The gender gap in wages over the life course: evidence from a British cohort born in 1958

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Funding

We thank UCL for seed funding and the ESRC for grant funding (grant number ES/S012583/1).

Acknowledgement

We would also like to thank the members of the 1958 birth cohort for their cooperation.

ABSTRACT

We trace the gender wage gap (GWG) though a mid-life peak for a cohort born in Britain in 1958 (NCDS) to quantify their life course experience of equal and unequal opportunities. Taking hourly pay of full-timers and part-timers together, an initial gap between men and women widened substantially during childrearing years. Much, but not all, of the GWG is attributable to divergent work experience, especially in mid-life. Education-related differences are minor. Family formation primarily affects the GWG through gender differences in work experience. Family composition is similar for male and female workers, but it attracts opposite wage premia. The GWG however is not only linked to family formation. There is a sizeable GWG on labour market entry and there are some otherwise unexplained gaps between the pay of men and women who had not (and did not) become parents, belying the notion that unequal wage treatment is confined to parents.

KEY WORDS: gender wage gap; work experience; life course; family formation; NCDS birth cohort

INTRODUCTION

Unequal rates of pay between men and women underpin gender inequality within and beyond the labour market, whether one takes the viewpoint of New Home Economics or a feminist theory of patriarchal power (Mincer and Polachek 1974; Walby 1990). Unequal pay offers disincentives to educating girls, and to women taking up training. It reinforces a gendered division of labour in the home and unpaid caring. Unequal pay implies economic vulnerability of families who depend on women's earnings, particularly lone parents, and affects the adequacy of women's pensions in old age. Many governments have intervened

in the labour market to tackle the gender wage gap (GWG) through legislation to squeeze out discriminatory practices that may underlie at least some of the gap. The relative pay of men and women has been slowly converging in the UK, as elsewhere (Kunze, 2018). The implementation of the UK Equal Pay Act in 1975 was marked by an abrupt drop of the raw gap, roughly from 40% to 30%, of men's hourly earnings. By the end of the 2010s, taking full and part-time work together, the raw GWG is around 17% (Office for National Statistics, 2019; Bryson, Joshi, Wielgoszewska and Wilkinson (2020).

The raw GWG continues to be a source of concern, witness the public outcry at the size of these gaps reported by larger firms in response to the government's Gender Pay Audit. [1] Assuming the operation of a fully efficient labour market, workers would be paid their marginal product, such that differences in hourly pay rates would reflect workers' human capital in terms of qualifications and work experience. The gap in formal qualifications between men and women, which favoured men entering the labour market until the 1990s, has reversed. The gap in work experience has reduced, as women return to employment more quickly after childbirth, more often into full-time jobs (Roantree and Vira, 2018) and mothers' employment rates rise towards those of fathers (ONS 2017). Yet, in spite of these trends, studies which condition on human capital continue to find a residual GWG, prompting speculation about the source of this underlying gap, and the appearance of a 'glass ceiling' stalling women's wage progression in mid-life.

A Brief Literature Review

The gap unexplained by human capital may be attributed, at least partly, to discriminatory employer practices. Audit studies show that employers tend to discriminate, consciously or

not, against women in their hiring and promotion practices (Mullany and Yoong, 2017). Legal cases, as well as some experimental studies, show that employers discriminate against women in pay setting for jobs of equal value (Azmat and Petrongolo, 2014, review the literature). Sexual harassment in the workplace can reinforce the GWG (McLauglin, Uggen and Blackstone, 2017).

However, the GWG is also likely to reflect wider societal expectations about gender roles, which result in different labour market aspirations for young men and women, leading to differential investments in human capital, different occupational choices and, perhaps, differences in labour market attachment. Still, even when these factors are accounted for, a residual gap persists (Adda, Dustmann and Stevens 2017). Men and women combine employment and family life in different ways. Their choices, given gendered constraints (Folbre, 1994) are a major, but perhaps not the only factor behind the GWG. The GWG itself may reinforce prevailing sets of gendered expectations and practices in society at large (Brueghel and Perrons, 1995).

According to Becker (1985), actual and anticipated domestic roles give men and women different incentives to invest in 'effort', resulting in differential pay and reinforcing the domestic division of labour. That differential pay remains associated with parenthood, when other gender inequalities in the labour market weaken, is illustrated empirically by Goldin (2014); Blau and Kahn (2017) and Juhn and McCue (2017) for the USA; and by Costa Dias, Joyce and Parodi (2020) for the UK. Pay penalties in the UK are particularly pronounced for women returning to part-time employment after a break. Some maintain that these patterns reflect women's preferences for work-life balance (Hakim, 2000, critiqued among others by McRae, 2004). Conventional norms about domestic roles lead women, but not men, to seek flexibility in their work schedule for which they are prepared to accept lower

rates of pay as compensating differentials (Goldin 2014). Discriminatory practices, such as fewer opportunities for training or promotion in part-time jobs (Manning and Petrongolo, 2008), or women's limited ability to search for a better job match (Manning and Swaffield; 2008; Addison, Ozturk and Wang, 2014) may apply particularly to women with family responsibilities (Blau and Kahn 2017). Under prevailing cultural norms, women may be less likely to apply for promotion, less likely to get it, and face, perhaps unconscious, discrimination in appointment to higher paid jobs (Babcock and Lashever, 2003; Mullany and Yoong, 2017). The role of gender differences in personality has been investigated but found to be minor (Manning and Swaffield, 2008; Risse, Farrell and Fry, 2018).

Recent studies indicate that the gap between men's and women's pay widens considerably on entry to parenthood (Costa Dias et al., 2020; Lucifora et al., 2018; Kleven et al., 2019). Additional children lead to further wage penalties for women (Harkness, 2016) which may, however, be ameliorated by maintaining employment continuity through maternity leave (Waldfogel, 1998; Joshi, Paci and Waldfogel, (1999). Women's lifetime earnings losses, through lower wages , hours and participation associated with childrearing, are substantial (Adda et al., 2017; Rake, 2000). The raw GWG varies by age: it has a life course profile, which tends to shift down over time, across cohort. Within-cohort the GWG tends to rise to a mid-life peak, falling back somewhat thereafter. Taking official labour market statistics for the UK on the broad 'Baby Boom' cohort born 1946-65, Gardiner (2017) shows the gap in hourly pay rising from around 15% of men's in the early twenties, to a peak around 35% in the early forties, then falling back [2]. A similar trajectory is plotted for cohorts born in the first two post war decades in USA by Goldin (2014, Figure 1), with a peak gap in mid-life also around 35% (albeit for full-year, full-time annual earnings).

This Paper

The contribution of this paper is to unpack the GWG over the life-course. Studies which rely on cross-sectional data to compare the wages of workers of particular ages born at different times cannot easily distinguish age from cohort effects. Here, by contrast, we focus on change over one cohort's life course, which is a combination of their own ageing and the passage of historical time, but also fairly typical of the broader generation born in the Baby Boom.

We ask whether the widening gap in men's and women's wages from their twenties onwards is fully accounted for by unequal accumulation of human capital and family responsibilities. Any 'residual gap', not accounted for by human capital and family responsibilities, can be thought of as 'unequal treatment' of equally qualified persons, even those without children. An unexplained, possibly discriminatory, male premium would contribute to differing opportunities for mothers and fathers in the labour market and reinforce traditional patterns in the choice of who works longer hours and who takes parental leave. It would also mean that women who do not have children might not completely escape the pay penalties of being female, contrary to the notion that the penalty remains only in gendered family responsibilities.

We chart the pay gaps and employment histories that have been uniquely recorded for a cohort who entered the labour market in the mid-1970s and has been followed over four decades. We explore the obstacles that have faced women born in 1958 over their careers to age 55 in 2013. This cohort, the National Child Development Study (NCDS), entered the labour market as the Equal Pay Act and other equal opportunity policies came in. Women were catching up with men on educational attainment (and overtaking them at school level) but males continued to outnumber females at university entry well into the 1980s (Smith 1985). This cohort also lived through a time when choice and control over fertility had

advanced. They had fewer children, at a later age, than their parents' generation but more and sooner than the cohorts which followed them. The cohort were in their forties when a fresh set of policies was introduced around 2000 to facilitate flexible parental employment and public support for children's early years. Most of the women in this cohort would have had their children already in a less 'family friendly' policy environment. The lowest paid women, mostly part-timers, would have benefitted from the introduction of the National Minimum Wage in 1999 (Dex, Sutherland, and Joshi, 2000)). Women would have started their careers under the 1975 State pension legislation contributing in their own right.[3] Changes in since then mean that neither women nor men are able to claim their state pension until they are 66 in 2024. In a wider context, including cohorts still in mid-career, maternal employment has risen, and the GWG has declined. Our focus here on the connection of these phenomena within a single cohort provides a starting point for understanding developments for later cohorts as well as the pension prospects of women born in the Baby Boom.

