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Original Article

Gender Wage Inequality: The De-gendering of the Occupational Structure

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Abstract

The gender segregation of occupations is an enduring feature of the labour market, and pay in female-dominated occupations remains lower than in male-dominated occupations. However, recent changes in the occupational structure have possibly altered the relationship between occupational segregation and the gender pay gap. Women's skills are increasingly in demand, and this is reducing the gender wage gap. We explore this premise using individual- and occupation-level Labour Force Survey and household panel data from Britain augmented with an innovative proxy indicator of productivity across occupations. The wage effects of occupational feminization are not as high as previously shown once this indicator is taken into account. Additionally, we find evidence that such wage effects are evolving into more complex processes, including differing impacts for graduates and non-graduates as well as for employees in graduate and non-graduate jobs. Claims that gender segregation is losing importance as a structuring factor in labour-market outcomes are therefore accurate. However, this applies mostly to women in jobs requiring high-level skills. Segregation continues to lower pay substantially for women in occupations requiring limited skills.

Introduction

The gender segregation of occupations is a long-standing feature of labour markets and is held to have pronounced wage impacts. Occupations where women predominate generally pay less than those where men predominate (England *et al.*, 1994; Blau and Kahn, 2003; Bettio and Verashchagina, 2009; Levanon, England and Allison, 2009). Extensive research has sought to unveil the reasons for this, often based on a small number of important theoretical ideas, in particular human capital theory (Tam, 1997), gender role theory (Lips, 2012; Ochsenfeld, 2014), and devaluation theory (England, 1992, 2010; Perales, 2013).[1]

Recent evidence shows that both occupational gender segregation and the gender wage gap are in decline, if slowly (Hegewisch, Liepmann and Hartmann, 2010; Olsen *et al.*, 2010; American Association of University Women, 2012). Rising female education has been cited as an important mediating factor in these developments (Weichselbaumer and Winter-Emer, 2005; Goldin, 2008). However, the role of education remains highly uncertain. For instance, recent research in the USA has unveiled a strong negative relationship between occupational feminization and earnings for the highly qualified (Hegewisch, Liepmann and Hartmann, 2010). Even less clear is whether the link between occupational gender segregation and the gender pay gap is itself weakening, as suggested by Charles and Grusky (2004). One problem is that the decline in segregation itself is not consistent over time (Stainback and Tomaskovic-Devey, 2012)

or across countries (Rubery, 2008: 299–300; Bettio and Verashchagina, 2009: 34–37). Further, insofar as the narrowing of the gender wage gap is the result of the growth in female skills, the decline in gender segregation could be linked to the spread of egalitarian gender ideologies and mainstreaming policies. It is unlikely that a single cause can explain the changing relationship between segregation and the gender wage gap.

Women's education has risen and this might have enabled women to enter professional jobs previously dominated by men so that such jobs have become increasingly integrated (England, 2010). However, it is also possible that shifts in the occupational structure have benefited women through creating more high-level 'female' jobs. There has been a long-run decline in 'male-typed' jobs involving physical strength or technical know-how (Oppenheimer 1970; Kucera and Milberg, 2000; Goldin, 2002), and this has been accompanied by the rise of higher-end 'post-industrial', predominantly female occupations (Esping-Andersen, 1993)—now highly professionalized (de Ruijter, van Doorne-Huiskes and Schippers, 2003). Primary school teaching and social care are prime examples. They have both in the past been tainted by low status and pay; yet, in many countries these jobs now require graduate education. This enables women, who have historically favoured such work, to obtain higher pay on average than they would otherwise (Disney and Gosling, 1998; Dustmann and van Soest, 1998; Budria, 2010). Nevertheless, this process only works if women specialize in skills which are in growing demand (Tam, 1997; Krymkowski and Mintz, 2007).

While existing studies have focused chiefly on individual skills, we use British data to test whether the wage effects of occupational feminization diminish when we control for an occupational level measure of productivity. We find that the role of occupational gender segregation in wage determination is weakening not only through women's growing educational advantage, but because an increasing proportion of university-educated women work in highly productive professions. We therefore have a story of occupations and a story of gender, which intersect yet remain distinct.

The Changing Relationship between Occupational Gender Segregation, Skill Demands, and Pay

Women are still over-represented in poorly paid occupations. Some claim that this is chiefly because of women having lower human capital or productivity (Polachek, 1976, 1981; Tam, 1997; Polavieja 2008). However, the rise in female education makes this general argument increasingly difficult to maintain; women's growing educational attainments are often cited as a major driver of the decline in the gender wage gap (Goldin, 2002, 2008). Nevertheless, education is a necessary but not sufficient condition for change in gender inequality to take place. For example, access to education is still gendered by prestige of institution and field of study (Hakim, 1998; Booth and Kee, 2011). For one British cohort (born 1958), Joshi and Paci (1998) find that educational achievement explains only about 10 per cent of the gender wage gap. In another British study, education explains 7 per cent compared with 62 per cent explained by gender itself (Olsen *et al.*, 2010). Many studies fail to find a consistent or strong impact of education on the gender pay gap (e.g. Aisenbrey and Brückner, 2008; Magnusson, 2009).

