THE ROLE OF EMPLOYMENT EXPERIENCE IN EXPLAINING THE GENDER WAGE GAP

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Executive Summary

Over the last two decades, the wage gap between men and women has narrowed, yet a sizeable discrepancy in earnings capacity remains between seemingly identical male and female workers. Analyses of the role of employment experience in explaining this gender wage gap have been limited by the rarity of appropriate data sources containing this information.

In this paper, data from a series of twenty cross sections of the British Family Expenditure Survey is used to examine the changing impact of employment experience on the wage differential across four cohorts of male and female workers. By using grouped data formed into a pseudo panel and by estimating the wage regressions in first differences rather than levels, the potential for estimation bias arising from unobserved heterogeneity and the endogeneity of experience is reduced.

The results show that accounting for differences in experience levels, either as a simple total of all years of employment or broken down into full-time and part-time employment, explains little of the gender wage gap. Indeed, it is differences in the returns to experience which generate the gender wage differential, for the gap only develops and widens as experience increases. Successive generations of female workers have are found to have faired considerably better than previous cohorts in terms of their wage position relative to men. However, this development is *not* explained by relative changes in education level or experience between men and women.

Introduction

Over the last two decades, the wage gap between men and women has narrowed, yet a sizeable discrepancy in earnings capacity remains between seemingly identical male and female workers.[1] Over the same period, differences in employment experience have also diminished, both through a decline in labour market participation on the part of prime-age males and through a growing propensity to work on the part of women[2]. Indeed, government policy has enhanced the incentives for female involvement, both through anti-discrimination legislation and, more recently, through active employment policies to encourage women, and particularly mothers, to be active in the labour market. According to human capital models of the labour market, such an approach may be particularly beneficial in addressing gender wage inequalities if differences in employment experience are important in explaining the lower wages commanded by women.

Changes in the gender wage gap have been documented for workers in the United Kingdom (for example, see Harkness (1996), or Joshi & Paci (1998)) and in the United States (for example, see Goldin (1990) or Blau (1998)). Comparisons across the industrialised countries have also been carefully analysed (Blau & Kahn (1992, 2000)). In terms of observable characteristics, increased levels of education and greater investment in human capital has enhanced the relative pay position for women in the United States (Blau (1998), O'Neil & Polachek (1993)), although Harkness (1996) finds no similar explanation for the UK. Female workers in the United States have also benefited from a shift towards higher paying occupations (Sorensen (1991)), while the introduction of equal pay policies in both the US and UK has played a role (Arrufat & Zabalza (1986)). However, rising wage inequality in the United States has worked to increase the gender differential by placing a larger penalty on those with

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[1] For example, Harkness (1996) finds that in 1992-3, even allowing for differences in observable characteristics, full-time working women have a female/male earnings ratio of just 82 percent, while part-time working women have earnings equivalent to 87 percent of those of men.

[2] For example, see Harkness (1996), Twomey (2001), Bower (2001), Women's Unit (2000).

lower levels of skills, including disproportionately female workers (Blau & Kahn (1992)). Although there has been a similar increase in wage inequality or men in the UK (Gosling, Machin & Meghir (1998)), the effect on British women has not been analysed.

Other explanations of the wage differential focus on the dynamic aspect. For example, some theoretical models suggest that a higher expected value of home time for women than for men generates a higher separation rate for female workers that lowers their promotion rate relative to male workers (Lazear & Rosen (1990)). Other models suggest that the career interruptions associated with marriage, birth of children and geographical mobility reduce investment in human capital (Weiss & Gronau (1981)). Career interruptions also disrupt the benefits of a good employer match and the accumulation of employer tenure that may generate wage returns to employer specific human capital. Indeed, one argument for generous maternity leave policies is to enable mothers to maintain their employer connections.

However, analyses of the role of employment experience and lifetime patterns of work behaviour have been limited by the rarity of appropriate data sources containing this information. Using the British BHPS, Harkness (1996) finds that adding experience variables to a standard wage equation explains an additional 6-7 percent of the gender wage gap for full-time women and 25 percent for part-time women. Light & Ureta (1995), using data from the US NLS young men and women cohorts, estimate a model that fully characterises the past employment experience. The results show that 12 percent of the raw male-female wage gap is due to differences in the *timing* of the work experience and that these timing differences account for 30 percent of the gap that would typically be attributed to differences in returns to experience. Although Bronars & Famulari (1997) present evidence on male and female wage growth and employer tenure for workers in the U.S., they do not focus on the gender aspect. Moreover, most work on the returns to tenure has focused almost exclusively on male workers.[3]

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[3] For example, see Abraham & Farber (1987), Altonji & Shakotko (1987), Topel (1991), Williams (1991), Dustmann & Meghir (1999).

In this paper, the role of employment experience in explaining the gender wage gap is carefully explored using data from the British Family Expenditure Survey. Using data from a series of twenty cross sections, the analysis focuses on the changing impact across four cohorts of male and female workers. By using grouped rather than individual panel data and by estimating wage regressions in first differences rather than levels, the potential for estimation bias arising from unobserved heterogeneity and the endogeneity of experience is reduced.[4,5]

The results show that accounting for differences in experience levels, either as a simple total of all years of employment or broken down into full-time and part-time employment, explains little of the gender wage gap. Indeed, it is differences in the returns to experience which generate the gender wage differential, for the gap only develops and widens as experience increases. Moreover, the estimated wage gap profile over experience varies considerably across education groups, suggesting a potential relationship with differences in the timing of the initial arrival of children across education groups. On a more optimistic note, the analysis by cohort shows that successive generations of female workers have faired considerably better than previous cohorts in terms of their wage position relative to men. However, this development is *not* explained by relative changes in education level or experience between men and women.

The following section presents an overview of the trends in employment for men and women over the 1978 to 1997 period. The third section describes the econometric model, while the next details the construction of an experience variable using the grouped data. The fifth section presents the results from the wage regressions, while the final section concludes.

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[4] As shown by Neumark & Korenman (1994), the estimated returns to experience can be sensitive to corrections for heterogeneity and endogeneity bias.

[5] Ongoing work is also testing using a GMM system estimator, similar to the approach in Blundell & Bond (1997, 1999).