The NCDS at age 33 has already been a source for research on the gender pay gap, as cited by Joshi, Makepeace, and Dolton (2007). That piece also used the wage data collected in 2000 when the cohort was 42. It considered workers in full-time employment only, to focus on a group thought most likely to benefit from equal opportunities. Although work experience continued to diverge between male and female employees, so did the estimate of unequal pay that controlled for human capital. The estimate of a gender premium in log pay of around 15 points at 33 rose to 18 points at 42. The subset who had been in full-time employment at both points had attributes implying a similar penalty. Dex, Ward and Joshi (2008) analyzed further the sub-sample of NCDS whose wages were observed at both 33 and 42 in full-time work and on whom occupational data were also available. The dependent

variable was the log of wage growth between those two ages, controls included occupation, as well as change in human capital and family circumstances. The results demonstrate men getting ahead in higher-level occupations, over a stretch where women within the cohort appear to be facing a 'glass ceiling'. This suggests that the absence of women in top jobs would not just be a 'cohort effect' to be eliminated by the succession of better achieving cohorts, but requires attention to career progression within cohort

This paper accounts for the GWG, all the way from age 23 to age 55, in terms of human capital and family formation variables, providing a unique life-course insight into the relative fortunes of women in the labour market. We are adding to the evidence not only new data points after age 42, but a harmonized set of data over five surveys, and a consistent, though simple method of analysis. We do not exclude part-timers from the main story. Our results confirm that family formation exacerbated this cohort's GWG. This operated mainly via its association with work experience, particularly women's shorter record in full-time work. Unequal treatment was amplified in the asymmetric remuneration, all else equal, of mothers and fathers, wives and husbands. But the gap was not just a matter of family formation. There was a sizeable unexplained pay gap on labour market entry, pre-parenthood, and there was still a gap at age 55 between men and women who never became parents.

METHOD

The objective of this paper is to marshal the descriptive evidence on the composition of the GWG in terms of human capital and family composition.

We estimate log hourly wage regressions for those observed in employment at the time of each survey with non-missing data on the dependent variable in a series of models.

The explanatory variables in all models include dummies for highest educational qualification - whether academic or vocational equivalent (NVQ levels 1 to 5) - achieved by the time of each survey. They also include controls for the number of times the cohort member has appeared in the wage estimation sample in previous surveys (a rough allowance for unmeasured characteristics associated with repeated observation in the unbalanced panel) and a dummy for residence in London or the South East (a rough allowance for regional price levels). As qualifications are the focus of interest in this baseline model we label the block of variables 'ED'. The set of work experience variables 'EXP' includes the number (and its square) of months that cohort members had worked in full-time and part-time jobs separately up to each survey. This allows for the low pay returns to part-time work experience (Neuburger, 2010; Costa Dias et al., 2020). Inclusion of the length of tenure of current job could reveal returns to job specific skills, or alternative returns to changing employer. The family composition variables (FAM) indicate the current presence in the household of a partner, and of children at various ages; and whether the cohort member had ever reported a child in the household, even if no longer present. We count any co-resident dependent child, assuming that those who might be adopted, fostered or step-children would present similar constraints to parental employment as natural children, and that biological offspring not in the household do not. Model 1 includes educational qualifications and controls (ED) at the time of interview; Model 2 adds work experience to Model 1 (ED+EXP); Model 3 drops experience and introduces current and past family responsibilities (ED+FAM). Our full Model 4 includes them all (ED+ EXP+ FAM).

Wage regressions are run for men and women pooled, interacting the female dummy with all other explanatory variables in the model. These fully-interacted linear models (FILM,

programmed by Leuven and Sianesi, 2004), estimated in STATA, allow values for all parameters in the model to vary by gender, whose difference can be tested.

Equations of the following form (for the fullest model) are estimated at each of five ages:

$$W_i = \beta_0 + qual_i.\beta_1 + qualmiss_i.\beta_2 + obs_i.\beta_3 + LonSE_i.\beta_4$$

$$+ftdur_i.\beta_5 + ftdursq_i.\beta_6 + ptdur_i.\beta_7 + ptdursq_i.\beta_8 + tenure_i.\beta_9 + tenmiss_i.\beta_{10}$$

$$+ partner_i.\beta_{11} + everchild_i.\beta_{12} + childage_i.\beta_{13} + u_i$$

$$with\ E(u_i|x_i) = 0$$

The *ß* parameters are estimated separately for each sex in the full interactions but are not shown for simplicity. Definitions of each variable are in the Supplementary Appendix.

We decompose the GWG between men and women using Oaxaca-Blinder decompositions based on separate regressions for men and women. This divides the GWG into the part associated with individual attributes and the part associated with unequal coefficients (including constant terms), and any interaction between them. We weight the differences in model coefficients, $\beta_m - \beta_f$, by the mean attributes of the female sample at each age, thereby estimating the gain women would have if paid like men, which can be thought of as the 'price of being female'.

Formally, the decomposition takes the following form:

$$GWG = [E(X_m) - E(X_f)]' \beta_f + E(X_f)'(\beta_m - \beta_f) + [E(X_m) - E(X_f)]' (\beta_m - \beta_f)$$

Characteristics Coefficients Interaction

The X terms are the various combinations of ED, FAM and EXP introduced into our regression models. The interaction term picks up any correlation between the X and coefficient gaps.

We undertake additional analyses for three sub-groups: those in full-time employment at the time of survey (who might be assumed to have high labour force attachment); employees who had no children in their home by a given survey; and those who never had children at any survey.

Our estimates are an accounting exercise to map the correlates of unequal pay over the life cycle and to establish empirical regularities, as advocated by Goldthorpe (2001). We make no efforts to recover causal estimates of the influences on the GWG, though we recognise that many choices regarding human capital and family investments are endogenous with respect to earnings potential. We do not adjust for sample selection, either in terms of survey response or employment participation.[4] That said, we do estimate the GWG for those in full-time employment and compare those results to the full sample, thus shedding some light on the role of labour market attachment and structure. Occupation is another important feature in the literature which we set aside. Although it is commonly added to human capital models of wages, assignment to gender-typical work may itself be discriminatory or reflect worker preferences (Goldin 2014; Blau and Khan 2017). We originally included two-digit indicators of occupation, but did not retain them. They made

little difference to explaining the GWG, differentials being more important within these categories than between them.[5] Thus, the residual, 'adjusted', value of the GWG, that emerges as the combination of coefficient differences, may to some extent reflect occupational segregation. It may also reflect a whole host of other factors that may differ between male and female employees and may attract differential remuneration: such as, subject and place of study, cognitive and soft skills, the organisation of the workplace, commuting opportunities, and health of self or family members. The possibility of omitted factors should be borne in mind when interpreting the results.

DATA

Our data are drawn from NCDS, the British National Child Development Study (University of London, 2008a-d, 2012, 2015). NCDS is a nationally representative cohort study of people born in 1958 (Pearson, 2016). We track the wages of those in employment at ages 23, 33, 42, 46, 50 and 55. Unlike cross-sectional data, the NCDS also allows us to place observed wages in the context of what the informants had done in the past.

The cohort study began with 17,414 births in a single week of 1958.[6] There was a net loss of informants by 1981, where our study starts, with 12,537 respondents aged 23 (Table 1). . The achieved sample suffered further losses through death, emigration and other attrition. Some cohort members who were absent at one sweep participated later. At age 55, 9,137 cohort members responded. All but the telephone survey at age 46 involved a home interview. The number of current employees in each sweep is somewhat lower, and the estimation sample is still smaller due to missing data on wages. We also excluded outliers at the top and bottom percentile of each sweep's wage distribution, a common practice to

deal with potential measurement error among outliers. The final estimation sample for men runs from 4,263 at age 23 to 2,346 at age 55, and for women from 3,585 to 2,546.

Over 6,000 men and women provide wage data at some point, but only 808 men and 551 women do so in all five interview sweeps. Thus, intermittent membership of the panel is the norm for men as well as women, though to a greater extent, as one would expect, among the women.