It is implicit in the concept of the 'glass ceiling' (Arulampalam, Booth and Bryan, 2007) that highly educated women's work is devalued (insofar as being female limits promotion opportunities). In the USA at least the gender wage gap is larger in more highly paid occupations (Evertsson *et al.*, 2009; Hegewisch and Liepmann, 2010), while the feminization of occupations appears to reduce returns to education for women in Britain (Joshi and Paci, 1998: 71–96), Germany (Aisenbrey and Brückner, 2008: 644), and the Netherlands (de Ruijter, van Doorne-Huiskes and Schippers, 2003). Nevertheless, the predictions of devaluation theory neither accord with the observed fall in the gender wage gap (Jackson, 2008), nor with variation in segregation and occupational wage gaps across countries (Bettio, 2002; Bettio and Verashchagina, 2009). 'Female' work is not paid uniformly poorly across countries, and many jobs in which women predominate are not stereotypically 'feminine' (Hakim, 1998). Further, gender-integrated occupations are generally better paid (Hakim, 1998; Cotter *et al.*, 2004; Magnusson, 2013) and more prestigious (Magnusson, 2009) than not only female-dominated but also male-dominated occupations. Occupational gender segregation has also been shown to be positively related to measures of female empowerment at the aggregate level (Blackburn, Jarman and Brooks, 2000).[2]

Our argument is that women have a comparative advantage in 'skill' (defined as the converse of 'brawn') and therefore tend to select into skill-intensive occupations. If so, then skill-biased technological change (Berman, Bound and Machin, 1997, Card and DiNardo, 2002), previously in favour of men, might raise the demand for women's capabilities and qualifications, thus

contributing to a narrowing of the gender wage gap at the top of the wage distribution.[3] This has been observed in both developing countries (Pitt, Rosenzweig and Hassan, 2012; Bhalotra, Fernandez-Sierra and Venkataramani, 2015) and developed countries (Harmon, Walker and Westergaard-Nielsen, 2001), and may explain why desegregation has occurred primarily in middle-class jobs (England, 2010). Koppera and Mehta's (2014: 9) analysis of the Current Population Survey in the USA explains the college boom in terms of shifts in the 'feminization of education-intensive jobs'. Female enrolments are associated with increases in typically female jobs rather than with higher-level jobs in general. There is a connection running from gendered employment trends to gendered educational trends rather than the other way round.[4]

Whether female educational investments are in skill-intensive sectors is rarely tested empirically. Some possible examples are given by Magnusson (2013) for Sweden. Like Hakim (1998), she finds that both men and women receive the highest wages in integrated occupations (i.e. occupations in which 30–50 per cent of workers are women), including some health and teaching professionals. Stainback and Tomaskovic-Devey (2012: 136, 172) show that in the USA, during an enormous expansion of professional jobs from around 1970 to 2000, (white) male representation in this general sector fell, with the difference being made up predominantly by (white) women.[5] Even 'caring' occupations, deemed to be the heart of the devaluation process (England, Budig and Folbre, 2002; England, 2005), are witnessing change of some benefit to women (Esping-Andersen, 1993; Goldin, 2008). For instance, the 'family going public' involves the professionalization of care work, mostly female dominated. As one example, care of the elderly requires increasing skills as a result of more client-focused approaches. These involve increasing attention to the emotional and social needs of clients, and a wider range of creative and interpersonal carer skills (Dench, La Valle and Evans, 1999). This, though, is not a linear pattern. Dwyer (2013) shows that in the USA from 1983 to 2007, demand for care work contributed considerably to growth in both the lowest quintile of occupational wages and the highest. Magnusson (2009) finds the relationship between care work and both occupational prestige and wages in Sweden to be positive; female-dominated 'interpersonal service work', in contrast, received both low prestige and pay.

A counterargument has been proposed by Mandel and Semyonov (2005), who make the case that while the expansion of women's work, predominantly in the public sector, has boosted female employment, wage compression in the sector has prevented women from obtaining highly paid jobs equivalent to those in the private sector, thus contributing to, not reducing, gender wage inequality. However, it is difficult to demonstrate that women would otherwise have achieved better pay in high-level private-sector occupations, for instance in finance. It has also been demonstrated that through increased entry into 'female' professional jobs, women have achieved high-level managerial positions that might not have been attainable otherwise (England, 2010). The problem is not the public sector, but the effects on gender equality of continued privatization (Rubery, Smith and Fagan, 1999). We note here, before presentation of our findings, that in the UK data set we use, mean pay from 1993 to 2008 is higher in the public than in the private sector for both men and women, while the gender wage gap is higher in the latter. On the other hand, restriction of the analysis to the relative highly paid (over £10 per hour) virtually eliminates these differences.

We have argued that segregation favours more-educated women while disadvantaging those who are less educated. There is an important methodological point here, in that the observed decline in the relationship between segregation and the gender wage gap masks two opposed processes. This decline is not what it seems. Segregation still remains important because it favours highly-skilled women on the one hand but remains damaging for the less skilled. In respect of the former, women's occupational preferences that have been historically to their detriment might now be working in their favour.

