln E_{M,PRI}})$. Earnings are on average higher in the public sector so an increase in $p_{M,PUB}$ or decrease in $p_{F,PUB}$ will increase the between differential *ceteris paribus*.

[9] This is possible if $p_{M,PUB} - p_{F,PUB}$ is constant so any change in $p_{F,PUB}$ is matched by an equal change in $p_{M,PUB}$. Let $GD_{PRI} = \overline{\ln E_{M,PRI}} - \overline{\ln E_{F,PRI}}$ and $GD_{PUB} = \overline{\ln E_{M,PUB}} - \overline{\ln E_{F,PUB}}$ be the gender differentials in, respectively, the private and public sectors. The within differential can be written as $GD_{PRI} + p_{F,PUB}[GD_{PUB} - GD_{PRI}]$. If $GD_{PUB} < GD_{PRI}$, an increase in $p_{F,PUB}$ will decrease the overall within differential *ceteris paribus*.

The within-sector differential is a weighted average of the sector differentials, each of which can be separated into explained and unexplained differentials using the OB method as described above. Brown, Moon, and Zoloth (1980) also decompose the between differential into an explained and an unexplained component. Following their approach, the probability of working in the public sector is estimated for men using a logit model with the same set of explanatory variables as the earnings equation. The resulting estimates are used to predict the proportion of women working in the public $(\widehat{p_{F,PUB}})$ and private $(1 - \widehat{p_{F,PUB}})$ sectors. These fractions show the predicted distribution of the sample of women across sectors assuming that they were allocated in the same way as men. Applying BMZ's method:

$$\text{Between} = \sum_S (p_{M,S} - p_{F,S})\overline{\ln E_{M,S}}$$
$$= \underbrace{\sum_S (p_{M,S} - \widehat{p_{F,S}})\overline{\ln E_{M,S}}}_{\text{Explained}} + \underbrace{\sum_S (\widehat{p_{F,S}} - p_{F,S})\overline{\ln E_{M,S}}}_{\text{Unexplained}} \quad (13)$$

The first term shows the explained portion of the between differential. It is determined by the difference in the proportions of men and women who would work in each sector if they were allocated to each sector as men. Because there is no difference in the allocation mechanism, any difference in these proportions is due to the different characteristics of men and women. The second term representing the unexplained component reflects the difference in the proportions of women who would work in each sector if they were to be allocated to each sector, first, in the same way as men and, second, in the same way as women. Because there is no difference in the characteristics of the women, any difference in these proportions is due to gender differences in allocation and is therefore "unexplained."

Results and Discussion

Results pooled for the entire time period are presented in Table 1 where Panel A describes the gender differentials for the overall economy and Panels B and C report on the public and private sector, respectively. The average gender pay gap for the economy over the period 1997–2015 is 0.256 log points and, consistent with previous evidence, it is smaller in the public sector where the gap is 0.219 log points compared to 0.311 for the private sector.[10] These are unadjusted gaps that do not, by themselves, imply any differences in

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[10] A lower gender pay gap in the public sector is consistent with previous findings in the UK (see Olsen et al. 2010). For an international comparison of the ratio of public to private sector gender pay gaps see The World Bank (2012).

TABLE 1

The Gender Wage Gap by Sector

	Ln units	% of Earnings Gap	% Increase
Panel A: Overall			
Coefficient of male	0.145	56.7	15.6
Diff ln earnings	0.256	100	29.1
OB unexplained 0	0.154	60.2	16.6
OB explained 0	0.102	39.8	10.7
Diff ln earnings	0.256	100	29.0
OB unexplained 1	0.128	50.1	13.6
OB explained 1	0.128	49.9	13.6
Panel B: Public Sector			
Coefficient of male	0.113	51.6	11.9
Diff ln earnings	0.219	100	24.5
OB unexplained 0	0.117	53.2	12.4
OB explained 0	0.103	46.8	10.8
Diff ln earnings	0.219	100	24.5
OB unexplained 1	0.117	53.3	12.4
OB explained 1	0.102	46.7	10.8
Panel C: Private Sector			
Coefficient of male	0.160	51.5	17.3
Diff ln earnings	0.311	100	36.5
OB unexplained 0	0.172	55.1	18.7
OB explained 0	0.140	44.9	15.0
Diff ln earnings	0.311	100	36.5
OB unexplained 1	0.140	44.6	14.9
OB explained 1	0.172	55.3	18.8

Notes Data are pooled between 1997–2015. Decomposition 0 (1): Unexplained gap weights differences in coefficients by the means for men (women). All components are significantly different from zero at the 1- percent level. A full set of coefficient estimates is available on request.

treatment between men and women. The male indicator model and the OB decompositions are used to distinguish that part of the gender wage gap that is due to differences in characteristics (explained) from differences in treatment (unexplained).