Trends in Employment and Wages

The Family Expenditure Survey

The Family Expenditure Survey is a survey of approximately 7000 households going back to 1964, collecting data on spending, incomes, family structure, education and employment. As the education leaving age was not recorded until 1978, this paper uses data for the period 1978 to 1997. Since the minimum school leaving age is 16, an experience variable can therefore only be constructed for those born since 1962, allowing a maximum experience level of 20 years[6]. For the cohort analysis, individuals are divided into four five-year cohorts: those born between 1962-66 (cohort 1), 1967-71 (cohort 2), 1972-76 (cohort 3) and 1977-82 (cohort 4). Total *usual* hours including overtime and *gross normal* weekly wage/salary are used to calculate hourly wages. Full-time employment is defined as employment at more than 30 hours per week, while people working between 1 and 29 hours are considered as part-time workers. The trends presented in this section include data from all individuals (including those born prior to 1962) in each year of the survey[7].

Trends in Male and Female Wages

The FES wage data confirms earlier documented findings that the gender wage-gap has fallen substantially in the past two decades.[8] Figure 1 demonstrates the change in the ratio of female to male hourly wages. The lower line in figure 1 shows

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[6] It is not possible to construct an experience variable for an individual born prior to 1962 because they would have potentially entered the labour market prior to 1978 and would need to be matched to individuals by education group prior to 1978.

[7] There were 267,904 individuals in the FES for the years 1978 to 1997. After those who have unreliable/inconsistent information about the age they left full-time education and family status were eliminated, a sample of 265,628 people remained. The sample was then trimmed to exclude those with hourly wages above £75 (in 1997 prices), leaving a sample of 174,944 individuals who are no longer in full-time education and who are under the age of 55.

[8] Waldfogel (1998), Blau (1998), and Blau & Kahn (2000) document these changes for the US. Between 1978 and 1999 the female/male wage ratio rose from 61 percent to 77 percent (Blau & Kahn, 2000). Harkness (1996) shows that the female/male wage ratio in the UK rose from 59 percent to 71 percent between 1973 and 1993. See Blau & Kahn (2000) for examples from other countries.

the ratio for all workers, while the higher line is the ratio for female and male workers in full-time work only. The difference reflects the fact that women in part-time work receive lower wages than those in full-time work, generating the lower ratio when all workers are included. Over the 1978-97 period, both measures trended upwards, particularly during the 1985 to 1995 decade. Indeed, from a low of 68 percent in 1980, the ratio for full-time workers dramatically increased to 78 percent by 1993, while the ratio for all workers rose from 67 to 73 between the two years.

Figure 2 divides the data for full-time workers by school leaving age. The first point to note is that although women in the highest educated group fair best relative to their male counterparts over most of the period, it is women in the middle education group (those leaving school aged 17 to 18) who consistently have the lowest ratio relative to their male counterparts[9]. Over the two decades, while the position of the most educated has, if anything, declined slightly relative to male workers, both the middle and lowest education groups have experienced a decline in the gender differential, leading to an overall compression in the differences in the wage ratio across education groups. Indeed, while the wage ratio was 62, 67, and 78 for the middle, lowest and highest education group in 1979, not only had the dispersion compressed but also the ranking altered in 1979 with ratios of 72, 73, and 76 for the highest, middle and lowest educated groups. Hence, it is falling wage differentials among the lower educated groups that has been the main driving force behind the improved position for women in the aggregate figures.

Trends in Employment

Employment rates for men and women aged 16 to 55 and not in full-time education are shown on figure 3[10]. While male employment rates have fallen

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[9] This does not seem to be the case for the US where the lowest educated group had the lowest female/male wage ratio in the late 1970s. Although the ratio increased from 57 to 67 percent between 1979 and 1994 for this group, it remained the lowest ratio relative to other education groups for whom the ratio increase by more than 10 percent (Blau (1998)).

[10] Between 1978 and 1997 the proportion of men aged 16-55 in full-time education grew from 1.4% to 2.5%, while among women it increased from 1.3% to 3.1%. However, the purpose of this paper is not to analyse these changes in participation in education and abstracts from them by reporting employment rates for those outside full-time education only.

substantially from 88.1 percent in 1978 to 75 percent in 1997, employment rates for women have shown a small, but steady, upward trend from 63.7 percent in 1979 to 68.5 percent in 1997. Indeed, the "employment gap" had almost closed by the late 1990s[11]. However, the hours of employment remains quite different between men and women. Women are much more likely to work part time (less than 30 hours per week) than men, for whom the choice seems to be between working full time or not working at all. This has changed over the period. In 1978, 87.1 percent of men worked full-time, while 1.1 percent were employed part-time, while the comparative figures for women were 39.3 percent and 24.3 percent. By 1997, the male full-time employment rate was 72.0 percent and the part-time rate 3.0 percent, compared to 41.5 percent full-time and 27.0 percent part time for women.

Figures 4 and 5 present full-time employment rates for men and women by education level. Lower educated men have suffered the greatest declines in employment rates, the rate falling from 84.5in 1978 to 62.4 percent in 1997 for this group. Among women those with the highest level of education have increased their employment levels most, rising from 49.0 in 1979 to 52.9 in 1997[12].

Figures 6 and 7 show the full-time employment rates broken down by the number of children[13]. For men, those with one or two children are most likely to be employment, while those with either no children or three or more children are distinctly less likely to work. Although employment rates have fallen for these groups of male workers, the gap has noticeably widened. In 1979, 87.3 percent of men with one child, 87.4 percent of men with two children and 80.5 percent of men with three or more children worked compared to 83.4 percent for men with no children. In contrast, by 1997, the corresponding figures were 70.5 percent, 75.9 percent, 64 percent and 62.8 percent. For women, the picture is much more stark: those without children are far more likely to work than those with children and those with more

[11] Employment rates in the US show similar trends. While female employment increased from 49 percent in 1970 to 72 percent in 1995, male employment fell from 94 percent to 87 percent in the same period. However, the employment gap remained high in the US, with women 15 percent less likely to participate than men in the mid 1990s (Blau (1998)).

[12] In the US, the highest educated women increased their participation rates by 22 percent between 1970 and 1995, while middle educated females were 26 percent more likely to participate in the latter year relative to 1970 (Blau (1998)).

[13] Children are defined as dependent children living in the same household under the age of 16 or under the age of 18 and in full-time education.

children are less likely to be employed than those with fewer children. For example, in 1979, some 73.1 percent of women without children were in employment compared to 52.5 percent, 51.9 percent and 44.16 percent for women with one, two or three or more children. However, the proportion of women with one child who work full-time increased steadily over the period reaching 31.3 percent by 1979, while that of women without children actually fell by almost four percentage points to 54.6 percent.