A corollary of this is that we need to distinguish between women's work and women's skills. With rare exceptions such as fashion modelling (male or female), but also following the decline of heavy industries, there is little work that both men and women cannot in principle each do effectively (Hakim, 1998). There are no such things as 'female' or 'male' skills. These are social artefacts derived from processes of segregation. However, if the underlying principle of devaluation theory is that women's work is considered to be of lower value than men's—because historically 'femininity' has been attributed lower value—then it is inevitable that the skills associated with the work that women do in typically female occupations will also be considered of lower value. Women's *apparent* (i.e. socially constructed) skills are then devalued. This is changing, we argue, but not because segregation is declining and more women are doing 'men's work' (a process that is in fact extremely slow), nor because women are now as well educated as men (which would not help if women's skills are devalued). The change is the result of the fact that the skills that women typically apply in segregated occupations

are increasingly in demand. Devaluation is not an immutable element of the social structure.

Occupational gender segregation is in this climate about poorly skilled women being in dead-end jobs. To make a simple but important point, gender equality cannot come about through wage equality based on highly educated women's skills matching those of men as long as women continue to be over-represented in low-paid occupations (Joshi and Paci, 1998: 71–96; OECD, 2002; Blau and Kahn, 2003; Rubery, 2008).

Analytical Approach and Data

We use information from two large-scale UK surveys. The main data set is the Labour Force Survey (LFS), a repeated cross-section survey of individuals, which supplies detailed information on employment and has a substantial sample size. We use LFS data from 1993 to 2008 (annual, though constructed out of quarterly surveys). The second data set is the British Household Panel Survey (BHPS). We use information from the first 17 waves, comprising the period 1991–2007. This allows us to complement the LFS analysis by minimizing the confounding effects of individual-specific unobserved heterogeneity.[6]

Our approach introduces two variables that measure in some way the pool of skills in the labour force. The first is the graduate density of occupations, operationalized as the proportion of graduate workers in an occupation—with graduates defined as holders of first or higher degrees from higher education institutions. Graduate density raises wages controlling for individual education. However, its wage effects are sometimes negative, which implies overcrowding (Brynin, 2002). If the supply of graduates rises in line with demand for high-status occupations more than their prospective economic value, this leads to over-qualification. This might especially apply to women tied by family responsibilities (Bobbitt-Zeher, 2011). As Ochsenfeld (2014) points out, sex-specific characteristics that are altered by technological and organizational developments are often unobserved. We therefore add a second measure that better reflects productivity, which we define for our purpose as factors that enhance wage growth within occupations. As explained below, we use occupation-level time-series wage regressions to extract the fixed effect of the residuals and use it as an indicator of underlying occupation-specific time-invariant factors that influence wages.

It should be noted that neither effect is solely that of occupational productivity. Graduate density is the proportion of graduates in an occupation and is therefore primarily a measure of skill supply. This need not relate directly to productivity—for instance, if supply is driven by the demand for the prestige of a degree rather than the wages it attracts. The fixed-effect measure, in contrast, captures unmeasured aspects of wage growth at the occupational level. This cannot be driven by individuals. We would therefore expect it to relate more closely to differential productivity. However, the unmeasured aspects of productivity picked up by the occupational fixed effects (OFE) depend on the information that we are able to enter into the right-hand side of the occupation-level equation. While this is extensive, there are factors, such as technology usage at work, which we are unable to measure.

Our occupation-level wage determination model can be represented as:

$$W_{ot} = F_{ot}\beta_1 + G_{ot}\beta_2 + C_{ot}\beta_3 + V_{ot}, \quad (1)$$

where subscripts o and t stand for occupation and time, respectively, W represents mean deflated gross hourly wages in the occupation, F is the proportion of women in the occupation (occupational feminization), G is the proportion of graduates in the occupation (graduate density), C is a vector of time-varying control variables, V is an error term, and β_1–β_3 are parameters of interest to be estimated. The error term (V_{ot}) can be divided as follows:

$$V_{ot} = \mu_o + \varepsilon_{ot}, \quad (2)$$

where μ_o are time-invariant occupation-specific wage differentials, and ε_{ot} is the usual stochastic error term. We estimate average occupational wages by regressing deviations from occupational means over time in the independent variables on deviations from the occupational mean over time in the dependent variable:

$$W_{ot} - \overline{W}_o = (F_{ot} - \overline{F}_o)\beta_1 + (G_{ot} - \overline{G}_o)\beta_2 + (C_{ot} - \overline{C}_o)\beta_3 + (\varepsilon_{ot} - \overline{\varepsilon_o}) \quad (3)$$

The time-invariant occupation-specific wage differentials (μ_o), which are averaged out of the above equation, are then retrieved. The resulting term, our OFE, captures pounds per hour in an occupation over or under model prediction, net of all observable factors. This will be used as a proxy for occupational skill demands in later models.