The coefficient on the dummy variable for "male" is 0.145 log points. As a measure of the unexplained differential, this represents 56.7 percent of the gender earnings gap and would lead to a 15.6 percent increase in women's earnings if eliminated. The remaining rows in Panel A show the OB decompositions. Using decomposition 0, 0.102 (39.8 percent) of the observed difference in log hourly earnings was explained by the different characteristics of men and women and 0.154 (60.2 percent) was attributed to differences in the way characteristics were rewarded. In the absence of any reason for the different treatment, the latter is interpreted as unexplained and is typically used as an upper bound estimate of gender discrimination in earnings. The

unexplained difference in log earnings can also be expressed as a percentage increase in earnings that a woman could receive if she had been paid the same as a man (Decomposition 1), 13.6 percent. Applying the same logic, the explained differential also gives an increase of 13.6 percent.

Panels B and C report the OB decomposition for each sector separately. Though larger in absolute terms in the private sector, both the explained and unexplained differentials account for roughly half of the gender pay gap in each sector. Indeed, and possibly surprisingly, one sector cannot be clearly distinguished from the other on this criterion, which suggests important common, or across-sector, gender differences in characteristics and treatment in wage determination. In further analyses, tenure, experience, part-time employment, and qualifications are found to be the most important contributors to the explained gap across both sectors. Women are treated relatively better in the public sector in the sense that their earnings would increase by about 12 percent if the unexplained pay gap were eliminated while, by the same criterion, the earnings of women in the private sector would increase between 15 and 19 percent.

The BMZ decomposition distinguishes the contribution of within-sector pay differences and the sector composition of employment to the gender pay gap. Table 2a reports summary statistics for pay and employment across and within sectors. The (log) earnings for men and women, which are consistent with an unadjusted public-sector premium that is larger for women, gives rise to the overall gender pay gap and the within-sector gender pay gaps in Table 1. Employment proportions by gender (columns 3 and 5) indicate that 20.8 percent of men work in the public sector compared to 37.3 percent of women. The last column shows the predicted proportions of women who would work in each sector if women were allocated to sectors in the same way as men. The predicted proportion of females in the public sector (23.0 percent) is substantially lower than the actual proportion of women indicating that women have different preferences for public sector employment and/or that there are sector differences in employers' hiring decisions. This may reflect gender differences in occupational choice not controlled for in our model or the public sector as an employer of last resort disproportionately employing those shut out of private sector employment (see Kahn 2008).[11]

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[11] In sensitivity analysis undertaken between 2001–2010 and presented in Online Appendix Figures OA7–OA10, occupation is controlled for using Standard Occupational Classification 2000 major groups and the predicted proportion of females in the public sector is midway between the rates for males and females suggesting about 50 percent of the differential can be explained. However, the key conclusions with respect to the dominance of the within gap and falling within explained gap prior to 2010 are robust to this change in specification.

Table 2b shows the decomposition of the observed difference in the overall gender pay gap (0.256 log points) into the components attributed to differences within sectors (0.277) and differences between sectors (–0.022). The within figure shows the contribution of intrasector gender wage differentials to the overall gender differential and the between figure shows the contribution of different gender sector allocations. The negative between variation reflects the fact that relatively more women work in the public sector where the average earnings are higher. If the between difference were eliminated—that is, women were employed across sectors in the same proportion as men—then the overall gender pay gap for the economy would increase by 0.022 log points, or 8.2 percent, and be 0.277 log points. The relative magnitudes indicate that the major determinants of the headline gender pay gap are the differentials observed between men and women *within* the private and public sectors rather than the different employment concentrations. Indeed, an absence of a gender pay gap within the public and private sector would reduce the overall gender pay gap to –0.022, that is, women would actually earn slightly more than men on average.