The gender difference in employment behaviour is most noticeable when considered over the individual's lifetime age profile. Figure 8 presents total employment profiles for men and women, while figure 9 shows the female employment profile divided into full-time and part-time employment. It should be noted that these figures include both age and cohort effects in the profiles. The probability of employment for men declines steadily, but slowly with age[14]. In contrast, the employment rate for women declines dramatically throughout the 20s, begins to rise again at age 30 and only returns to the 20-year old rate at age 40. This corresponds with women withdrawing from the labour market during the prime child-rearing period. As figure 9 shows, this total employment rate masks an important development during this period out for child rearing: a substantial switch from full-time to part-time work. Indeed, the full-time employment rate falls from 69 percent to 28 percent between the age of 19 and 32 and then rises to around 38 percent in the late 40s. Between the same ages, the part-time employment rate rises from 8 percent to 30 percent and then remains at about 30 to 35 percent for the rest of the working life.

Finally, figures 10-12 demonstrate employment rates for men and women for the four cohorts that are used in the analysis below. For men, figure 10 shows that the oldest cohort (those born between 1962 and 1966) employment rates were higher than for later cohorts at very young ages, but there are few substantial differences at other ages. Figure 11 shows a similar picture for women for full-time employment rates, except that each successive cohort has a lower employment rate up to the age of 21. This feature is reversed across cohorts for part-time employment rates for women shown in figure 12, with each successive cohort of women more likely to work part-time than the previous one, even up to the oldest recorded age of 26 for cohort 3 (those born between 1972 and 1976).

This initial overview of the data has served two purposes. First, it has demonstrated that the FES data is not unusual with respect to comparative employment and wage pictures drawn from other data sources. Second, it has highlighted that education level, number of children, age and cohort are important factors correlated with the decision to undertake employment and thereby with future experience levels. Hence, they are appropriate variables upon which to create artificial cohorts for the purpose of generating experience levels.

Econometric Model

In line with the previous literature[15], wages are assumed to be determined by observable individual characteristics that affect productivity (such as education), by employment experience, by time effects and by unobservable individual heterogeneity. The impact of experience is an amalgamation of several processes. It reflects the accumulation of general human capital through employment and of the attainment of a good job match through time in the labour market. It is also correlated with higher employer tenure, generating returns either through the accumulation of employer-specific human capital or from wage contracts designed to reduce employee turnover. It is assumed that only the accumulated amount of experience is important and not the specific timing of employment, implying that there is no depreciation to its benefits during time spent out of work. This assumption is in part necessitated by the data, which provides average employment rates by year but cannot identify correlations across years. The wage equation for individual i at time t can be written as:

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[14] This is consistent with data for the US. Blau (1998) reports participation rates for men by age for different years, showing a similar pattern to the figures here, with a slight increase in participation among men aged 35-44 relative to the earlier age group and a decline in participation at higher ages.

[15] For example, see Abraham & Farber (1987), Altonji & Shakotko (1987), Topel (1991), Williams (1991), Dustmann & Meghir (1999).

(eq. 1) $\ln w_{it} = \alpha + \beta_1 X_{it} + \beta_2 \exp_{it} + \beta_3 T_t + \nu_{it}$

where X_{it} includes the observed individual factors (such as education level), $\exp_{it}$ is total experience since leaving full-time education[16], T_t are time dummies and ν_{it} is an unobserved individual effect. In this unobserved individual effect, we allow both for a time-invariant fixed effect η_i and a time-specific shock μ_{it} which may exhibit autoregressive serial correlation. For expositional simplicity, this is assumed to be an AR(1) process of the degree ρ $(0 \leq \rho \leq 1)$, but higher order processes would not qualitatively alter the argument. The individual wage shock can be written as:

(eq. 2) $\nu_{it} = \eta_i + \mu_{it}$

where $\mu_{it} = \rho\, \mu_{i(t-1)} + \varepsilon_{it}$

where ε_{it} = white noise random error

If the experience measure, $\exp_{it}$, is not endogenous to the wage, w_{it}, then an Ordinary Least Squares regression of the wage equation (eq.1) will be unbiased. However, experience will be endogenous to the current wage and the regression biased if two conditions hold. The first condition is that the current wage is related to previous wage levels for unobserved reasons ($corr(\nu_{it}, w_{i(t-1)}) \neq 0$), either through the individual fixed effect ($\eta_i \neq 0$) or through serial correlation in the time-specific shock ($\rho \neq 0$). The second condition is that current employment participation is dependent upon the current wage, so that current experience (the summation of all previous employment participation) is dependent upon the previous wage ($corr(\exp_{it}, w_{i(t-1)}) \neq 0$). This may operate either through the individual's reservation wage or through a correlation between the wage level and the ability to obtain employment. In particular, if both correlations are positive (both the current wage and experience are positively related to the previous wage), there will be an upwards bias in the estimated coefficient β_2. Intuitively, individuals who have benefited from higher wages in the past are both more likely to have higher experience levels and to have a higher current wage level, but not because the higher experience *causes* a higher current wage.

In attempting to address this potential bias, two modifications are applied to the OLS approach. First, grouped data rather than individual data is employed[17], so that the model takes the following form for group g at time t:

(eq. 4) $$\mathbf{ln\ w_{gt}} = \alpha + \beta_1 \mathbf{X_{gt}} + \beta_2 \mathbf{exp_{gt}} + \beta_3 T_t + \boldsymbol{\nu}_{\mathbf{gt}}$$

where the bold notation denotes group averages. Note that $\boldsymbol{\nu}_{\mathbf{gt}}$ is now a group specific effect rather than an individual specific effect which also contains the AR(1) component in the wage path. Since $\boldsymbol{\nu}_{\mathbf{gt}}$ is the group average error, its first moment will be zero, but the variance will be $\boldsymbol{\sigma}^2/\mathbf{n_g}$, where $\boldsymbol{\sigma}^2$ is the variance of $\boldsymbol{\nu}_{\mathbf{gt}}$ and $\mathbf{n_g}$ is the number of observations in group g. To ensure homoskedasticity the equation must be weighted by the square root of the group size (Greene, 1997). The potential for bias arising from unobserved heterogeneity in the wage and the participation propensity may be lower for the grouped data. In particular, in comparing our results for men and women, for the bias to explain all of the estimated experience effects it would be necessary to assume that all of the gender differential in experience was due to unobserved heterogeneity in the wage (even controlling for observed factors such as education), rather than differences in other factors affecting the employment participation decision, such as the value of home production and social norms in the labour market. In addition, the likelihood of serial correlation in the wage across groups seems much less than that for individual data. Given the inclusion of common time dummies, this would require that time-varying shocks affect only one group or a