$$OFE_o = \mu_o = \overline{W}_o - \overline{X}_{ot}\,\hat{\beta}, \quad (4)$$

where $\overline{X}$ is the mean vector of the observable variables included in the regression, and $\hat{\beta}$ is the corresponding vector of estimated model parameters. Entering this into

individual-level cross-sectional and fixed-effect models, respectively, gives:

$$W_{it} = F_{it}\beta_1 + G_{it}\beta_2 + C_{it}\beta_3 + Z_i\beta_4 + OFE_i\beta_5 + V_{it} \quad (5)$$

$$W_{it} - \overline{W}_i = (F_{it} - \overline{F}_i)\beta_1 + (G_{it} - \overline{G}_i)\beta_2 + (C_{it} - \overline{C}_i)\beta_3 + (OFE_{it} - \overline{OFE}_i)\beta_4 + (\varepsilon_{it} - \overline{\varepsilon}_i) \quad (6)$$

where Z captures time-constant individual factors. The model in Equation (5) controls for occupation-level, but not for individual-level, unobserved factors that determine wages. The model in Equation (6), which we term a 'dual fixed-effect' model, simultaneously controls for person-specific and occupation-specific unobserved heterogeneity in wages.[7] While this accounts for both unmeasured aspects of individual human capital and occupational skill supply and demand factors, our main aim is to use the OFE as a *proxy* indicator of productivity to see whether this alters the relationship between gender segregation and the gender wage gap.

Empirical Evidence

Trends in Feminization and the Gender Wage Gap

Occupational gender segregation and the gender wage gap have both declined over the period examined in this study, as is apparent from LFS data presented in Figure 1. Between 1993 and 2008, the overall gender difference in inflation-adjusted hourly wages decreased substantially from £2.2 to £1.1. The within-occupation gap (not shown) fell from £1.63 to £0.82. With inflation-adjusted average pay rising, the gender wage gap as a proportion of average pay decreased over the period from 23.4 to 10.3 per cent.

At the same time, a less impressive though important fall in the degree of occupational gender segregation took place. The value of the Duncan and Duncan Index of Dissimilarity was 0.58 in 1993, indicating that an estimated 58 per cent of men and women would need to change occupations for the gender composition of all occupations to reflect the gender composition of the labour force. By 2008, this had reduced to 50 per cent.

Extreme forms of gender concentration also declined. For example, the proportion of employees working in occupations where women were at least 75 per cent of workers fell from 25 to 20 per cent. Further, the correlation between occupational feminization and the within-occupation gender wage gap (male minus female hourly wage) measured at the occupational level is negative, so the gender wage gap is smaller in more-feminized occupations. In fact, the magnitude of this negative correlation strengthened over the period from −0.05 (non-significant) to −0.30 (highly significant).

These descriptive analyses suggest that women's poor wage position relative to men is both declining and

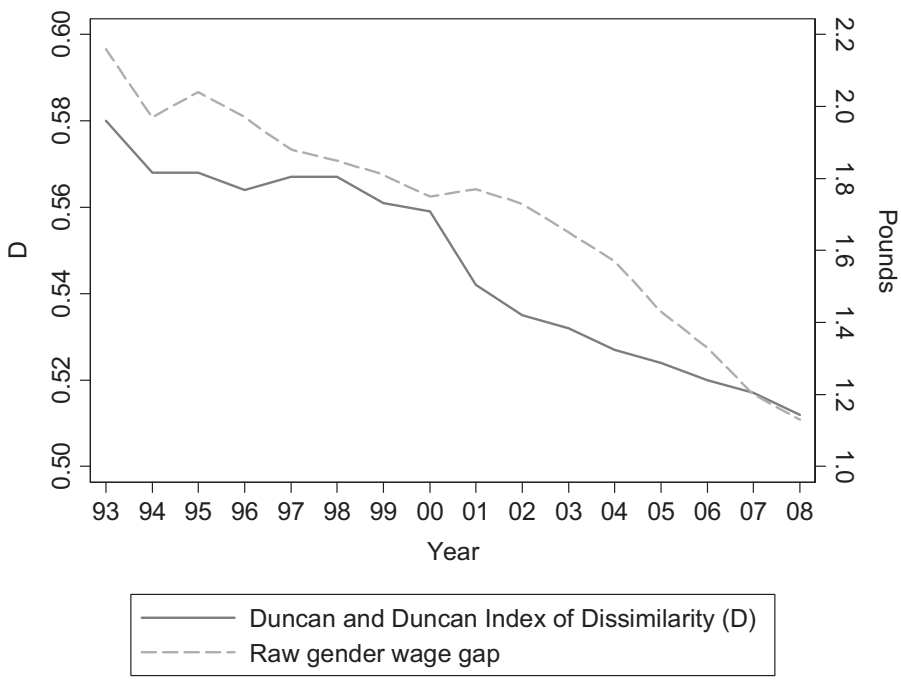

Figure 1. Time trends in the Duncan Index of Occupational Dissimilarity and the gender gap in hourly wages, LFS (1993–2008)

decreasingly determined by occupational gender segregation.[8] We now examine whether this is related to gendered skill distributions and unobserved productivity.

The Role of Skills

Most research shows a negative correlation between gender segregation and wages. Results in Table 1 from the regression models described in Equation (1), using LFS data at the occupation level, clearly reflect this negative relationship. However, occupational feminization has a stronger negative wage impact for men than women, and more so in the later period. Working in female-dominated occupations therefore results in lower within-occupation wage gaps between male and female workers. The problem is that women by definition prevail in feminized occupations.

Just as men are more affected than women by the negative wage impact of feminization, if in small numbers, not all women are equally affected. The table also shows that the magnitude of these negative effects is small when compared with the effects of graduate density.