Wages

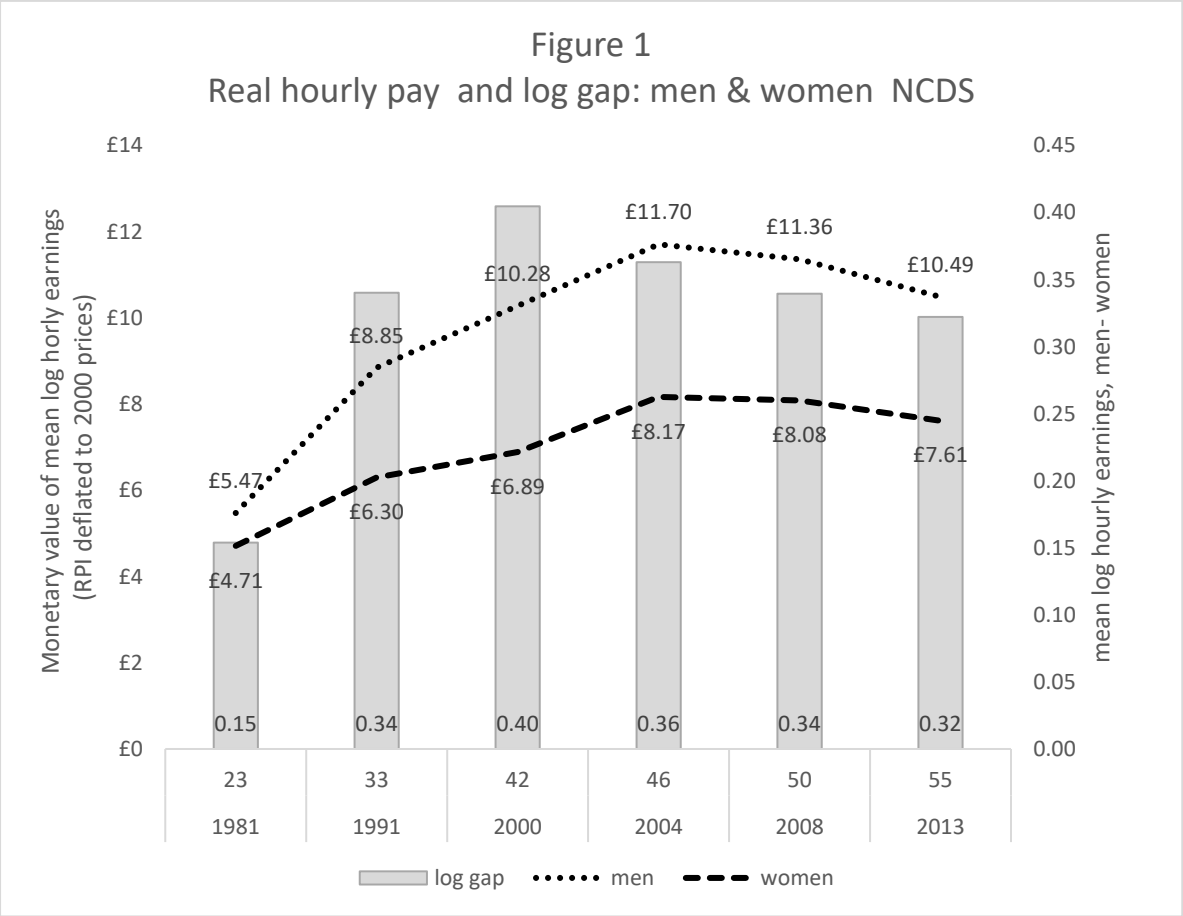


Figure 1 shows real hourly mean pay for men and women for those with wage data at each survey sweep. The grey bars indicate the raw gap in mean log hourly earnings between men and women. Real wages for both men and women grew until their mid-forties, with men's rates of pay rising faster than women's until both fell back slightly in their fifties. Among

employees at age 23, men's mean log hourly earnings exceeded women's by 15 log points. The gap had grown to 40 log points by age 42 in 2000, but by age 55 in 2013 it had closed somewhat to 32 points. The data for age 46, though shown in Figure 1, are discarded in the regressions, due to the high level of missing wage data (see Table 1). £'s express the monetary value of the log mean hourly wage, (deflated to 2000 prices by the RPI).

These estimates of the pay gap are reasonably close to those for the broader Baby Boom generation already cited from Gardiner (2017), 15% around 23, rising to 35% at 42 and receding to 25% at 55. The NCDS GWG trajectory, expressed as percentages of men's pay, starts at 14%, rises to 33% and falls back to 28% at 55. The two sources diverge more at age 33, the GWG in 1991 from the New Earnings Survey (NES) standing at 24% whereas this survey stood at 29%. Such a discrepancy is in line with the particularly large proportion of our 33-year-old employees working very short part-time hours, which is likely to have put them below the weekly earnings threshold of NES coverage.

Table 1 here

RESULTS

Before presenting the regression-adjusted wage gaps, we introduce the key independent variables, namely educational qualifications, employment experience, and family formation.

Educational qualifications

NCDS men and women entered adulthood with similar levels of tertiary attainment in their twenties (Makepeace, Woods, Galinda-Rueda, and Joshi 2003)). With time, more cohort members acquired tertiary qualifications - from around one in six at age 23 to around one in three by 42, partly due to the acquisition of further qualifications (Jenkins, 2017) and partly

due to selective attrition. The proportion with tertiary qualifications in the wage sample is greater than in the cohort as a whole, consistent with positive selection into employment (see Table 1) Male employees' qualifications tend to be higher than female employees' except at age 23. Among women at that age, the difference between qualifications of employees and the whole sample of women was particularly pronounced, reflecting the higher employment participation rates of more educated women. Table 1 summarises the percentages with qualifications at Level 4 or 5, but the regression analyses include a full battery of six qualification levels (see Supplement Table A1).

Employment experience

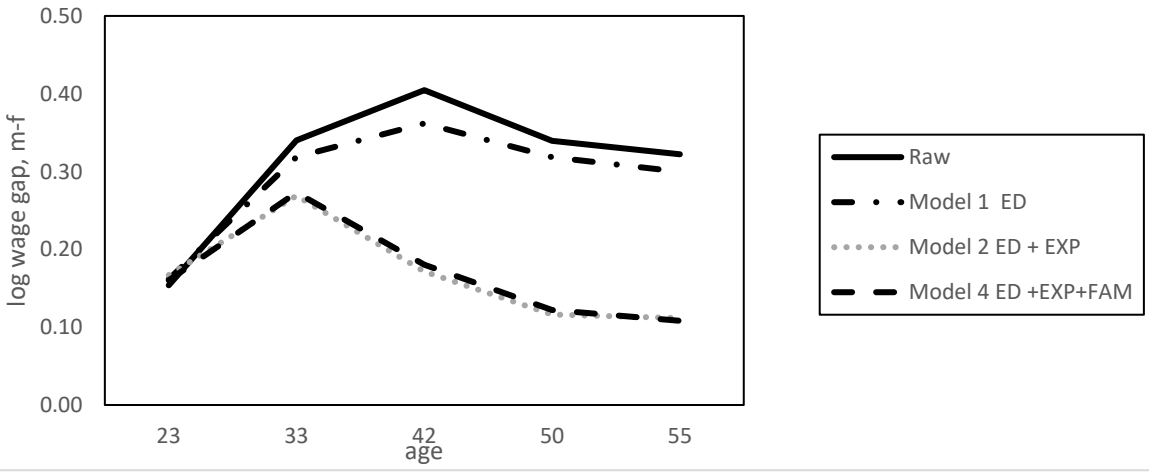
Many of the mothers who had returned to employment mid-life worked part-time (30 hours per week). The men in the sample worked almost exclusively full-time, with negligible rates of part-time employment at the survey snapshots. The proportion of women employees in part-time jobs was always substantial, particularly at age 33 (45%) and age 42 (40%). The mean full-time work experience of men in the wage sample grew steadily to 35 years at age 55, compared to 21 years' experience for women employed at age 55. They had accumulated 10 years of part-time experience on average, compared with just 7 months for men. The block of work experience variables also includes time spent with the current employer. Women employees' average job tenure is lower than men's but, like men's, rises with time.

Family

We characterise family responsibilities on the basis of household composition. At 23, the women in the wage sample were more likely than men to have a partner (53% vs 43%), but from age 33 onwards around eight in ten of both sexes in the wage sample were partnered.

At 55, 85% of the men had partners against 78% of women, perhaps reflecting more remarriage among men.[7] We account for the presence of dependent children (i.e. under 16) in the household at each snapshot survey regardless of whether they are the biological offspring of the cohort member. At 23 only one-in-six men in the cohort had such children, women twice as many. At 42, 68% of men and 80% of women had dependent children at home. The difference reflects childbearing starting earlier for the women and their higher likelihood of single parenthood. By age 55, later fatherhood meant more men than women in the cohort currently had children in the home (46% vs 43%). But over four-fifths of men and women (80% and 84% respectively) had had a child at home at some point. The proportion of men, and older women in the wage sample with dependent children is much the same as for the cohort at large, whereas for younger women up to age 42, the proportion with children is lower. Further details in Supplementary Tables A1 and A4.[8]

Figure 2 Raw and unexplained gender wage gaps: human capital and full models



REGRESSION-ADJUSTED WAGE GAPS

Estimates of the three components of all four models were made for 5 age samples (Supplementary Table A2). The main results are summarised in Figure 2. The five raw wage gaps, shown in bars in Figure 1, reappear as the top line in Figure 2 which also shows the estimates of the residual GWG after adjustments for the blocks of variables in the step-wise regression. The adjusted plots are the gaps in coefficients weighted by average female characteristics, which represent an estimate of unequal treatment for a given endowment. Gender differences in ED (education with the baseline controls) make only a few log points difference to the explanation of the raw gap, as shown by the proximity of the plot for Model 1 adjusted gap to the the raw one. The addition of the other conventional human capital terms, experience, in Model 2 (ED + EXP) makes a major contribution to the account of the gap at all ages beyond 23. The inclusion of FAM terms in the full model 4 makes hardly any difference to the residual GWG, witness the lines for Models 2 and 4 (grey dots and black dashes) being more or less identical. The addition of FAM terms without EXP (Model 3) also makes virtually no further difference. It is not plotted, for clarity, as it lies almost exactly along the path of Model 1. The lack of explanatory contribution from family status 'endowments' reflects the similar family composition of male and female workers at a given age, whereas the employment experience of men and women diverges.