[16] Experience in included as a single linear term for expositional simplicity in this section, but was included in various specifications (including as a quadratic and in a piecewise linear form) in the empirical work.
[17] See Deaton (1985) and Verbeek (1992).

subgroup of groups with ongoing repercussions in subsequent periods that do not spread to other groups. Hence, it is assumed that $\rho = 0$ for the grouped data

The second modification addresses further the potential bias arising from the unobserved time-invariant group wage effect $\boldsymbol{\eta_g}$. In order to remove this fixed group effect, the wage equation (eq. 4) is also estimated in differences:

$$\text{(eq. 5)} \qquad \Delta\, \mathbf{ln\ w_{gt}} = \beta_1 \Delta\, \mathbf{X_{gt}} + \beta_2 \Delta\, \mathbf{exp_{gt}} + \beta_3\, T_t + \Delta\, \mathbf{v_{gt}}$$

where $\Delta\, \mathbf{ln\ w_{gt}}$ is $\mathbf{ln\ w_{gt} - ln\ w_{gt\text{-}1}}$, and similarly for $\Delta\, \mathbf{X_{gt}}$, $\Delta\, \mathbf{exp_{gt}}$, and $\Delta\, \boldsymbol{\nu_{gt}}$. The constant term drops out of the equation, as does the time invariant element ($\boldsymbol{\eta_g}$) of the error term $\boldsymbol{\nu_{gt}}$ so that (assuming $\rho = 0$), $\Delta\boldsymbol{\nu_{gt}}$ equals the white noise term ($\boldsymbol{\varepsilon_{gt} - \varepsilon_{g(t-1)}}$). Weighting the regression by the square root of the group size, again ensures that an estimate of (eq. 5) generates efficient estimates of the coefficients. A comparison of the results from the levels regression (eq. 4) and the differenced regression (eq. 5) provides an indication of the bias introduced by the presence of unobserved group fixed effects in the wage.

Construction of an Experience Variable Using Grouped Data

An experience variable is constructed covering all years since an individual left continuous full-time education. The sample contains people born between 1962 and 1981, corresponding to those aged 16 and potentially entering the labour market in 1978 (the year from which information on education is recorded) to those potentially entering in 1997. The sample is therefore limited to those aged 36 or less, but previous research suggests that this is the most crucial time in the labour market for wage growth. Each individual is assigned to a group that can be matched to a corresponding group of observations in previous years. For each group in every year, the full-time (30 plus hours per week) and part-time (less than 30 hours per week) employment rates are calculated. The full-time and part-time experience variables are the sum of these past employment rates since the first year in the labour market.

Three main criteria were used in selecting the group specification. First, the characteristics defining the groups need to be correlated with employment differences or the final experience variable will exhibit little variation. Second, the resulting number of groups will influence the cell size, that is, the number of observations available for calculating the employment rates in previous years. Fewer groups mean larger cells and greater precision in the employment rates and fewer empty cells, while more groups increase the variance in the final experience measure. Finally, there is a practical issue that group-defining characteristics must be time-invariant or such that the timing of changes can be deduced in order to match "current" individuals with their corresponding counterparts in previous years. For example, age, number of children and age of children can be mapped backwards, but marital status cannot be mapped backwards and marital history is not available in the FES.

The previous section highlighted a number of characteristics that are closely related to employment rates. The following were chosen to define the groups:

- gender
- 5-year cohorts
- age
- education: left full-time education aged 16 or less (group 1), aged 17-18 (group 2) or aged over 18 (group 3)
- number of children (top coded at 3)
- age of the youngest child
- age of the second youngest child

The analysis was also repeated on a second set of group-defining characteristics that excluded the children variables, but the results did not differ qualitatively. The division by cohort was included specifically to analyse the changes over different generations of workers. It was also useful in allowing for time effects in employment without including year as a group-defining characteristic which would have resulted in much smaller cell sizes and a higher proportion of empty cells. Similarly, in order to reduce the proportion of empty cells, the youngest children's ages were matched by age bands defined as 0-4, 5-10 and 11-19. An example of the construction of the experience variable is provided in the Appendix.

Two other minor adjustments were required. First, there is no information in the FES as to whether children are biological, adopted or step children. It was assumed that people recorded as parents are biological parents of the children and that their period of care for the child is equal to the age of the child. Since most children stay with their mother upon relationship separation, this is most likely to overestimate the duration of the presence of children for stepfathers. However, as shown above, family structure is not such an important determinant of employment for men as it is for women. Second, exact dates of birth and exact date of leaving full-time education are not recorded in the FES data. Therefore, in creating the experience variable, only complete years of potential labour market participation were included, excluding both the first year after leaving school and the current year. For example, a 30-year old individual who left school at the age of 16 will have 13 years of potential labour market experience for the ages 17-29.

Table 1 presents some of the main sample features. There were 41,940 individuals with employment status recorded in the relevant age group[18] across the 20 years of data. Some 30,073 individuals reported an hourly wage and it was possible to calculate the experience variable for 28,807 of these observations, accounting for 95 percent of male workers and 96 percent of female workers recording a wage. Men reporting an employment status were divided into 844 groups with an average cell size of 23.7, while women were divided into 1051 groups with an average cell size of 20.8 A small proportion of cells contained fewer than 10 observations (8.1 percent for men and 9.9 percent for women), while the vast majority contained 50 plus observations (76.5 percent for men and 66.1 percent for women). The number of final wage and experience groups is far greater than the number of employment groups because wage observations recorded in the same employment cell may have histories covering different paths of employment spells and will therefore be divided into different wage and experience groups. In the levels wage regressions, 6,156 groups can be used (2,764 male groups and 3,392 female groups). However, the first difference regressions require groups with wage and experience observations in both the current year and in the previous year and the sample size is reduced to 5,675 groups (2,539 male groups and 3,136 female groups).