This analysis of total earnings gaps conflates the role of differences in the explained contribution (characteristics) and the unexplained contribution (behavior/treatment). These are separated and presented in the BMZ decomposition in columns 3 and 4 of Table 2b. About half of the within component is explained compared to only 13.1 percent of the between component. Moreover, in absolute terms the within explained component is more than forty times larger than the explained between component. Indeed, despite the between gap being predominately unexplained, the unexplained within gap is still seven times larger in absolute terms. If the unexplained gender pay gap within sectors were eliminated the gender pay gap would fall by 0.131 log points or 51.2 percent, whereas if the unexplained between gap is eliminated the gender pay gap would rise by 0.019 log points or 7.4 percent. These findings point to differences in the influence of gender in determining wages within sectors being far more important for the overall gender pay gap than differences in the behavior that determines sector allocation between genders.[12]

The analysis of trends over time begins in Figure 1, which presents raw gender pay gaps for the whole economy, as well as by sector, steadily declining from 1997 to 2010. In the private sector the gap declined from 0.380 in 1997 to 0.267 in 2010 but has remained flat in subsequent years. The public sector gender pay gap, while smaller, has also fallen (from 0.251 in 1997 to 0.183 in

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[12] However, this does not imply an unimportant role for the public sector in facilitating work for women who may otherwise choose not to participate.

TABLE 2A

SUMMARY STATISTICS FOR BMZ DECOMPOSITION OF OVERALL GENDER WAGE GAP

	Men		Women		
	ln Earnings	% in Sector	ln Earnings	% in Sector	Predicted % in Sector
Public	2.550	20.8	2.331	37.3	23.0
Private	2.420	79.2	2.109	62.7	77.0
Overall	2.447	100	2.192	100	100

NOTES Data are pooled between 1997–2015.

TABLE 2B

BMZ DECOMPOSITION OF OVERALL GENDER WAGE GAP

	Total (Explained + Unexplained)	Explained	Unexplained
Within gap	0.277 (108.2%)	0.146 (57.0%)	0.131 (51.2%)
Percent	100	52.8	47.2
Between gap	–0.022 (–8.6%)	–0.003 (–1.2%)	–0.019 (–7.4%)
Percent	100	13.1	86.9
Overall gap	0.256 (100%)	0.143 (55.9%)	0.112 (43.8%)
Percent	100	55.9	43.8

NOTES Data are pooled between 1997-2015. The components of the BMZ decomposition are set out in equations (11)–(13). Figures in parentheses are the percentage of the overall total gender wage gap.

2010) and has subsequently levelled.[13] This stalling of the long-term advancement of gender pay equality in 2010, both within and across sectors, has not to our knowledge been previously reported as an empirical finding for the UK.

Before examining differences by sector, Figure 2 presents trends for the explained and unexplained components of the overall pay gap measured in absolute terms (log points). The main factor driving the decrease in the gender pay gap has been the clear downward trend in the explained differential. The explained differential can decline over time if there is (1) convergence in the characteristics of men and women or (2) the set of returns at which the explained gap is evaluated falls. This issue is examined further using the Juhn, Murphy, and Pierce (1991) decomposition, which is applied to data at each end of our period (1997 and 2015) and isolates the contribution of what are referred to as quantity and price effects, to the *change* in the explained gap.[14]

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[13] We note the temporary increase in the public sector gender pay gap between 2000 and 2002 in Figure 1. Given year on year variability, we are cautious in attempting to interpret this short-term fluctuation. However, the increase coincides with a substantial expansion in public sector funding such that from 2001 public sector pay growth exceeded that in the private sector. The trend in the gender pay gap would be consistent with men gaining disproportionately relative to women.

[14] These results are available in Online Appendix Table OA1. The change in the gender wage gap between 1997–2015 is –0.063 (–0.113) in the public and private sectors, respectively, of which –0.062 (–0.081) is driven by the explained component and –0.078 (–0.079) of this is due to a quantity effect.