At age 23, at around 16 log points, there is little difference between the raw GWG and any of the adjusted GWGs, , and relatively little at 33. The explained gap (between the raw and fully adjusted wage in model 4) widens as time passes between age 33 and age 50, accounting for around half the raw gap at 55. The main source of divergence is employment experience. The residual GWG that is apparent in Model 4 when all controls have been

introduced (represented by the dashed line) rises 11 log points between ages 23 to 33 to 27 log points, but then falls again by 9 log points by age 42. It continues to decline gently but remains at 11 log points by age 55 (equivalent to 10 percent of men's wages).

The decomposition of pay gaps into those accounted for by endowments, coefficients, and their interaction, in all 4 models, is reported for reference in Table A2. The interaction term is generally quite small.

Table 2 here

Using Model 4, Table 2 takes a closer look at how blocks of explanatory variables account for the GWG. Negative terms represent cells where women do better than men (e.g. on the education endowment for employees at 23). As is apparent in Figure 2, the gap in educational attainment between the men and women makes a relatively small contribution to the endowment gap, and the gap in returns to education, summarized in the coefficients gap, is also relatively small (and generally insignificant). Work experience accounts for most of the endowment gap, except at age 23 (when experience had hardly begun accumulating). The coefficients on the experience terms generally favour men, but the difference is only statistically significant at age 23. While the family terms contribute little to the endowment gap, they are an important and well-determined part of the gap in coefficients, reflecting differential remuneration of men and women with given family responsibilities.

Drilling further down into the coefficients gap in Model 4 (fully reported in Table A3), we focus first on estimates for each term in the family status block. Having a partner appears to attract a higher wage premium for men than women across the life cycle. All else equal, this accounts for 5 log points in the GWG at age 23, 2 points at age 42, and 8 points at age 55. This could be due to the labour market perceiving partnered men as more productive than

partnered women. Alternatively, it might reflect low paid men having relatively less success in finding or keeping a partner. The indicator of parenthood attracts opposite signs for fathers and mothers from age 33 onwards. For example, at age 42, fathers, all else equal, receive a pay premium of 0.082 in the logs relative to men who are not (yet) fathers, while mothers face a penalty of -0.094, resulting in a coefficient gap of 0.176. However, this term has to be evaluated alongside the variables indicating the presence of children by age. For a 42 year old living in a household with children all in the school age range (5-15), fathers earn +0.110 (i.e. 0.082+0.028) more in log hourly earnings than their child-free counterparts. Mothers, on the other hand, earn -0.104 (i.e.-0.094-0.010) less than child-free women. This yields an adjusted GWG among such parents of 0.214. However, women employees with younger children are estimated to be less poorly paid, which is enough to offset the gender gap in coefficients at 33 and 42, if there are only children under 3 present. This may be picking up the protective effect of remaining in employment over childbearing. Employment continuity at this juncture might have been facilitated by taking maternity leave.[9] An alternative explanation for the reduced wage penalty for older mothers who participate in the labour market in children's earliest years is positive selection due to especially high earning ability, not fully captured elsewhere in the model. At age 55, dependent children had largely departed the home, but the legacy of their having been there remains. There is a coefficient gap for mothers relative to fathers of 8 log points at both 50 and 55, the pay of mothers relative to men and women who have not had children is also reflected in the lower employment experience of mothers.

The coefficients on the experience terms reveal positive returns to full-time experience and negative returns to part-time employment (at least in the linear terms) but little significant difference in these returns for men and women. The few men with experience in part-time

jobs face a similar penalty to women from part-time experience. Years in the current job generally attract no more than a modest addition to the returns to employment in general. These modest estimates are higher for women than men, but only significantly so at age 23. This is consistent with the idea that women gain from staying with the same employer while men are more likely to gain from 'job shopping', at least in early stages of labour market life. This may reflect the protective effect of maternity leave for women, but needs further investigation

The more attached vanguard

We consider three sub-samples of cohort members who might be more attached to the labour market: full-timers and two definitions of people without co-resident children: those who had no child to date and never parents (Table 3).

TABLE 3 here

Full-timers

The sample of full-timers excludes very few men but a sizable minority of women from age 33 onwards. Figure 3 compares both raw and adjusted GWGs for the all employees and those for full-time employees. The raw GWG for full-timers is less than the GWG for the whole sample, suggesting some of the female pay disadvantage arises from low wages in part-time jobs. However, the adjusted GWG between full-timers and the whole sample is, perhaps surprisingly, virtually indistinguishable at ages 42, 50 and 55 when conditioning on the full set of controls of model 4. The adjusted gender premium at 42 (0.189), is of a similar order of magnitude as found in an earlier version of the data (Joshi et al, 2007), at 0.182. The data from ages 50 and 55, reveal only a small decrease in the gender penalty as age and labour force experience accumulated. This suggests that the glass ceilings detected

between 33 and 42 by Dex et al. (2008) continued to operate, although a few latecomers may have made it into higher paying careers in their late forties. The smaller GWG among full-timers at age 33 was not surprising as it is in line with earlier studies focusing on this sweep (Joshi and Paci, 1998 and Neuburger 2010). Both the raw and adjusted GWGs are considerably smaller if working full-time among those aged 33. The penalty to part-time wages seems to have been particularly marked at age 33. This could be due to the high proportion in very short time jobs, noted above. Another consideration is that this sweep in 1991 was before the National Minimum Wage of 1999, which would have put a floor under low part-time wages.

Figure 3 Full-timers and all employees: raw and adjusted GWGs (full model)

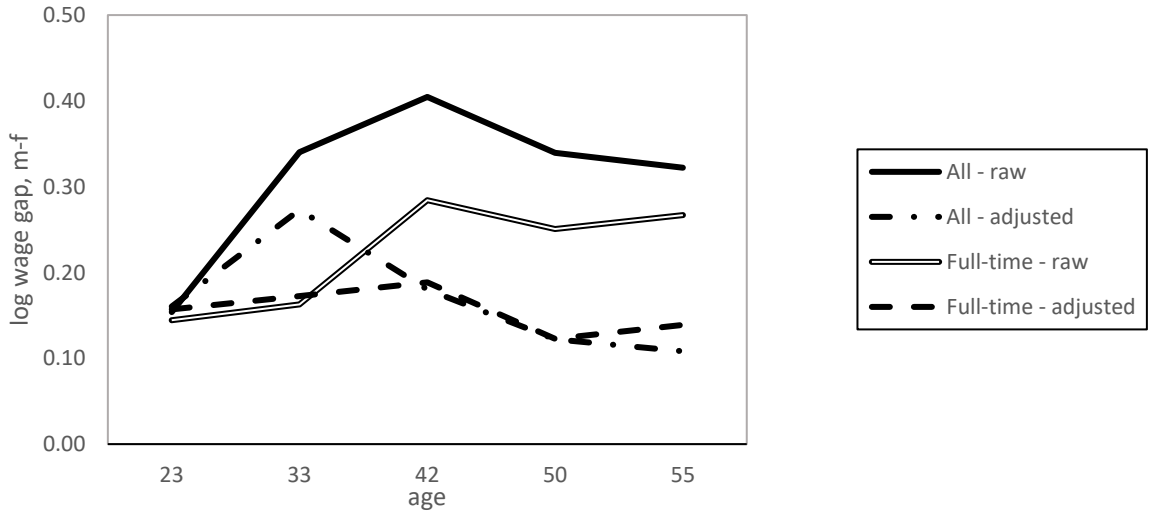


Figure3 here

No Parenthood

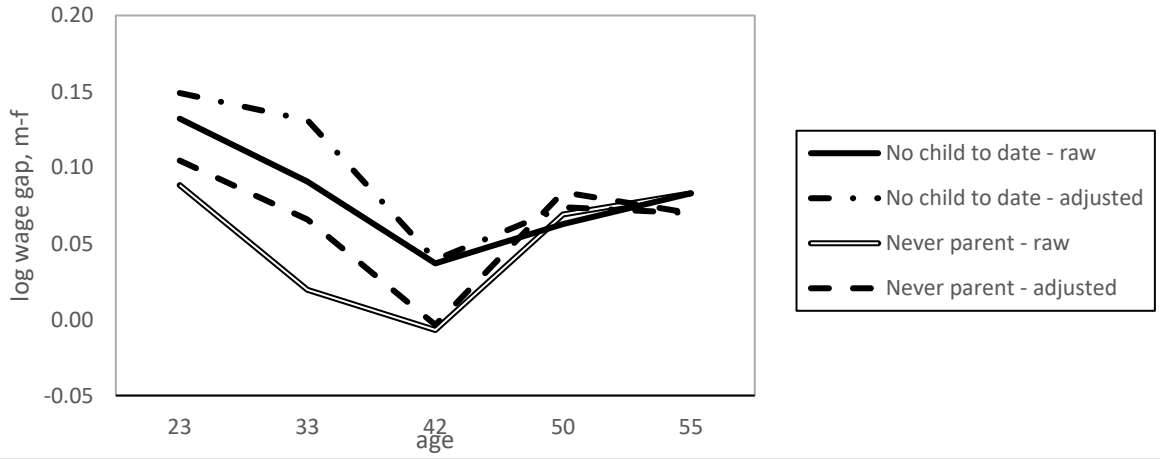
The second sub-group we consider, labelled 'No child to date', are those who at the time of the survey did not have dependent children in the home and had not had them in the past.