The experience variable takes values ranging from 0 to 14.87. Table 2 presents the average experience for different categories of workers at 20, 25 and 30 years of age (in order to control for differences in potential labour market experience).[19] As would be expected from the raw employment data presented above, women have lower experience levels. Controlling for age (rather than potential years in the labour force) means that we would expect the middle education group to have around 2 years less experience than the least educated and the highest education group to have about 5 years less experience than the least educated. The table shows that the lowest two education groups have surprisingly close levels of experience, although the top two categories exhibit the expected three year gap. As would be expected, experience for male workers declines with cohorts, but it also declines for female workers, at least for the younger ages. This may reflect changes in education levels as much as changes in participation post-education. Again, as expected from the raw employment data, the presence of children raises experience levels for men, while lowering it substantially for women and to a greater degree for women with more children.

The mean value for the experience variable will be measured with some error dependent both on the variance of employment within the group and on the correlation across individuals of successive employment probabilities. The standard errors of the estimates of returns to experience should ideally be corrected for this estimated regressor using the two-step procedure described in the literature (Murphy & Topel,

[18] Relevant age group meaning 16 year olds not in full-time education in 1978, 16-17 year olds in 1979, 16-18 year olds in 1980 and so on to 16-36 year olds in 1997/98 (since 1993/94 the FES has been collected for the financial year (April to March) rather than the calendar year).

1985). However, in this case, such an adjustment is not possible without making strong assumptions about the correlation of successive employment probabilities[20].

Results

Regression Specification

Wage regressions (eq. 4) and (eq. 5) were estimated using three different specifications. The first simply includes dummy variables for female, education, female and education interactions and year. Hence, the gender gap is allowed to vary across the three education categories. The year dummy variables are included to remove cyclical effects in employment and wages. In all regressions, the dependent variable is the log hourly wage for all workers.[21]

The second specification adds piecewise linear experience variable. This takes the form of dummy variables for each of the first six years of experience and linear segments for each following year groups of 7 to 8 years, 9 to 11 years and 12 to 16 years. For example, a group with 3.25 years of experience will have unit values for the experience variables in years 1 through 3, a value of 0.25 for experience in year 4 and zero values in all subsequent years. For higher levels of experience, the years were grouped across variables with similar (and not significantly different) levels of return. This piecewise linear form allows a great deal of flexibility, which is particularly important given that the estimates for higher levels of experience will only be drawing on the data for the older cohorts. The analysis was also performed using a quadratic

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[19] For example, the raw averages across cohorts present much higher figures for cohort 1which includes those aged 16 to 36 than for cohort 4 which only contains those aged 16 to 21.

[20] In particular, there is no theoretical basis for assuming anything from zero to complete correlation in the employment probability at an individual level and empirical estimates of the correlation could only be made from individual panel data of a sample similar to those individuals in the FES data.

[21] The regressions were also estimated using the wages from full-time workers only. Differences in the estimation results arose because several groups had wage observations only for part-time workers and there was a reduction in sample size. (Results using wages from all workers and from those using only full-time workers were very similar when the sample of groups was held

specification for experience and the resulting profiles were very similar. This second specification is initially estimated without female interactions with the experience variables (specification 2a), which provides an indication of the gender gap controlling for experience differences but assuming that the returns to experience are the same for men and women. Specification 2b adds the female interactions with experience, allowing the gender gap to be analysed both in terms of differences in levels and in the returns to experience.

The third specification replaces the total experience variables with a similar set of variables broken down into full-time and part-time experience, allowing for potential differences in the impact of full-time and part-time work on future wage levels. Specification 3a includes only common experience variables for both genders, while specification 3b adds female and experience interaction variables. However, the number of interactions for the part-time experience variables was limited by the fact that very few male groups had part-time experience in excess of 2 years.

Returns to Experience: Levels Regressions

Tables 3 to 5 present the results for the levels wage regressions corresponding to regression (eq. 4). In table 3, the results from the basic specification without any experience variables is shown for a sample containing all the available wage observations and for a sample of only those which can be used in the first difference regressions. The estimates for the restricted first differences sample (which is used in all subsequent regressions) show an element of non-randomness in the selection but the results between the two regressions are broadly similar. The regressions show significant positive returns to education, as well as a substantial gender gap. Using the first differences sample, female workers with the lowest level of education receive wages 21.7 percent lower than their male counterparts, while those in the middle and highest education categories face a discrepancy of 14.7 percent.

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constant). The change in sample reduced the size of the estimated returns to experience in the first difference regressions but did

The results for the second specification, which adds the experience variables, are shown in table 4. Controlling for experience levels increases the returns to educational level for both men and women. The first regression (specification 2a) assumes identical returns to experience for men and women. The estimates indicate a 22.5 percent return to the first year of experience, followed by returns of 12 and 11 percent in the following two years, a drop to 5 percent in the fourth year and a downward decline to around 4 percent in the final years measured[22]. Controlling for experience differences between men and women reduces the unexplained gender wage differential to 19.7 percent for those in the lowest education group, but slightly increases the gap for those in the middle education group to 15.8 percent and slightly reduces the gap for those in the highest education group to 13.9 percent. Hence, differences in experience levels explain very little of the raw gender wage gap.

The second regression (specification 2b) allows the returns to experience to vary by gender. The coefficient on the female dummy variable is much smaller and insignificant and the coefficients for the female and experience interaction are of an offsetting value, indicating little gender difference in wage levels at initial entry into the labour market for all education groups. However, the returns to experience are persistently lower for women than men, although the estimated difference is only significant for experience in years 7-8[23]. Hence, the gender wage gap widens as experience increases.

Figure 13 presents the female/male wage ratio for each education group across experience levels using the coefficients estimated in regression 2b. The lines are parallel because the specification assumes common returns across education groups[24]. Although education groups 2 and 3 are almost identical in the wage ratio, the pure difference in wage levels would be greatest for the most highly educated because the ratio would be operating on a higher base. The pattern of initial gender near-equality

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not qualitatively alter the gender differences.

[22] A summary of previous estimates for the returns to experience can be found in Williams (1991). Direct comparisons with the estimates presented here are not straight forward as previous work has used a quadratic format for the experience variables and has also included employer tenure in the regressions.

[23] The increase in the R^2 value between specification 2a and 2b shows that the set of experience and female interaction variables are jointly significant.