Individual-level wage regression models using the LFS are presented in Tables 2 (men) and 3 (women). Their estimates are consistent with the above results. The impact of occupational feminization on wages is nearly always negative and, in the more complex specifications, more so for men than women. The effect of graduate density, as expected, is positive, and slightly favours women, while its effect again far outweighs that of gender-based segregation. It seems to matter more whether men and women work in graduate-typed occupations than in female-typed occupations. This is apparent also in that the negative effect of segregation on women reduces substantially when controlling for graduate density.

Further support for our general argument is provided by an interaction term between feminization and graduate density in the third column of Tables 2 and 3. Its sign is negative for men but positive for women. Interpretation is aided by visual inspection of Figure 2. Men are always penalized for working in feminized occupations at all levels of the graduate density distribution, though the penalty is larger in graduate-typed feminized occupations. In contrast, this combination benefits women, albeit only slightly. Women do not on average gain from working in male-typed occupations but perform better in graduate female-typed occupations. This is a key result in terms of the arguments presented above.

It is nevertheless unclear, amongst other things, how much this is the result of unobserved occupational productivity, which might be either directly or indirectly gendered. Occupations become more graduate presumably

Table 1. Wage effect of proportion female and proportion graduate on male and female pay at the occupational level, ordinary least squares models (LFS 1993–2008)

	Male pay		Female pay	
	1993–2000	2001–2008	1993–2000	2001–2008
Proportion female	−0.28	−1.17***	−0.22	−0.54**
Proportion graduate	7.90***	8.22***	7.94***	8.72***
R^2	0.77	0.80	0.76	0.79
n (occupation-year observations)	616	656	612	650

Note: Dependent variable: Average deflated male/female hourly wages in the occupation. Controls: average age, average tenure, proportion of workers from an ethnic minority, proportion of workers with school-leaving qualifications.

*$P < 0.1$, **$P < 0.05$, ***$P < 0.01$.

Table 2. Wage effect of proportion female, proportion graduate, and OFE on male pay at the individual level, ordinary least squares models (LFS 1993–2008)

Proportion female	−0.10	−0.16	−0.13	−0.03
Proportion graduate		0.76	0.83	0.22
Proportion female * Proportion graduate			−0.21	
OFE				0.08
R^2	0.41	0.48	0.48	0.53
n (individuals)			278,637	

Note: Dependent variable: Log of deflated hourly wages. Controls: Age, age squared, education, married, permanent job, full-time job, tenure, industry, public sector, firm size, region. All coefficients are statistically significant at $P < .001$

Table 3. Wage effect of proportion female, proportion graduate, and OFE on female pay at the individual level, ordinary least squares models (LFS 1993–2008)

Proportion female	−0.22	−0.02	−0.03	0.03
Proportion graduate		0.85	0.82	0.36
Proportion female *Proportion graduate			0.06	
OFE				0.08
R^2	0.44	0.53	0.53	0.56
n (individuals)		284,594		

Note: Dependent variable: Log of deflated hourly wages. Controls: Age, age squared, education, married, permanent job, full-time job, tenure, industry, public sector, firm size, region. All coefficients are statistically significant at $P < .001$

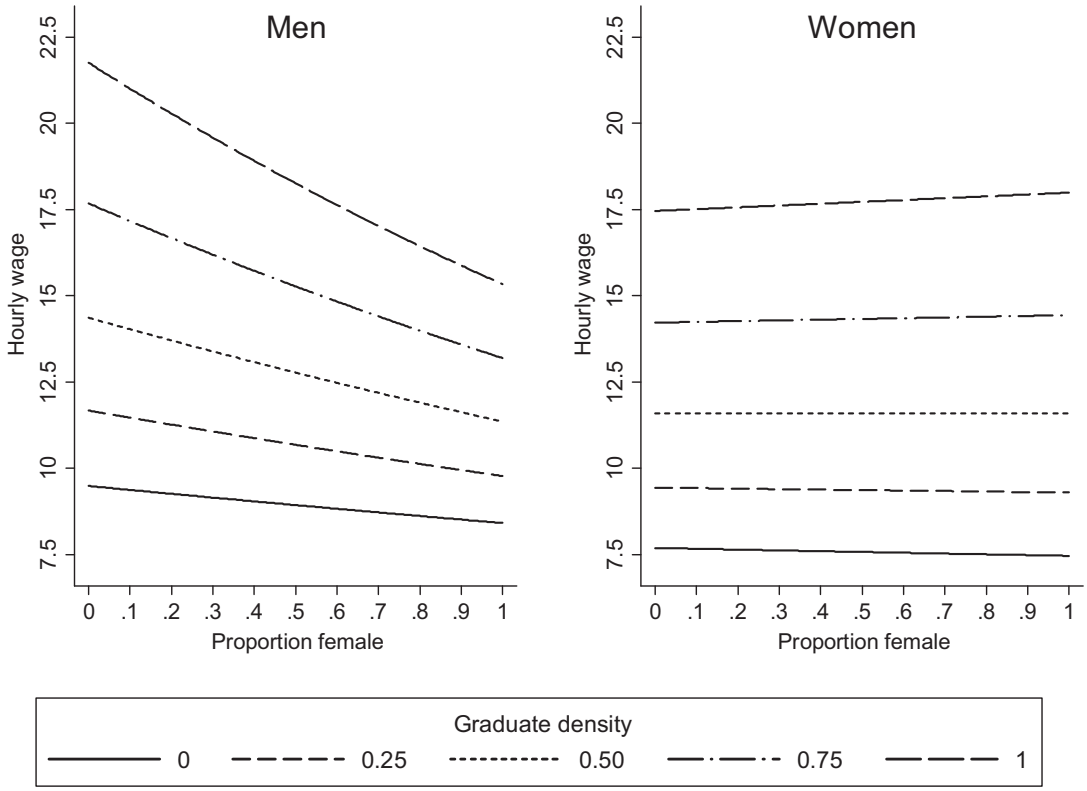

Figure 2. Visual representation of interactions between proportion female and proportion graduate in Tables 2 and 3, individual-level ordinary least squares models (LFS 1993–2008)