Isolating them from the general sample yields an estimated GWG which is lower than for parents at the same point in the life-cycle and takes the opposite shape – U- shaped rather than the inverse. However, a gap remains. Figure 4 shows the raw gap stands at 13 log points at age 23 and 9 points at 33, compared to 16 and 34 among the whole cohort (Figure 1). Adjusted for human capital and partnership (in Model 4) the estimate of unequal treatment goes up to 15 log points at 23 and 13 log points at age 33, reflecting a correction for the relatively favourable human capital of women who had not (yet) become parents. At 42 the raw and adjusted pay gap among those who had not (yet) had children in their home drops to statistical insignificance but the gaps then re-emerge, with very little difference between raw and adjusted around 7 log points at ages 50 and 55. Analysis incorporating the health of cohort members and their family members is beyond the scope of this paper, but will be included in future work. While it is not clear that health conditions would affect older men and women differentially, caring responsibilities could affect older women's earning power more than men's.

Some of those observed with no children, present or past, had postponed parenthood, and were observed as parents at later sweeps. Decisions about their employment might have been affected by the expectation of parenthood. Although we do not know whether the childlessness was a matter of choice, we take this group as particularly likely to have a permanent attachment to the labour market.[10] The remaining cohort members who never became (co-residential) parents up to age 55 are distinguished in Figure 4 and the last column of Table A4. These are the same people as the 'non-parents' at 55 but a sub-set of them at ages before 55. The difference is the number of employees who were subsequently observed with children in the household. At ages 23 and 33 the 'permanently child-free' employees had smaller raw and adjusted wage gaps than the parents-to-be. At age 42 the

wage gap for employees who eventually remained without children was apparently zero. However, women with no children experienced a wage penalty relative to their male counterparts at age 50 and 55. This was little affected by including measured endowments or dropping cases, mainly men, whose household acquired children after age 42. Hence childlessness, seldom explicitly visible, and affecting only a minority, is associated with a smaller gender pay gap, but not one of zero.

Figure 4 Current and eventual non-parents: raw and adjusted GWGs (full model)



CONCLUSIONS

Almost half a century after the Equal Pay Act women in Britain continue to earn less than their male counterparts. The rate of convergence is slow, despite successive cohorts of women closing most of the gap in work experience and overtaking men in their academic attainment. We find signs of pay penalties for women in this cohort, allowing for gender differences in human capital, continuing over the life-course. This applies, to some extent, to women without children, belying the notion that the gender pay penalty is confined to mothers.

The analyses presented in this paper track the GWG for a representative cohort of men and women born in 1958. We track the gap faced by those in employment through to age 55. We control for information collected at six survey sweeps on their human capital, family formation and work experience. In doing so we are extending a good deal of previous work, by including later sweeps of data, harmonizing variables and in developing sub-group analyses, particularly of workers who have not (yet) become parents. This provides a unique life-course insight into the relative fortunes of women in the labour market compared to those of men in one cohort.

The raw GWG among this birth cohort follows an inverse U-shape, running from age 23 in 1981 before most of them had become parents to a peak at the age 42 and then falling back somewhat at surveys in their fifties. The increase in the raw wage gap as family building proceeded to mid-life was mainly accounted for by a divergence in work experience - women's slower accumulation of experience in full-time employment, which was an indirect consequence of family building. For this cohort the GWG did not start (or end) with family formation. After allowing for the widening differences in experience over the life-cycle

there is still a residual wage gap observed at age 23 indicating a significant price for being female, around 16 log points (or 15% of male pay), and ends at around 11 log points at 55. Much of this residual gap is associated with asymmetric remuneration of men and women with family responsibilities, but unequal treatment is not wholly due to parenthood. There was a wage penalty to being female before parenthood and women who never had children did not entirely escape it at the later ages. Female full-timers faced a similar gender penalty to all workers (except at age 33), which peaked in the early 40s, but does not appear to decline much as the cohort grows older, despite the historical trend towards gender equality in the overall labour market and in social norms. Within this single cohort the different pattern of men's and women's life cycle dominates the passage of historical time in shaping the profile of the gender wage gap. The evidence suggests that women's careers tended to be flying on clipped wings.

There are important limitations to this analysis. First, we do not seek to account for the potential influence of choices made about family formation, work experience, job tenure or human capital accumulation. Second, we do not allow for occupation, or other potential explanatory variables. Third, we ignore the dispersion of the wage distribution. We will be tackling these and other simplifications in future work on this and other cohorts. The examination of other cohorts will reveal how far the secular decline in the GWG across cohorts is due to cohort-wide improvement in treatment or endowments.

The implication of these findings is that equal opportunity policies should not be confined to facilitating employment for people with family responsibilities. A 'pure' gender penalty also exists suggesting the need for better enforcement of anti-discrimination measures. Policies in the workplace and for non-parental childcare which make it easier for parents, of both sexes, to combine paid and parental roles would address the larger pay gap for women with

family responsibilities. The rest of the estimated pay gap, due to differential treatment of human capital regardless of family status, could be addressed by policies that reduce discrimination in hiring, promotion and firing- 'glass ceilings' and 'sticky floors' -from which both mothers and the child-free would benefit. The set of family-friendly policies introduced in UK from 1997, are likely to have benefitted subsequent cohorts more than the one studied here. Future research on later cohorts will show how far this has played out in reducing the gender wage gap. The results presented here suggest that policies aimed at gender per se would also still have a role. A two-pronged attack on the gender pay gap is more likely to be successful than one tackling either parents or gender alone.

Looking to the future of this particular cohort, the evidence on wages and work experience at our various snapshots indicate that women's lifetime earnings for this cohort will be considerably below men's, for reasons which include and extend beyond, the direct and indirect effects of motherhood. This will have implications for the pension income they can expect, particularly in earnings-related occupational schemes (Gardiner et al., 2016). The protection of state pension rights from the direct consequences of spending years out of paid work will not be sufficient to level the differences in earnings received by men and women when in work. From this point of view also, the experience of this cohort will form a yardstick by which to judge the fortunes of those who follow.

ENDNOTES

1 The private firms, employing more than 250, which submitted returns in 2018 showed a median pay gap in favour of men, at 10% within organisations. This is less than the national estimate from survey data (18%) as it does not cover differences between firms (Colebrook,

Snelling and Longlands, 2018). Neither estimate allows for gender differences in education, grade or experience. The requirement on large firms to report the gender pay gap was suspended in March 2020.

2 The following ONS datasets were used: New Earnings Survey Panel, Quarterly Labour Force Survey, Annual Survey of Hours and Earnings.

3. The Married Women's Option to rely on their husband's contributions was abolished from 1977. Instead they could claim an allowance in the pension calculation to discount some years of labour market absence for home responsibilities.

4 Joshi and Paci (1998) found some positive selection into employment for NCDS women at 23 and 33, less so at 42. Bryson et al (2020) examined selection from non-employees, self-employed and employees with missing wage data over ages 23-55, and found a modest enlargement of the wage gap at ages 23 and 33, at the median, due to women's lower participation in employment, less so at 42. This work also found that corrections for attrition had negligible effect on estimates of the gender wage gap.

5 In an analysis of the wage gap at age 33, Joshi and Paci (1998) found that a set of variables covering job characteristics, including occupation, reduced the unexplained pay gap, but far from completely. We anticipate tackling issues of occupational choice and occupational segregation, and parental occupation in future papers.

6 Some children born abroad in the survey week were recruited from school at ages 7, 11 and 16.

7 Note that in contrast to data from household panels, the cohort members did not generally share households with each other. The few exceptions are not identified in the estimation sample. The women tend to have partners a little older than themselves, and the men vice-versa Details of the numbers of employees with partners can be found in Supplementary Table A1.