[24] The regressions presented in the section “Returns by Education” below relax this assumption.

and a widening gap with experience can clearly be seen with the ratio reaching a minimum point at eight years of experience at 75.0 percent for the lowest educated and 78.3 percent for the top two education groups. Although there is some convergence at the higher experience levels, women do not catch up with men within the 16-year time frame of this sample. In addition, this convergence may reflect some selection effects: only those women who have taken little time out of the labour market since leaving education will be recording such high levels of experience, while a much higher proportion of men will reach these levels. Nevertheless, it is clear that although female workers initially command similar wages to their male counterparts upon entry to the labour market, women fair increasingly poorly relative to men the longer that they are in employment.

The results for the final regression specification that breaks experience into full-time and part-time variables are shown in table 5. The part-time experience variables (being groups averages) were limited to a maximum amount of 7 years, with the highest level for any male group being 1.3 years. Hence, the female interaction terms could only be included for years 1-2 of part time experience, while the variable for part-time variables in excess of two years are estimated using data only from female groups. Assuming that men and women command identical returns to experience (specification 3a) means that the unexplained gender wage gap falls to 10.9 percent for the lowest education group and 9.4 percent and 9.6 percent for the higher education categories. As the estimated coefficients on the full-time experience variables are very similar to those for the total experience variables (specification 2a), the large and negative returns to part-time work are explaining a substantial part of the raw gender gap, particularly for the lowest educated group. Allowing for differences in the returns to experience for men and women (specification 3b) once again reduces the gender gap at zero experience to a small and insignificant level, while the female differential is taken up in the experience variables, showing a lower return for women than for men to *full-time* experience, particularly at lower levels of experience. In addition, the strong positive coefficient on the female interaction with the first two years of part-time experience shows that working part-time is particularly detrimental in terms of future wages for men. Hence, the raw gender gap can be explained both in terms of lower returns to full-time experience for women and by the fact that women are more likely to work part-time which is related to lower wages in future employment[25]. However, the underlying cause of this part-time experience effect may be either a causal relationship (in that part-time work reduces future productivity) or may be the result of unobserved heterogeneity across groups (in that those commanding lower average wages have higher proportions of part-time workers).

Returns to Experience: First Difference Regressions Controlling for Unobserved Heterogeneity

The bias in the estimated returns to experience resulting from unobserved heterogeneity across groups can be addressed using the first difference wage regressions shown in (eq. 5). The results for specification 2 (including the total experience variables) are presented in table 6. Aggregated across men and women (specification 2a), there is a 14.1 percent and 12.6 percent return to the first and second years of experience, followed by returns of 6.4 and 4.4 percent in the following two years, a drop to around 3.5 percent in the fifth and sixth years and virtually no return in subsequent years. These numbers are considerably lower than those estimated in the levels regressions shown in table 4, indicating that at least some of the returns to experience could be accounted for by unobserved heterogeneity in wage levels and the propensity to be employed across groups.

Allowing for differences between men and women in the returns (specification 2b) again produces lower estimates of the returns than in the levels estimation, but there is a clearer gender distinction in the first difference regressions than in the levels

[25] Harkness (1996) (table 5(d)) includes regressors for full-time and part-time experience in separate wage regressions for men and women, but includes only linear and squared terms for each and also includes age in the regression. Using BHPS recalled employment data, the results suggest lower returns to full-time experience for women than men (due to a larger negative squared term) and negative returns to part-time experience for women currently employed full-time, while both men and women employed part-time receive positive returns to part-time experience.

regression: women receive significantly lower returns during the first two years of experience and generally lower returns than men in most subsequent years[26].

Figure 14 presents the female/male wage ratio for each education group across experience levels and is the first differences counterpart to figure 13[27]. Once again, the pattern of increasing inequality with experience can be clearly seen, with the ratio reaching a minimum level at 11 years of experience at 73.2 percent for the lowest education group and about 77 percent for the more highly educated groups. The lower returns to experience estimated in the first differences approach implies less equality at initial labour market entry and a slower recovery after the minimum point.

Figure 15 uses the results from specification 2b in tables 4 and 6 to demonstrate the degree of bias in the accumulated returns to experience from using the levels estimation rather than the first differences in the wage regression. This is calculated as the running sum of the difference in the estimated coefficients on the experience terms between the levels and first difference regressions. For example, the levels approach estimates a return of 20.5 percent for men and 14.5 percent for women from the first year of experience, while the first difference approach estimates returns of 16.6 percent and 13.0 percent, generating a bias in the levels approach of 3.9 percent for men and 1.5 percent for women. Given that the returns for each experience level are persistently lower using the first differences approach, the size of the accumulated bias rises steadily with experience, reaching some 38 percent for men and 52 percent for women at 16 years of experience. This bias is consistent with the potential impact of unobserved heterogeneity that those commanding lower wages tend to have lower experience levels, exaggerating the return to experience. The argument that such endogeneity of experience on wage levels may be argued to be greater for women (due to a higher value of home production or to traditional social roles) is confirmed by the fact that the bias is substantially greater for women than men.

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[26] Once again, the increase in the R^2 value between specification 2a and 2b indicates that the set of female and experience interaction variables are jointly significant.

Table 7 shows the results of the estimation of the first difference regressions using separate regressors for full-time and part time experience (specification 3). The pattern of returns to full time experience is broadly similar to that of total experience, with a distinctly smaller return for women than men up to about 6 years of full-time experience. However, the returns to higher levels of full-time experience (over 8 years) are considerably higher for women than, suggesting a degree of catch-up for women who remain in full-time work for these longer years. The results also confirm the finding of negative returns to part-time experience seen in the levels regression results, but the impact is smaller. As using the first differences approach eliminates the unobserved heterogeneity argument, this suggest that some, but not all, of the impact measured in the levels regression is due a causal relationship between part-time work and lower wage growth. For example, part-time work may be perceived as a bad signal by employers or may lead to depreciation of human capital.