FIGURE 1

Gender Pay Gaps by Sector (1997–2015)
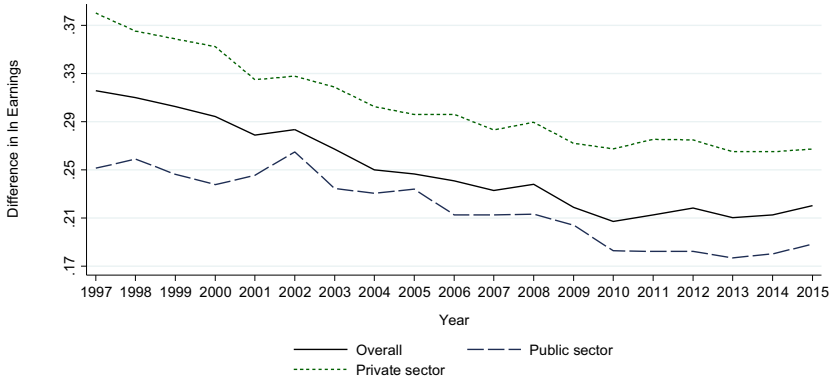
NOTES: The wage gaps refer to unadjusted wage gaps measures in log units. [Color figure can be viewed at wileyonlinelibrary.com]

FIGURE 2

OB Explained and Unexplained Gender Pay Gaps (1997–2015)
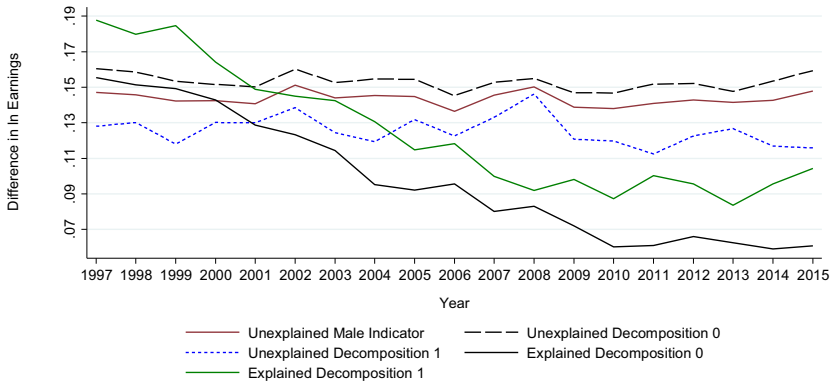
NOTES: The wage gaps refer to OB decompositions of wage gaps for the overall economy measured in log units. [Color figure can be viewed at wileyonlinelibrary.com]

Quantity effects are the dominant cause of the decline in the explained gap, which implies that women have acquired relatively more of the attributes valued in the labor market compared to men, with relative improvements in qualifications being the key driver in both sectors. While the unexplained gap also declines between 1997 and 2010 the improvement is minimal (0.01 log

points). From 2010, the explained gap has levelled and, if anything, there is a slight upward trend in the unexplained gap. While it is perhaps too early to establish the permanency of a new trajectory for the gender pay gap, these changes are consistent with the end of the long-term narrowing trend.

The focus of Figure 3 is the time path of the unexplained components of the pay gap within each sector. As reported in Table 1, the absolute unexplained differential is consistently lower in the public sector, which suggests greater gender earnings equality. This differential possibly has a slight downward trend in the private sector but has no clear trend in the public sector. The OB(1) estimate is consistently lower (typically 2–3 log points) than OB(0) in the private sector and more volatile in the public sector. Consistent with Elder, Goddeeris, and Haider (2010) the evidence suggests that the male indicator model provides a reasonable approximation of the unexplained gap.[15]

The employment distribution by sector is tracked in Figure 4. The proportion of men working in the public sector remained fairly stable (1997–2010) at about 20 percent in contrast to substantial growth in the concentration of women from 34.8 percent to 40.4 percent. The period after 2010 has been characterized by a falling concentration of employees in the public sector, for both men and women. While the percentage point decline in public sector employment has been slightly greater for women (4.5) than men (3.5) this represents a greater relative change for men (16 percent) compared to women (11 percent). The "predicted" female line plots the rate of public sector employment on the basis of female characteristics but male behaviour and tracks slightly above the male rate indicating that the sector employment gap is predominately unexplained.