8 Though outside the scope of this paper, the picture will be changing in later cohorts as childbearing comes later, and for an increasing minority, never. The eventual proportion of parents among workers will also be affected by changing employment participation.

9 There would have been better access to maternity leave in the late 1990s than in the 1980s, but not as much as in the 2000s.

10 This approach contrasts with that Costa Dias et al (2020) whose analysis of the impact parenthood on pay does not include people who are never observed to become parents. They track pay in terms of time to and from parenthood in a multi-cohort sample, mostly entering parenthood a decade or two later than ours.

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Table 1 Descriptive statistics for whole cohort and wage sample, by gender, NCDS

	Males						Females					
	23	**33**	**42**	**46†**	**50**	**55**	**23**	**33**	**42**	**46†**	**50**	**55**
Whole cohort												
N in contact	6267	5634	5626	4644	4822	4433	6270	5835	5793	4890	4968	4704
N employees	4737	4161	4077	3392	3291	2739	3881	3542	4128	3684	3632	3129
% with NVQ Level 4 or 5‡	17.7	27.6	32.2	35.2	34.9	38.3	18.7	24.4	30.2	33.5	35.4	38.5
Average work experience in years	5.2	13.8	21.5	26.2	29.5	33.9	4.5	10.6	16.9	21.2	24.2	28.2
% with dependent children	16.7	61.1	69.5	68.0	58.7	46.0	32.6	74.9	79.7	73.4	59.7	43.3
% ever had child in home to date	16.7	63.0	76.4	80.3	80.0	80.3	32.6	75.7	84.0	85.0	84.4	84.0
% ever had child in home any survey	80.6	82.1	81.9	82.1	81.1	80.3	84.3	84.9	84.8	85.3	84.7	84.0
N with observed wages	4363	3755	3629	891	2880	2392	3648	3126	3546	827	3151	2600
Wage sample – excluding outliers§												
N with observed wages§	4263	3691	3567	871	2801	2346	3585	3050	3464	811	3108	2546
N observed at all previous sweeps§		2,450	1,703	338	257	181		1,734	1,153	211	164	108
N all previous sweeps§ except 46					1,124	808					799	551
N observed§ intermittently			1,362	490	2,415	2,115			1,552	539	2,696	2,368
N observed§ at no previous sweep		1,241	502	43	129	50		1,316	759	61	248	70
Real log hourly pay ¶	1.70	2.18	2.33	2.46	2.43	2.35	1.55	1.84	1.93	2.10	2.09	2.03
% with NVQ Level 4 or 5‡	18.1	31.5	36.6	39.4	38.2	42.1	23.3	28.9	32.9	35.4	38.7	40.8
% working full-time	99.2	99.1	98.0	98.0	97.3	94.8	90.5	55.1	60.3	67.4	67.4	65.6
Mean years full-time experience	5.4	13.8	21.7	26.7	30.0	34.6	4.8	9.4	13.0	16.4	18.0	21.0
Mean years part-time experience	0.1	0.2	0.3	0.4	0.5	0.6	0.3	2.3	5.2	6.4	8.1	9.8
Years with current employer	3.5	6.9	10.6	13.4	12.7	14.4	3.2	4.7	6.8	9.1	8.9	11.3
% with dependent children	16.3	61.8	72.9	64.3	60.3	47.7	9.0	65.4	78.5	68.1	60.4	44.6
% ever had child in home to date	16.3	63.2	79.3	79.3	81.6	82.1	9.0	66.0	82.6	81.1	84.5	85.0
% ever had child in home any survey	88.3	87.4	87.1	84.5	84.1	82.1	85.7	83.8	86.9	85.4	86.1	85.0

† Telephone survey. ‡. Percentage based on cases with non-missing education data. § Excluded outliers are top and bottom 1% of sweep specific wage sample.

¶ Hourly wage deflated to January 2000 prices by the RPI

Table 2: Decomposition of gender wage gap in NCDS: full explanatory model 4

AGE	23		33		42		50		55	
Difference in Log Hourly Wage										
	0.154	***	0.340	***	0.405	***	0.339	***	0.322	***
Accounted for by differences in Endowments										
Education[1]	-0.016	***	0.026	***	0.038	***	0.013	*	0.018	**
Experience	-0.001		0.082	***	0.148	***	0.174	***	0.136	***
Family[2]	-0.006	**	0.027	***	0.02	***	-0.006	**	0.008	**
Total	-0.022	***	0.135	***	0.206	***	0.181	***	0.162	***
Accounted for by differences in Coefficients										
Education[1]	0.051	***	0.099	***	0.038		0.042		0.016	
Experience	0.068	***	0.052		0.053		0.122		0.254	
Family[2]	0.038	***	0.125	***	0.177	***	0.130	***	0.131	***
constant	0.003		-0.003		-0.087		-0.172		-0.292	
Total	0.16	***	0.273	***	0.18	***	0.122	***	0.108	**
Interaction of Coefficients and Endowments										
Education[1]	0.007	***	0.052		-0.003		-0.001		-0.004	
Experience	0.011	***	0.125	***	0.039		0.023		0.055	
Family[2]	-0.002		-0.003		-0.019	***	0.014	***	0.001	
Total	0.016	***	0.273	***	0.018		0.036		0.052	
R squared in Fully Interacted Linear Regression										
	0.220		0.433		0.331		0.400		0.350	
N (males +females)										
	7848		6741		7031		5909		4892	

[1] Education block includes controls for region and times observed in wage sample

[2] Family block includes presence of partner, dependent children by age, ever parent to date. See appendix

* p<.1; ** p<.05; *** p<.01

Table 3. Estimates of log female wage penalty (βm-βf) for three sub-groups and whole sample, by age and explanatory model

Age	model		Currently Full-time	No child to date	Not parent by 55	Whole sample
23						
	Raw		0.144	0.132	0.090	0.154
	model 1	ED	0.153	0.139	0.088	0.162
	model 2	ED+EXP	0.149	0.143	0.082	0.150
	model 3	ED+FAM	0.161	0.153	0.111	0.171
	Model4	ED+FAM+EXP	0.157	0.149	0.105	0.160
	N		***7474***	***6829***	***1012***	***7848***
33						
	Raw		0.163	0.091	0.011	0.340
	model 1	ED	0.187	0.125	0.057	0.319
	model 2	ED+EXP	0.172	0.124	0.058	0.269
	model 3	ED+FAM	0.177	0.129	0.064	0.317
	Model4	ED+FAM+EXP	0.166	0.131	0.066	0.273
	N		***5351***	***2393***	***959***	***6741***
42						
	Raw		0.284	[0.037]	[-0.007]	0.405
	model 1	ED	0.270	[0.050]	[0.009]	0.362
	model 2	ED+EXP	0.198	[0.015]	[0.014]	0.172
	model 3	ED+FAM	0.252	0.062	[0.017]	0.361
	Model4	ED+FAM+EXP	0.189	[0.039]	[-0.004]	0.180
	N		***5513***	***1343***	***913***	***7031***
50						
	Raw		0.251	0.063	0.069	0.339
	model 1	ED	0.250	0.113	0.122	0.319
	model 2	ED+EXP	0.130	[0.052]	0.070	0.116
	model 3	ED+FAM	0.231	0.126	0.133	0.311
	Model4	ED+FAM+EXP	0.123	0.074	0.084	0.122
	N		***4675***	***996***	***876***	***5909***
55						
	Raw		0.267	0.083	0.083	0.322
	model 1	ED	0.267	0.120	0.120	0.300
	model 2	ED+EXP	0.140	[0.060]	[0.060]	0.112
	model 3	ED+FAM	0.250	0.123	0.123	0.284
	Model4	ED+FAM+EXP	0.139	0.070	0.070	0.108
	N		***3782***	***801***	***801***	***4892***

Estimates all not significantly different from zero p<0.05 except for those [in square brackets].

Plotted in Figures 3 and 4

APPENDICES

Appendix 1 Definitions and Derivations

2.i Derivation of the dependent variable

Hourly earnings are deflated to January 2000 prices by the RPI. They are derived from separate survey questions about the amount cohort members were paid, the pay period this relates to (allowing weekly earnings to be calculated) and the hours worked per week in the respondent's main job. Hourly wage.

In all surveys, cohort members were asked about gross pay, that is before any deductions for tax, national insurance, pension etc. They were asked to include any overtime, bonuses, commissions, tips or tax refunds. At age 55 cohort members were simply asked to report their gross pay, whilst at age 42, 46 and 50 they were asked to report gross pay last time they were paid, and at age 23 and 33 they were asked to report their usual gross pay. At 50 and 55 respondents who could not recall their pay were encouraged to provide an approximation through unfolding brackets in the question.