A summary of the estimated female/male wage ratios across different specifications and estimation method is presented in table 8[28]. The ratios are always higher for the more highly educated groups, with little difference between the top two education groups for most specifications. Adding the total experience variables (comparing specification 2a with 1) has little impact on the ratios using either the levels or first differences approaches, indicating that little of the gender discrepancy is due to differences in total experience levels. However, inclusion of full-time and part-time experience variables has a much larger impact that differs by the approach used. Using the levels approach suggests that the negative impact of part-time experience explains a sizable proportion of the gender gap. But, using first differences suggests that much of this apparent explanatory power may be due to unobserved heterogeneity. In particular, part-time work explains a substantial proportion of the

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[27] In calculating the ratios from the first difference regressions, the intercept term at zero experience was calculated as $\boldsymbol{\alpha} = \mathbf{w_{gt}} - \boldsymbol{\beta}.\mathbf{exp_{gt}}$ where $\mathbf{w_{gt}}$ and $\mathbf{exp_{gt}}$ are the observed group wage and experience levels and $\boldsymbol{\beta}$ is the vector of estimated coefficients on the experience variables from specification 2b.

[28] For the levels regressions, the ratios are calculated straight-forwardly from the female and female and education interaction dummy variables. For the difference regressions, a predicted wage level was estimated for each observation from the estimated coefficients on the experience variable and the implied common intercept term (α): $\mathbf{w^p_{gt}} = \boldsymbol{\alpha} + \boldsymbol{\beta}.\mathbf{exp_{gt}}$. The gender ratio was then calculated as the ratio between the average difference in the observed and predicted wage. Hence, the ratio captures the gender differences not explained by the gap predicted by differences in experience levels.

gender gap not because part-time work is detrimental to future wage levels, but only because of a selection effect whereby groups of women with lower wages have higher proportions who work part-time.

Returns by Education

Tables 9 through 11 present the results from specifications 1 and 2 for separate regressions for each education group. Not surprisingly, table 9 generates very similar estimates to table 3 that the raw gender wage differential falls substantially as education level increases[29]. The results for specification 2a (using the first difference approach) are shown in table 10 and indicate that the returns to experience broadly decline with education level. Indeed, those leaving school at age 16 or less can expect substantial wage growth for the first 6 years of work, while there is surprisingly little growth for those leaving after age 19.

Inclusion of the experience and female interaction variables (specification 2b) in separate regressions for each education group permits the returns to experience to differ both by gender and education level. The results from estimations using first differences are shown in table 11. The pattern of distinctly lower returns to experience for the higher two education groups than the lowest is repeated, but it is only women in the lowest education group who experience a significant gender gap in the returns.

Figure 16 presents the female/male wage ratio for each education group across experience levels using the results from table 11 to allow independently shaped profiles for each group. Indeed, the profiles turn out to be markedly different between the education levels. For female workers leaving school at age 16 (education group 1), the profile is similar to the U-shaped picture of the aggregate profile shown in figure 14, although the upturn begins distinctly earlier at around 6 years of experience and the ratio returns to equality by 16 years of experience. In contrast, those in education group 2 face a fairly flat, slightly declining, ratio up to about year 11, after which the ratio of female wage to male wage falls substantially. Although women in the highest education group initially fair worst of the three groups at labour market entry, their position improves to maintain the highest ratio for the first eight years. From 9 years onwards, however, the wage ratio for education group 3 shows a dramatic decline.

It is interesting to note that these differences across education group may correspond to variation in the average age that women have their first child and the point at which a break in labour market participation may occur. For the lowest educated, the break comes relatively early with a relatively small detriment to wages that is recovered within the range of experience used in the estimation. For the highest educated, the break is much later (at around 30 for a women leaving college at 21 and working continuously thereafter) and has a much more dramatic impact. The middle group is something of a mixture of the other two profiles. There are at least two competing possible explanations for such a loss is relative wage position following the time of initial childbirth. The first is that any interruption in employment may result in the loss of the benefits of accumulated employer tenure or may lead to a real or perceived depreciation in human capital during time spent out of employment. This would affect male or female workers in a similar way but might have a greater detrimental effect for more highly educated workers. Alternatively, the decline may be related to a change in employment tastes or capabilities brought about by the presence of young children for working mothers. For example, mothers of young children may trade-off other desirable work aspects (such as flexible hours or the ability to work at home) against wage levels in their employment choice. The ability to trade such aspects may be greater for the more highly educated. The results presented here demonstrate that a greater understanding of gender wage differentials requires further investigation of such hypotheses.

A summary of the impact of using separate regressions for each education group on the estimated gender wage gap is presented in table 12. In spite of increasingly flexible specifications allowing experience to explain a greater proportion

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[29] The regression in table 3 would produce identical results to those in table 9 if the year dummy variables were also interacted with education level.

of the wage variation between groups, there is little impact on the fraction of the gender wage ratio which can be explained by differences in experience levels between men and women.

Returns by Cohort

Finally, tables 13 through 15 divide the analysis into the three cohorts: those born between 1962-66 (cohort 1), 1967-71 (cohort 2), and 1972-76 (cohort 3)[30]. Table 13 presents the results for the base regression without any experience variables (specification 1) and shows that the raw gender differences declines substantially with each new cohort at every education level. As this may reflect differences in the potential experience profile across the cohorts (they are all truncated at 1997 rather than at age 16), with the older cohorts including the higher experience levels where the gender gap is greatest, the regressions were also estimated using a restricted sample of those observations with less than 9 years of potential experience (the maximum for cohort 3). The results (presented in appendix table B1) also show a decline in the gender differentials across cohorts.

The results for the regressions including the experience variables (specification 2) controls for these differences and allows a comparison across cohorts. Table 14 presents the results using first differences for the model including a common return to experience across men and women (specification 2a). Although the oldest cohort enjoyed substantial returns to experience across the entire range, the estimates show only significant returns over the first two years for cohort 2 and both small and insignificant returns for the most recent cohort.[31]

The results shown in table 15 allow for different returns to experience across men and women (specification 2b). The declining rates of returns across cohorts holds for men alone, while all cohorts of women have received significantly lower returns to

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[30] Cohort 4 had too few groups and too short a time frame to be used in a separate analysis.

[31] Results for the sample restricted to observations with less than 9 years of potential experience are presented in appendix table B2. They show a similar picture to the estimates for the unrestricted sample, although the differences in returns to experience for the first tow cohorts are not so marked.

the first two years of experience than their male counterparts, with the greatest gender gap being for the most recent cohort[32].

The female/male wage ratio for each cohort across experience levels, calculated from the estimates shown in table 15, are presented in figure 17. The picture shows how the gender gap has closed with each successive cohort at most levels of experience, although there still remain considerable discrepancies right across the experience profile.