in part because employers increasingly demand graduate skills, but social demand for education might relate only poorly to employer demand (Brynin, 2013; Koppera and Mehta, 2014). Use of the indicator of underlying productivity proposed in Equation (4)—the OFE—enables us to get a clearer picture.

We add this term in column 4 and hence fit the model depicted in Equation (5). Its effect appears small, but this is relative to the variable's range (−£3.7 to £5.5). The result means that for every one-pound increase in unmeasured productive potential in an occupation, hourly wages increase by roughly 8 per cent. This favours men insofar as they tend to work in occupations with both higher wages and higher productivity. Nevertheless, the occupational fixed-effect term has an equally positive effect on the wages of both men and women. In this sense, productivity performance within occupations does not exacerbate gender inequality.

Also of note is that the inclusion of the OFE in the model greatly reduces the predicted wage advantage from work in graduate occupations. This implies that most of the graduate density effects are the result of differences in occupational productivity. More important, for both men and women the negative effects of occupational feminization on wages can no longer be observed, which suggests that the gendering of work *per se* does not influence their wages. The apparent wage penalties previously associated with occupational feminization result from a link between occupational gender segregation and productivity.

We conclude our main empirical analyses by fitting the 'dual fixed-effect' model suggested in Equation (6), using the BHPS. Results are presented in Tables 4 (men) and 5 (women).

The predicted wage effects of graduate density, occupational feminization, and the occupational fixed-effect term are, with some exceptions, similar to those estimated in the previous specification using LFS data. However, interesting differences emerge. First, the wage effect of occupational feminization on wages remains negative and statistically significant for both men and women in the presence of an encompassing set of statistical controls, including measures of graduate density, unobserved occupation-level productivity, and skill demands, as well as unobserved individual-level skills or capability. This provides indirect evidence for the continued devaluation of female-typed lines of work. Nevertheless, the estimated impacts of occupational feminization reduce to −0.04 for men and −0.07 for women, which means that a full reversal in the sex composition of a worker's occupation from 100 per cent 'male' to 100 per cent 'female' would only result in a 4–7 per cent contraction in his/her wages. This is substantially smaller than in much of the comparable worth literature (e.g. Groshen, 1991, Cotter *et al.*, 1997, Magnusson, 2009, Perales, 2013). Second, once the fixed effects are included in the model, graduate density has no wage impact for either men or women. This suggests that wage-enhancing unobserved factors are a better proxy for occupation-level skill demands than is the proportion of graduates in an occupation.

Non-linear and Other Differential Effects

Our theoretical set-up suggested that the wage effects of occupational feminization may be non-linear across different levels of skill demand and supply. We test this proposition by estimating models analogous to those in Tables 2 and 3 that (i) differentiate between graduates and non-graduates on the one hand and those who work in occupations with high and low high-graduate density on the other, and (ii) add second and third-order polynomials of the occupational feminization variable to capture non-linear effects. The results are presented in Table 6 and can be more easily interpreted by visual inspection of Figure 3.

Taking non-graduates first, increasing levels of feminization reduce both men's and women's wages for at least a part of the range. The overall result is though not far from flat. The same applies to individuals who do not work in graduate occupations. For graduates and those working in graduate occupations, the non-linear effects are much more visible, though relatively small in magnitude. Male graduates gain from working in gender-integrated relative to male-dominated occupations but, at higher levels of feminization, their wages worsen. The same applies to female graduates, but less so. As we have stated, education alone is not sufficient to counteract the devaluing effect of 'women's work'. However, where this work demands high-level skills, the effect is generally positive, above all for women, as we see from the uppermost curve in Figure 3. These results further demonstrate that graduate status does not protect against high levels of feminization, whereas working in a graduate occupation does.

Table 4. Wage effect of proportion female, proportion graduate, and OFE on male pay at the individual level, ordinary least squares, and fixed-effect models (BHPS 1991–2007)

	Ordinary least squares		Fixed effects			
Proportion female	−0.16***	−0.18***	−0.08***	−0.10***	−0.09***	−0.04**
Proportion graduate		0.65***	0.20***		0.18***	0.00
OFE			0.08***			0.03***
R^2/R^2 (within)	0.40	0.45	0.49	0.23	0.23	0.24
n (individuals)			4,642			
n (observations)			29,499			

Note: Dependent variable: Log of deflated hourly wages. Controls: Age, age squared, education, married, permanent job, full-time job, tenure, industry, public sector, firm size, region. *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.