Questions on hours worked per week also varied across surveys. At age 33 and 55 cohort members were asked to report usual hours worked including overtime; whilst at age 42 and 50 they were first asked if they did any paid or unpaid overtime. If they reported no overtime, they were asked to report usual hours. If they reported overtime, they were asked to report usual hours not including overtime, and usual paid overtime hours and usual unpaid overtime hours. These approaches allowed calculation of the same measure of usual hours worked including overtime hours. In all surveys, cohort members were asked not to include meal breaks in the reporting of their hours worked.

At age 46, when the survey was conducted by telephone, cohort members were asked to report usual hours worked **not** including overtime. The poor reporting of hours made it difficult to compute hourly pay in this survey (Neuburger 2010). The approach was also slightly different at age 23; cohort members were asked to report actual hours worked in an average week including any paid overtime you usually do.

Another important difference between the surveys was in the allowable range of responses to these questions. At age 42, 50 and 55, cohort members could report up to 168 hours per week; whilst at age 46 the maximum number of hours that could be reported was 80, at age 33 it was 99, and at age 23 if cohort members did more than 96 hours per week, interviewers were told to code weekly hours as 96.

In our calculations of hourly earnings, we use hours as reported in each survey. For the surveys where the reporting of hours was less restrictive, less than 0.2 per cent of the sample reported hours of more than 80 hours per week. These cohort members were more likely to be men. The average number of hours reported was highest at age 23 at 39.9 hours per week, but across other ages differences are relatively small (age 33 – 36.9 hours per week, age 42 – 37.0 hours, age 46 – 37.7 hours, age 50 – 36.7 hours, and age 55 – 37.3 hours).

The exact wording of the questionnaires can be found in the documentation of the study at https://cls.ucl.ac.uk/data_documentation/ or the UK Data Service under the references given above.

The sex of the respondents is as reported at each survey. There is no evidence of any respondent having changed their gender identity in the data analysed.

2.ii Definition Explanatory Variables, by Block

ED	*qual*: a set of 5 dummy variables identifying the National Vocational Qualification level of highest qualification held; NVQ levels include both academic and equivalent vocational certificates. Level 1= lower than O level: Level 2 =O level or equivalent; level 3 = A level or equivalent; Level 4 = Degree or equivalent vocational diploma; level 5 postgraduate, academic or professional. Note that we treat nursing and teaching qualifications as level 4 whether or not they were treated as degrees at the time this cohort gained them.
	qualmiss a dummy variable indicating data on highest qualification is missing; plus the basic controls,
	obs :a count of how many times the respondent has appeared in previous estimation samples; *LonSE* a dummy variable for residence in London or the South East
EXP	the number and its square of months that cohort members had worked full-time/part-time up to the time of each survey. Full-time= 30+hours per week
	tenure - the number of months the cohort member had worked with their current employer at the time of each survey, reported as years in regression results.
	tenmiss - a dummy variable indicating where data on the time with current employer is missing.
FAM	*partner* - a dummy variable identifying whether the cohort member currently had a partner living in the household.
	everchild - a dummy variable identifying whether the cohort member reported a dependent child living in the household at the current or any previous surveys;
	*childa*ge - dummy variables identifying whether the cohort member had a child in the home aged 0 to 2, 3 to 4, or 5 to 15.

Appendix 2 Supplementary Tables

Table A1 Descriptive statistics for the wage-earning estimation sample NCDS

Table A2 Broad Decomposition of gender wage gap in NCDS by Model

Table A3. Individual coefficients and their gender gaps, Model 4

Appendix Table A1 Detailed descriptive statistics for the wage-earning estimation sample NCDS

	Males						Females					
Age at sweep	**23**	**33**	**42**	**46***	**50**	**55**	**23**	**33**	**42**	**46***	**50**	**55**
Log of real hourly pay	1.70 (0.28)	2.18 (0.45)	2.33 (0.61)	2.46 (0.46)	2.43 (0.52)	2.35 (0.55)	1.55 (0.29)	1.84 (0.48)	1.93 (0.57)	2.10 (0.45)	2.09 (0.49)	2.03 (0.49)
% living in London or the South East	31.9	30.2	29.3	28.2	21.3	20.8	33.9	29.3	29.2	28.6	22.2	23.4
% with No qualifications	14.3	10.8	9.4	8.6	8.2	6.1	11.0	12.1	11.2	10.0	7.5	6.0
% with NVQ Level 1	11.1	14.2	12.1	11.9	11.1	9.5	10.2	14.0	12.7	10.9	9.9	9.2
% with NVQ Level 2	21.9	24.8	22.1	23.2	22.5	21.0	27.9	32.4	29.8	31.3	28.6	26.6
% with NVQ Level 3	17.2	18.7	19.9	16.9	20.0	20.3	15.2	12.7	13.5	12.5	15.3	16.7
% with NVQ Level 4	14.1	28.8	32.5	35.4	32.9	35.0	19.3	27.6	30.0	31.4	34.1	34.6
% with NVQ Level 5	0.2	2.7	4.1	4.0	5.3	6.4	0.3	1.3	2.8	3.9	4.5	5.7
% with missing qualifications data	21.1	0	0	0	0	1.7	16.1	0	0	0	0	1.3
Mean number of previous wage observations	0 (0)	0.7 (0.5)	1.4 (0.7)	2.1 (0.9)	2.4 (1.0)	3.2 (1.1)	0 (0)	0.6 (0.5)	1.1 (0.7)	1.9 (0.9)	2.0 (1.0)	2.8 (1.1)
Mean full-time experience (months)	65 (27)	165 (48)	260 (56)	321 (56)	359 (65)	415 (68)	57 (28)	113 (61)	157 (86)	197 (104)	216 (113)	252 (129)
Mean part-time experience (months)	1 (5)	2 (13)	4 (17)	4 (19)	5 (24)	7 (27)	3 (11)	28 (39)	62 (63)	77 (78)	98 (89)	118 (106)
Mean job tenure (months)	42 (30)	83 (66)	127 (103)	160 (126)	152 (136)	172 (145)	38 (29)	57 (58)	82 (80)	109 (101)	107 (99)	136 (112)
% with missing job tenure data	0.3	1.6	0.0	0.1	3.3	0.8	0.1	2.5	0	0.4	2.7	0.7

Appendix Table A1 (continued) Detailed descriptive statistics for the wage-earning estimation sample NCDS

	Males							Females					
Age at sweep	**23**	**33**	**42**	**46†**	**50**	**55**		**23**	**33**	**42**	**46†**	**50**	**55**
% with partner	42.7	80.6	84.3	81.7	83.9	84.5		53.0	78.7	81.6	76.6	79.1	77.6
% ever had child in household to date	16.3	63.2	79.3	79.3	81.6	82.1		9.0	66.0	82.6	81.1	84.5	85.0
% with child aged 0-2 in household	14.0	28.1	8.7	3.6	1.1	0.2		5.3	16.2	3.2	0.1	0.1	0.1
% with child aged 3-4 in household	3.1	23.5	8.2	2.3	1.4	0.5		3.1	16.0	4.6	0.2	0.0	0
% with child aged 5-15 in household	0.8	38.3	58.9	38.3	25.6	11.8		2.5	52.5	60.6	32.6	18.1	3.8
Estimation sample‡	4263	3691	3567	871	2801	2346		3585	3050	3464	811	3108	2546

Standard deviations of continuous variables in parenthesis. † Telephone survey . ‡ There is no weighting of sample numbers.

Appendix Table A2: Broad Decomposition of gender wage gap in NCDS by 4 Models

Age at sweep	23		33		42		50		55	
Difference in Log Hourly Wage. Men -Women										
	0.154	***	0.340	***	0.405	***	0.339	***	0.322	***
Accounted for by differences in Endowments										
1.ED	-0.017	***	0.042	***	0.061	***	0.030	***	0.032	***
2.ED +EXP	-0.013	***	0.157	***	0.216	***	0.179	***	0.150	***
3.ED+FAM	-0.024	***	0.068	***	0.080	***	0.024	***	0.040	***
4: ED+EXP+FAM	-0.022	***	0.135	***	0.206	***	0.181	***	0.162	***
Accounted for by differences in Coefficients										
1.ED	0.162	***	0.319	***	0.362	***	0.319	***	0.300	***
2.ED +EXP	0.150	***	0.269	***	0.172	***	0.116	***	0.112	***
3.ED+FAM	0.171	***	0.317	***	0.361		0.311	***	0.292	***
4: ED+EXP+FAM	0.160	***	0.273	***	0.18	***	0.122	***	0.108	**
Interaction of Coefficients and Endowments										
1.ED	0.009	***	-0.020	***	-0.018	***	0.009	**	-0.009	*
2.ED +EXP	0.016	***	-0.086	***	0.017	*ns*	0.044	*ns*	0.061	*ns*
3.ED+FAM	0.007	***	-0.045	***	-0.036	***	0.004	ns	-0.011	*ns*
4: ED+EXP+FAM	0.016	***	-0.068	***	0.018	*ns*	0.036	ns	0.052	*ns*
R squared in Fully Interacted Linear Regression										
1.ED	0.174		0.380		0. 291		0.349		0.312	
2.ED +EXP	0.209		0.422		0.323		0.390		0.342	
3.ED+FAM	0.192		0.410		0.309		0.362		0.322	
4: ED+EXP+FAM	0.220		0.433		0.331		0.400		0.350	
N (males +females)										
	7848		6741		7031		5909		4892	