Figure 5 traces the explained and unexplained gaps associated with both the between and within components in the BMZ model. The between explained differential (measured on the RHS axis) is stable at just below zero. The between unexplained differential, also close to zero, fell from 1997 (–0.015) to 2004 (–0.023), a period of rapid female public sector employment growth. Both are negligible relative to the overall gender pay gap and suggest that the sectoral employment composition has not been a key driver of the level or

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[15] In additional analyses we use this method to explore the absolute unexplained gender differential across the wage distribution to ensure that trends at the mean are representative. As shown in Online Appendix Table OA2, the unexplained gender gap increases across the distribution but remains greater at each point in the private than public sector. The unexplained gap measured in log points increases from 0.07 (tenth percentile) to 0.16 (ninetieth percentile) in the public sector, corresponding figures for the private sector are 0.13 and 0.20 and suggest the presence of "glass ceilings" in both sectors (see also Baron and Cobb-Clark 2010). While the gender wage gap falls over the period at points across the distribution and in both sectors the unexplained gap remains relatively constant in the public sector. Consistent with trends at the mean there is a modest downward trend in the unexplained gap at the ninetieth, fiftieth, and tenth percentile in the private sector.

FIGURE 3

OB Unexplained Gender Pay Gaps (1997–2015) by Sector

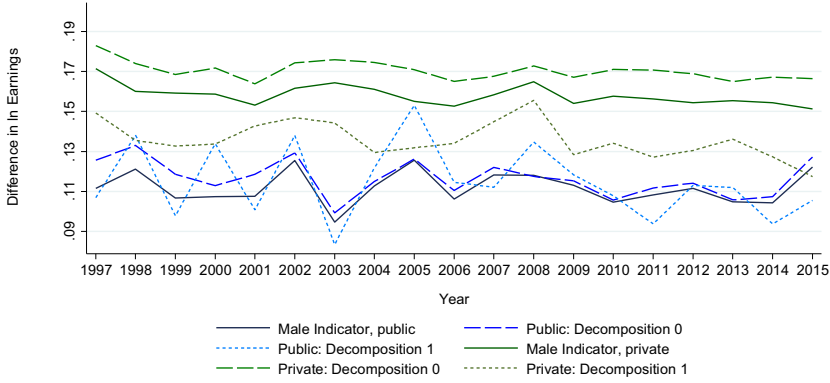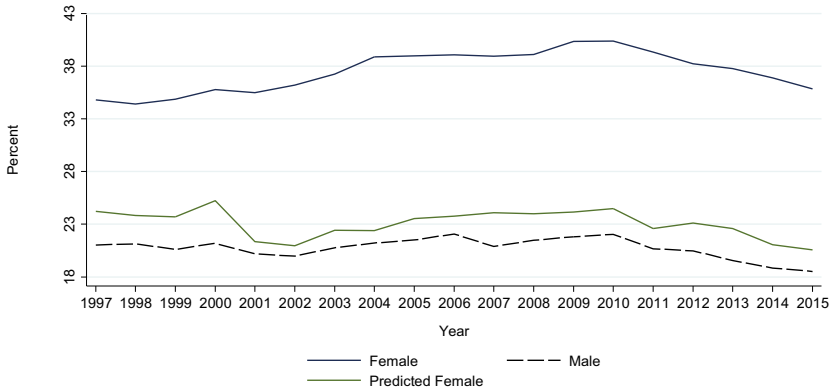[Color figure can be viewed at wileyonlinelibrary.com]

FIGURE 4

BMZ Percentage of Employees in the Public Sector (1997–2015)

[Color figure can be viewed at wileyonlinelibrary.com]

trend in the UK gender pay gap. In contrast, between 1997 and 2008 there is a pronounced and downward trend in the within-sector explained gap, consistent with the improvement in observed productivity-related characteristics of women relative to men in both sectors. Consistent with the earlier evidence from the OB decomposition the within-sector unexplained differential had a modest drift downward until 2011, albeit with considerable variation. Since then it has been fairly stable.