Table 5. Wage effect of proportion female, proportion graduate, and OFE on female pay at the individual level, ordinary least squares, and fixed-effect models (BHPS 1991–2007)

	Ordinary least squares		Fixed effects			
Proportion female	−0.32***	−0.12***	−0.09***	−0.15***	−0.10***	−0.07***
Proportion graduate		0.84***	0.41***		0.24***	0.06
OFE			0.08***			0.03***
R^2/R^2 (within)	0.40	0.48	0.51	0.19	0.20	0.21
n (individuals)			4,961			
n (observations)			32,117			

Note: Dependent variable: Log of deflated hourly wages. Controls: Age, age squared, education, married, permanent job, full-time job, tenure, industry, public sector, firm size, region. $*P < 0.05$, $**P < 0.01$, $***P < 0.001$.

Table 6. Non-linear wage effect of proportion female on male and female pay at the individual level, by individual and occupational skill groups, ordinary least squares models (LFS 1993–2008)

	Graduates		Non-graduates		Graduate occupations		Non-graduate occupations	
	Men	Women	Men	Women	Men	Women	Men	Women
Proportion female	0.20***	0.06	−0.09***	−0.24***	0.34***	0.42***	−0.10***	−0.36***
Proportion female^2	−0.39**	−0.29	0.29***	0.40***	−1.01***	−0.90***	0.24***	0.51***
Proportion female^3	0.07	0.13	−0.30***	−0.15***	0.72**	0.58**	−0.26***	−0.16***
R^2	0.44	0.45	0.48	0.48	0.32	0.28	0.49	0.49
n (observations)	53,185	49,300	229,600	239,167	47,999	39,113	230,638	245,481

Note: Dependent variable: Log of deflated hourly wages. Controls: Age, age squared, education (columns 3 and 4), married, permanent job, full-time job, tenure, industry, public sector, firm size, region. $*P < 0.05$, $** P < 0.01$, $***P < 0.001$.

Discussion and Conclusions

Gender-based occupational segregation is clearly an important organizing principle within labour markets. There is overwhelming evidence for this, and indeed, we know much about the factors that have historically led to its emergence and preservation. A large body of research has demonstrated that doing 'women's work' has a negative impact on men's and women's pay, but how recent changes in the economic structure have affected these relationships is much less clear. Women, we argue, increasingly work in occupations to which the changing economic environment has been mostly beneficial.

First, we present important evidence of a rapid decline in the gender wage gap in the British labour market between 1993 and 2008. In this period, the gap halved. This movement towards pay equality was accompanied by a (not so impressive) decrease in occupational gender segregation. Between 1993 and 2008, the Index of Dissimilarity fell from 0.58 to 0.50. This makes the British example an interesting case study.

At the level of both occupations and individuals, our results indicate that the underlying demand for skills (in part captured by the percentage of graduates in each occupation but primarily by unobserved factors that influence wage growth within occupations) are gradually eliminating the predictive impact of occupational gender segregation on wages. On the other hand, the distinct and patterned effects of occupational feminization on wages in previous decades are not disappearing; they are instead evolving into a more complex constellation of processes, including differing impacts for graduates and non-graduates, and for employees in graduate and non-graduate jobs, as well as non-linear relationships across the spectrum of feminization. In our view, this makes understanding the role of gender and the gendering of occupations in determining labour market outcomes more rather than less important.

Our research contributes to current knowledge on underlying changes in the occupational structure, in particular through the use of OFE to approximate productivity. Nevertheless, this remains only an indirect proxy measure, and we cannot be certain what this represents: productivity, demand for skills, technological change, or demand for particular goods and services? There are also clearly other wage-enhancing factors that may be