[1] Education block includes controls for region and times observed in wage sample

significance of difference from zero:* p<.1; ** p<.05; *** p<.01

Appendix Table A3.: Individual coefficients and their gender gaps, model 4, part 1 ages 23, 33 and 42

	age 23						age 33						age 42					
	males ßm		**females ßf**		**m-f ßm-βf**		**males ßm**		**females ßf**		**m-f ßm-βf**		**males ßm**		**females ßf**		**m-f ßm-βf**	
EDUCATION																		
Highest NVQ																		
0	-0.169	***	-0.271	***	0.102	***	-0.504	***	-0.577	***	0.073	**	-0.571	***	-0.508	***	-0.063	
1	-0.154	***	-0.295	***	0.141	***	-0.408	***	-0.536	***	0.128	***	-0.459	***	-0.531	***	0.072	*
2	-0.100	***	-0.190	***	0.090	***	-0.293	***	-0.432	***	0.139	***	-0.332	***	-0.410	***	0.078	**
3	-0.045	***	-0.123	***	0.077	***	-0.222	***	-0.298	***	0.076	**	-0.211	***	-0.324	***	0.113	***
5	-0.065		0.065		-0.130		0.057		0.106		-.049		0.212	***	0.232	***	-0.019	
missing	-0.110	***	-0.192	***	0.083	***												
other controls																		
Wage obs							0.026	*	.022	*	.005		0.031	**	0.050	***	-0.019	
Lon/SE	0.089	***	0.160	***	-0.071	***	0.255	***	.174	***	.052	**	0.212	***	0.145	***	0.067	**
EXPERIENCE																		
Yrs full-time	0.009		0.011		-0.002		0.003	***	0.001	*	0.002	**	0.050	***	0.021	***	0.029	
Yrs ft sqd	0.000		-0.003	***	0.003	**	-.000	***	-.000		.000	**	-0.001	***	0.000	*	-0.001	***
Yrs prt-time	-0.043	*	-0.059	***	0.016		-.002		-.002	***	0.000		-0.067	***	-0.015	***	-0.052	***
Yrs pt sqd	0.009	**	0.007	***	0.002		0.000		0.000		0.000		0.004	***	0.001	***	0.003	***
Job tenure-	0.017	***	0.022	***	0.005	**	0.007	***	0.017	***	-.010	***	0.006	***	0.009	***	-0.002	
tenure miss	-0.195	**	-0.242		-0.046		-.084		-0.167	***	0.083		-0.143				-0.143	
FAMILY																		
Partner	0.068	***	0.016	*	0.052	***	0.074	***	0.053	***	.020		0.073	**	0.052	**	0.021	
Ever parent	0.007		0.003		0.004	**	-0.007		-0.083	***	.105	***	0.082	**	-0.094	***	0.176	***
Household has																		
kids<3	-0.010		-0.076	**	0.066		-0.020		0.082	***	-.102	***	0.028		0.215	***	-0.187	***
kids 3-4	-0.011		-0.097	***	0.086	*	0.027		-0.007		.033		0.026		0.090	**	-0.064	
kids 5-15	0.013		-0.130	***	0.143		-0.007		-0.102	***	0.096	***	0.028		-0.010		0.039	
CONSTANT	1.643	***	1.640	***	-0.003		2.044	***	2.047	***	-.003		1.834	***	1.921	***	-0.087	

* p<.1; ** p<.05; *** p<.01

Appendix Table A3 Individual coefficients and their gender gaps, model 4, part 2, ages 50 and 55												
	age 50						age 55					
	males		females		m-f		males		females		m-f	
	ßm		ßf		ßm-βf		ßm		ßf		ßm-βf	
EDUCATION												
Highest NVQ												
0	-0.525	***	-0.510	***	-0.015		-0.539	***	-0.508	***	-0.030	
1	-0.494	***	-0.508	***	0.014		-0.530	***	-0.487	***	-0.043	
2	-0.375	***	-0.415	***	0.040		-0.380	***	-0.405	***	0.025	
3	-0.256	***	-0.317	***	0.061	*	-0.296	***	-0.300	***	0.003	
5	0.224	***	0.290	***	-0.066		0.214	***	0.271	***	-0.057	
missing							0.476	***	0.401	***	0.075	
other controls												
Wage obs	0.034	***	0.033	***	0.001		0.017	*	0.018	**	-0.001	
Lon/SE	0.197	***	0.100	***	0.097	***	0.169	***	0.083	***	0.086	***
EXPERIENCE												
Yrs full-time	0.003	***	0.001	***	0.002	**	0.042	***	0.013	***	0.029	**
Yrs ft sqd	0.000	***	0.000		0.000	***	-0.001	***	0.000		-0.001	***
Yrs part-time	-0.004	***	-0.001	***	-0.002	***	-0.039	***	-0.011	***	-0.028	***
Yrs pt sqd	0.000	***	0.000	***	0.000	***	0.002	**	0.000	***	0.001	**
Yrs in current job	0.005	***	0.007	***	-0.002		0.005		0.003	***	0.002	
tenure miss	-0.050		0.061		-0.111	**	-0.199	*	-0.214	**	0.015	
FAMILY												
Partner	0.147	***	0.025		0.123	***	0.119	***	0.039	*	0.080	**
Ever parent to date	0.047	**	0.009		0.039		0.082	***	-0.001		0.082	**
Household has												
kids<3	-0.087		-0.243		0.155		-0.188		-0.351		0.158	
kids 3-4	-0.031		-0.591		0.560	***	0.132				0.132	
kids 5-15	0.048	**	0.045		0.003		0.039		0.077	*	-0.037	
CONSTANT	1.840	***	2.012	***	-0.172		1.618	***	1.910	***	-0.292	

* p<.1; ** p<.05; *** p<.01

Table A4. Estimates of log female wage penalty (βm-βf) for three sub-groups and whole sample, by age and model

Age	Model		All employees	Currently Full-time	No child to date	Not parent by 55
23						
	Raw		0.154	0.144	0.132	0.090
	model 1	ED	0.162	0.153	0.139	0.088
	model 2	ED+EXP	0.150	0.149	0.143	0.082
	model 3	ED+FAM	0.171	0.161	0.153	0.111
	Model4	ED+FAM+EXP	0.160	0.157	0.149	0.105
	N		***7848***	***7474***	***6829***	***1012***
	Males		*4263*	*4229*	*3,567*	*498*
	Females		*3585*	*3245*	*3,262*	*514*
33	Raw		0.340	0.163	0.091	0.011
	model 1	ED	0.319	0.187	0.125	0.057
	model 2	ED+EXP	0.269	0.172	0.124	0.058
	model 3	ED+FAM	0.317	0.177	0.129	0.064
	Model4	ED+FAM+EXP	0.273	0.166	0.131	0.066
	N		***6741***	***5351***	***2393***	***959***
	Males		*3691*	*3659*	*1,357*	*465*
	Females		*3050*	*1692*	*1,036*	*494*
42	Raw		0.405	0.284	[0.037]	[-0.007]
	model 1	ED	0.362	0.270	[0.050]	[0.009]
	model 2	ED+EXP	0.172	0.198	[0.015]	[0.014]
	model 3	ED+FAM	0.361	0.252	0.062	[0.017]
	Model4	ED+FAM+EXP	0.180	0.189	[0.039]	[-0.004]
	N		***7031***	***5513***	***1343***	***913***
	Males		*3567*	*3502*	*740*	*459*
	Females		*3464*	*2011*	*603*	*454*
50	Raw		0.339	0.251	0.063	0.069
	model 1	ED	0.319	0.250	0.113	0.122
	model 2	ED+EXP	0.116	0.130	[0.052]	0.070
	model 3	ED+FAM	0.311	0.231	0.126	0.133
	Model4	ED+FAM+EXP	0.122	0.123	0.074	0.084
	N		***5909***	***4675***	***996***	***876***
	Males		*2801*	*2721*	*514*	*444*
	Females		*3108*	*1954*	*482*	*432*
55	Raw		0.322	0.267	0.083	0.083
	model 1	ED	0.300	0.267	0.120	0.120
	model 2	ED+EXP	0.112	0.140	[0.060]	[0.060]
	model 3	ED+FAM	0.284	0.250	0.123	0.123
	Model4	ED+FAM+EXP	0.108	0.139	0.070	0.070
	N		***4892***	***3782***	***801***	***801***
	Males		*2346*	*2227*	*420*	*420*
	Females		*2546*	*1555*	*381*	*381*

Estimates all significantly different from zero at p<0.05, except for those [in square brackets].