Conclusions

The public sector has made an important contribution to progressing gender equality at work through its role as a regulator of employment relations, as a model employer, including providing support in balancing work and care, and by providing support for care outside work (Rubery 2014; Walby 2015). A period of public sector austerity in the UK beginning in 2010 raised concerns about an interruption to this progress (Karamessini and Rubery 2014; Rubery and Rafferty 2013). Within this broader context, this study examines the contribution of public sector employment to a headline indicator of gender equality at work, the gender pay gap. Using the UK LFS, we compare gender pay gaps within the public and private sectors and identify the extent to which these are explained by differences in the observable characteristics between men and women. These within-sector gaps are then distinguished from the contribution of gender differences in the sector employment composition to the overall UK gender pay gap. Finally, the gender wage gap and its components are tracked from 1997 to 2015, a period of public sector growth and then austerity from 2010.

Gender pay gaps, both raw and unexplained, are lower in the public sector. Using averages measured across the pooled data, the raw gender pay gap is 0.311 log units (or 36.5 percent) in the private sector and 0.219 log units (or 24.5 percent) in the public sector. Characteristics and treatment account for roughly equal proportions of the overall pay gap in each sector suggesting common drivers of the gap, albeit these account for a lower absolute pay gap in the public sector. In examining the contribution of the gender allocation of

FIGURE 5

BMZ WITHIN AND BETWEEN EXPLAINED AND UNEXPLAINED GENDER PAY GAPS (1997–2015)

[COLOR FIGURE CAN BE VIEWED AT WILEYONLINELIBRARY.COM]
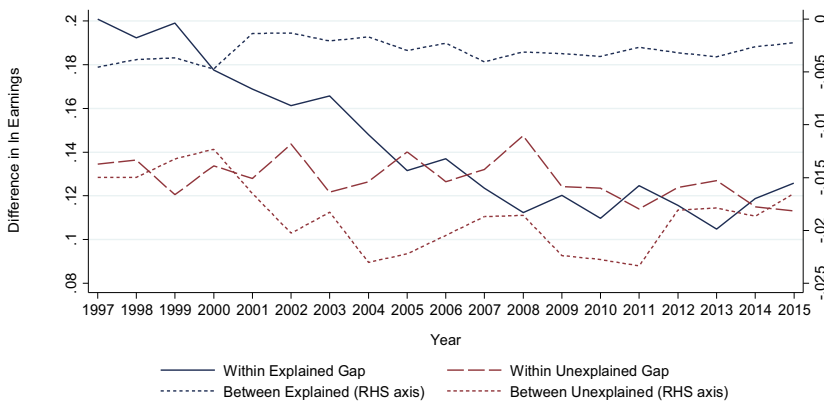
employment across sectors we find that the largely unexplained concentration of women in the public sector has a limited, although further narrowing effect (–0.019 log points or –7.4 percent), on the overall gender wage gap.

Analysis of trends over time shows that the long-term narrowing of the gender pay gap stops in 2010 within and across sectors. Empirical evidence to date has indicated at most only a slowing in the rate of progress for Europe (European Commission 2014) but we report the absence of any reduction in the gender pay gap between 2010 and 2015 in the UK.[16] It is the stalling in the downward trend in the explained component, reflecting an end to the relative improvement in women's productivity-related characteristics, which underlies this change (see also Rubery and Grimshaw 2015). In terms of the unexplained component only a weak downward trend is discernible (1997–2010). This is surprising, at least for the public sector, given the extensive equality initiatives implemented during this period (Local Authority Single Status agreement from 1997; NHS Agenda for Change from 2004; Gender Equality Duty from 2006; Public Sector Equality Duty from 2011). Equally, however, the absence of a clear trend in the unexplained pay gap post 2010, the period of public sector contraction, does not support an austerity-driven change in "treatment" within the public sector.

There are a number of reasons to be concerned about the changing trend from 2010. In the immediate aftermath of austerity, it was difficult to separate short-run implications from changes to longer term trends (Bettio and Verashchagina 2014; Rubery and Rafferty 2013). The evidence is now clearer: the long-term narrowing in the gender pay gap stopped in 2010. This represents a retreat from a hitherto prolonged and continuous path of convergence in pay for men and women in the UK. While this appears to be more than a short-term delay in progress, whether it implies an historical shift (a critical juncture, or tipping point) toward a more permanent absence of progress (or even a regressive path) depends on what happens next. The trend change certainly warrants greater recognition, continued observation, and further investigation. In this respect, the new statutory provision for the reporting of gender pay gaps at the organizational level in the UK from 2018 (under the newly enacted Section 78 of the Equality Act 2010) would seem to provide a timely focus on gender pay disparities.