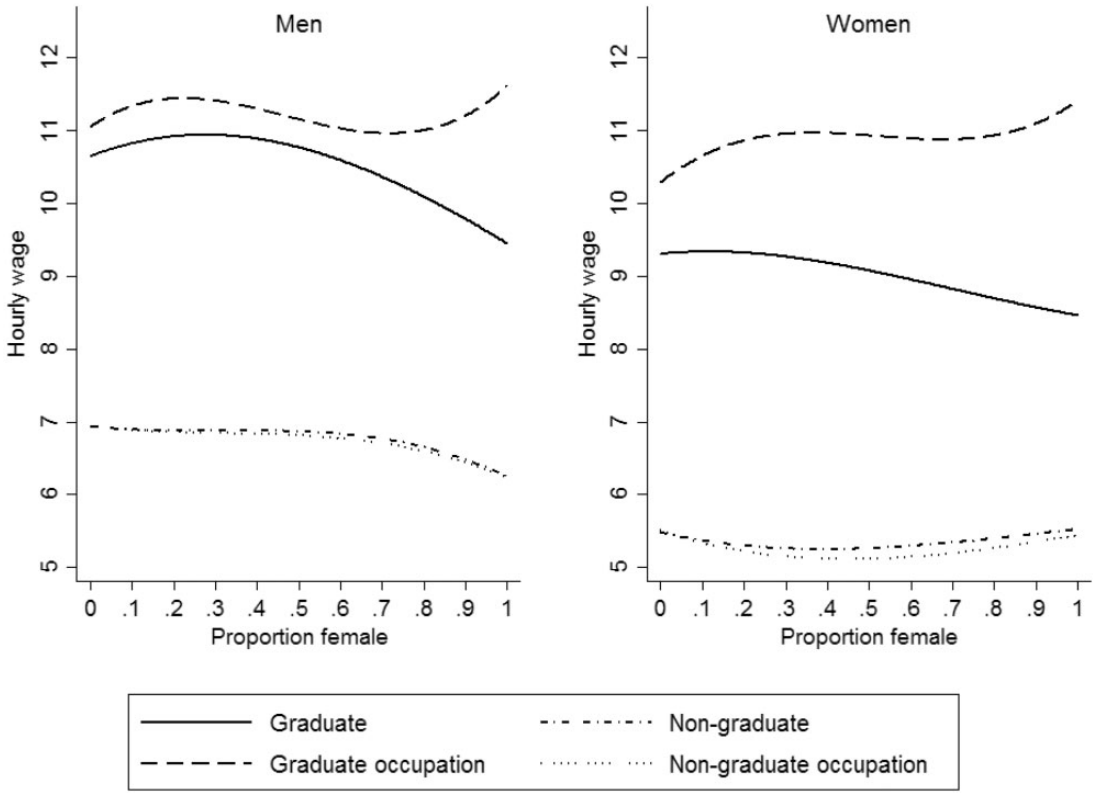

Figure 3. Visual representation of non-linear effects of proportion female on wages in Table 6, individual-level ordinary least squares models (LFS 1993–2008)

important. Above all, this measure is not informative as to the specific types of skill that play a role in wage determination processes. Nevertheless, our findings suggest that researchers should perhaps shift focus from the study of the extent and impacts of occupational segregation to the examination of gendered process of occupational change, in particular to what this means for changing valuations of both women's work and women's skills. These two concepts have different implications for women.

An earlier period of exploitation of female labour is giving way to an inexorable process of change. Previous research has stressed the importance of sociopolitical attitude change and gender mainstreaming policies in improving the situation of women in the labour market (England, 2010). Our findings complement this body of evidence by highlighting the role of exogenous transformations in the occupational structure and the distribution of skills, which could for instance reflect technological change or shifts in the global division of labour. These have in principle little to do with gender *per se*; yet, they have been important drivers of current trends towards gender equality at work. In this sense, arguments for a declining significance of gender in work outcomes are not misguided. Whether that will remain the case, though, particularly with the emergence of widespread economic recession, is uncertain.

The improvement in women's labour market standing has been steady but not overwhelming; changes in the occupational structure have also almost exclusively benefited highly educated women. Even if these women are an increasing proportion of the female workforce, many poorly educated women work for little reward. Thus, while women's work is not devalued across the board, the power of occupational segregation to reduce the welfare of women unable to benefit from the rising demand for female skills is a continuing concern.

Notes

1 An alternative view is offered by 'queuing theory' (Thurow, 1979). This posits that women are concentrated in a smaller number of occupations than

men, which increases competition amongst women for jobs and also employers' power to set comparatively low wages in female-dominated occupations (Fernandez and Moors, 2008).

2 One further prediction of devaluation theory is that, at least if female *skills* are undervalued, there should be excess female overqualification. Overqualification is common amongst both men and women (Borghans and de Grip, 2000; Korpi and Tahlin 2009), but there is only limited evidence of a gender differential in its incidence or wage effects (e.g. Olsen *et al*, 2010: 33–41).

3 It must be noted that not all available research evidence supports this notion. For instance, de Ruijter, van Doorne-Huiskes, and Schippers (2003) find that even though female-dominated occupations often suffer labour shortages, wages in female-dominated occupations where skills are in demand are in fact relatively low. This is however the Dutch case, where regulatory forces have a strong wage impact.

4 Koppera and Mehta (2014) also find, as does Goldin (2008), that what benefits men in the long term is work experience. With low work experience, the college premium is almost equal between men and women, but as this rises, so does the male advantage. This may be responsible for the higher returns to education for men noted above in several countries.

5 A specific example of change in the structure of an occupation in Britain is the printing industry, a traditionally male-dominated, skilled, highly paid environment. Technological developments that made this industry obsolete simultaneously raised the demand for computer skills, and therefore the rewards offered in highly computerized, less male-typed occupations such as journalism, graphic design, and publishing (Cockburn, 1983; Brynin, 2006).

6 The British occupational coding system underwent substantial modification from SOC90 to SOC2000 in 2000, which means that there is little comparability between specific occupations before and after this. Our analysis is, though, not of specific occupations but of occupational characteristics at a comparable level of occupational aggregation, minor occupational groups (81 in SOC90 and 88 in SOC2000). We therefore assume comparability over time. While it is possible that the coding change has some influence on the results, this is unlikely, as robustness checks using several time points show consistent trends.

7 This tackles in a different way the problem addressed by the multilevel models of de Ruijter, van Doorne-Huiskes, and Schippers (2003). These similarly allow for simultaneous variation at both the individual and occupational levels, but make strong distributional assumptions about the occupation fixed effects.

8 The mean feminization level is substantially higher amongst female non-graduates (68 per cent) than amongst female graduates (57 per cent). This could suggest that educated women gain from doing 'men's' work, but as the figures for men are only 27 and 38 per cent, respectively, the implication is a growth in 'female' graduate jobs.

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