Despite the widespread use of the gender pay gap as a key indicator the analysis of a single measure is naturally restrictive and captures a particular dimension of gender inequality at work. The focus on pay ignores nonwage characteristics of jobs (Danzer and Dolton 2012), which may vary by sector, be

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[16] Slowing in the speed of convergence during the 1990s is reported for the United States in Blau and Kahn (2006).

valued differentially by gender, and have changed over time. Further, the gender pay gap is a relative measure that is squeezed or expanded from two sides. As Rubery and Rafferty (2014) and Grimshaw, Rubery, and Marino (2012) note, the levelling down of men's wages might narrow the gap without benefitting women. Likewise, any continuing public sector advantage may reflect a faster deteriorating situation in the private sector rather than any active redress or positive action in the public sector (see Fuller 2005). The focus on pay also neglects the equality implications of differential job losses and/or reduced hours precipitated by public sector austerity. Moreover, we have not captured the heterogeneity of austerity effects within a diverse public sector. These issues clearly warrant future research to enhance our understanding the changing role of the public sector and the impact of austerity on gender equality at work.

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APPENDIX

TABLE A1

SUMMARY STATISTICS FOR EXPLANATORY VARIABLES

Variable	Public		Private	
	Male	Female	Male	Female
Marital Status				
Single	0.26	0.23	0.33	0.31
Married	0.62	0.60	0.55	0.51
Divorced/separated/widowed	0.12	0.18	0.13	0.19
White	0.94	0.94	0.93	0.95
Experience (years)	24.81	23.79	23.53	21.86
Tenure (months)	146.01	113.29	101.17	74.91
Qualifications				
Degree	0.37	0.31	0.23	0.18
Other higher education	0.13	0.19	0.10	0.09
A level	0.23	0.16	0.30	0.19
O level	0.15	0.21	0.18	0.31
Other	0.07	0.08	0.12	0.13
None	0.05	0.05	0.08	0.11
Region				
North East	0.05	0.05	0.04	0.05
North West	0.11	0.12	0.11	0.11
Yorkshire and Humberside Manchester	0.09	0.10	0.09	0.10
East Midlands	0.06	0.07	0.08	0.08
West Midlands	0.08	0.09	0.09	0.08
Eastern	0.07	0.08	0.09	0.09
London	0.13	0.10	0.12	0.11
South East	0.12	0.12	0.15	0.15
South West	0.09	0.09	0.09	0.09
Wales	0.05	0.06	0.04	0.04
Scotland	0.11	0.11	0.08	0.09
Northern Ireland	0.03	0.03	0.02	0.02
Temporary employment	0.05	0.07	0.04	0.05
Part time	0.08	0.42	0.06	0.42
Workplace Size				
1–10 employees	0.07	0.08	0.19	0.25
11–24 employees	0.08	0.13	0.13	0.16
More than 25 employees	0.85	0.79	0.68	0.59
Management Responsibility				
Manager	0.33	0.21	0.30	0.19
Foreman or supervisor	0.16	0.16	0.15	0.13
Neither manager or supervisor	0.51	0.63	0.55	0.68
Quarter				
January–March	0.22	0.22	0.21	0.21
April–June	0.27	0.26	0.26	0.26
July–September	0.26	0.26	0.26	0.27
October–December	0.26	0.26	0.26	0.26

TABLE A1 (cont.)

Variable	Public		Private	
	Male	Female	Male	Female
Occupation (2001–2010)				
Managers and senior officials	0.13	0.06	0.22	0.14
Professional occupations	0.25	0.22	0.14	0.07
Associate professional and technical	0.28	0.23	0.12	0.12
Administrative and secretarial	0.10	0.21	0.05	0.23
Skilled trades occupations	0.04	0.01	0.16	0.02
Personal service occupations	0.06	0.19	0.02	0.11
Sales and customer service occupation	0.01	0.01	0.04	0.16
Process, plant, and machine operatives	0.04	0.00	0.15	0.04
Elementary occupations	0.10	0.08	0.12	0.12

NOTES Data are pooled between 1997–2015. Controls for survey year are also included in the pooled models but are not presented here.