Finally, table 16 presents the estimated gender ratios across cohorts for specifications 1 and 2a, using both the unrestricted sample and the sample restricted to observations with a maximum potential experience of 8 years[33]. Regardless of sample or specification, the estimates suggest that the gender gap has closed substantially with each successive cohort and has shown the greatest decline for the lowest two education groups. However, these changes have occurred independently of changes in experience levels: the estimates controlling for experience levels (specification 2a) show an almost identical pattern to those for the base regression (specification 1). Hence, there is no evidence to support the hypothesis that increases in employment participation leading to higher experience levels for women can account for the closing wage gender gap over the last two decades.

Conclusions

Women continue to play a very different role in the labour market from their male counterparts, both in terms of employment participation and work hours as well as in the hourly wage they receive. Using data from repeated cross-sections of the British Family Expenditure Survey, this paper has shown how the propensity to be employed differs not only be gender, but also by education level, age, number of

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[32] Results for the sample restricted to observations with less than 9 years of potential experience are presented in appendix table B3. Again, they show a similar picture to the estimates for the unrestricted sample, but the differences in returns to experience for the first tow cohorts are not so marked.

[33] The estimated ratios for the restricted sample are based on the estimates shown in appendix tables B1 and B2.

children and cohort. It has also evidenced the changing patterns in these influences over the last twenty years.

The focus of the analysis has been to explore the role of accumulated employment experience in explaining why male workers command higher wages than female workers. This has required addressing the issue of unobserved heterogeneity in estimating the returns to experience, a source of bias that is potentially greater for women and men. Two modifications were made to the basic wage regressions. First, suitably weighted grouped data was used on the grounds that the potential bias is less for grouped than individual level data. Second, the wage regression was estimated in first differences rather than in levels. In addition, the method developed for deriving the returns to experience from a series of cross-sections rather than using panel or recalled employment data could be applied to similar household surveys in other countries.[34]

In the raw data without any allowance for differences in experience, female workers with the lowest level of education receive wages that are 22 percent lower than their male counterparts, while those in the middle and highest education categories face a discrepancy of 15 percent. Adding experience variables to the wage regressions makes little impression on this gender gap, implying that the gender wage difference cannot be explained by straightforward differences in total experience. Without controlling for unobserved heterogeneity, the levels wage regressions suggest that differences in full-time and part-time experience can explain a sizeable proportion of the gender gap. However, estimates from the first difference regression shows that this explanatory power is a consequence of unobserved heterogeneity and that accumulated employment experience, measured as a single total or divided into full-time and part-time, plays very little role in explaining the gender wage gap.

By allowing the returns to experience to differ by gender, it is possible to map out the gender wage gap over the experience profile. Although male and female wages are close to equality upon labour market entry (at zero experience), there is a steady

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[34] Ongoing work is exploring the possibility of applying an identical analysis to the Current Population Survey for the United States.

decline in the relative female position for the first 11 years of experience, followed by a gradual recovery. Disaggregating the profiles by education level show that the lowest educated experience the decline very early in their careers, while the highest educated maintain close to parity with their male counterparts for the first 9 years of experience. This pattern bears some relation to differences across education groups in the timing of the arrival of the first child and a corresponding potential break in employment for female workers. Moreover, the decline in relative wage, once it hits, is much greater for more educated female workers than less educated ones, suggesting that the arrival and presence of small children has a greater impact for more educated mothers. This may arise because an interruption to employment is more harmful to wages at higher experience and qualification levels, particularly through the loss of accumulated employer tenure. Alternatively, more highly educated working women may be more likely to trade-off other desirable employment characteristics (such as flexible work hours) against wage returns in the presence of young children. Whatever the underlying reason, this is clearly a crucial period in the labour market for women and policies aiming to reduce gender wage inequality might benefit from focusing on this point in the career.

Finally, breaking the analysis into separate cohorts shows that successive generations of female workers have faired better then previous generations in their wage position relative to male workers. However, these changes occur within education groups and are not explained by changes in relative experience levels. Hence, there is no evidence to support the hypothesis that increases in employment participation leading to higher experience levels for women can account for the closing wage gender gap over the last two decades. It might be, however, that an increasingly female workforce has reduced the wage discrepancy through less immediately measurable effects, such as, reducing gender discrimination or changing the capability or desire of women to undertake higher paid employment. Whatever the underlying cause, the declining gender wage gap by cohort is an optimistic indication for future developments in the role of women in the labour market.

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Table 1: Sample Statistics.

	Men	Women
Number of Individuals:		
With employment status	20035	21905
With wage variable	15215	14858
With wage and experience variables	14500	14307
Number of groups (cells):		
For employment rates	844	1051
For wage and experience: levels	2764	3392
For wage and experience: first differences	2539	3136
Average number of individuals in each employment group (average size):	23.7	20.8
Percentage of groups in size band:		
1 to 10	8.1	9.9
11to 50	15.4	24.0
50 plus	76.5	66.1

Table 2: Average Experience by Age, Education, Cohort and Number of Children

	Average Years of Experience (standard deviation)					
	Men Aged:			Women Aged:		
	20	25	30	20	25	30
Education:						
Left school age 16	2.29	6.29	10.08	2.32	6.10	9.23
	(0.13)	(0.23)	(0.21)	(0.30)	(1.25)	(2.06)
Left school aged 17-18	1.15	5.38	9.55	1.18	5.68	9.70
	(0.36)	(0.38)	(0.39)	(0.40)	(0.66)	(1.01)
Left school aged 19 plus	0.00	2.10	5.71	0.00	2.14	6.16
	(0.00)	(1.21)	(1.69)	(0.00)	(1.19)	(1.64)
Cohort:						
Born 1962-1966	2.02	5.30	9.17	1.90	5.12	8.70
	(0.71)	(1.78)	(1.91)	(0.77)	(1.96)	(2.20)
Born 1967-1971	1.93	4.93	8.67	1.75	4.94	8.92
	(0.63)	(1.93)	(1.97)	(0.78)	(2.00)	(1.95)
Born 1972-1976	1.64	5.01	n.a.	1.56	4.81	n.a.
	(0.70)	(1.56)		(0.76)	(1.84)	
Born 1977-1981	1.51	n.a.	n.a.	1.18	n.a.	n.a.
	(0.72)			(0.74)		
Children:						
None	1.88	4.98	8.85	1.75	5.08	9.27
	(0.71)	(1.91)	(1.95)	(0.79)	(2.07)	(2.28)
1 child	2.12	5.93	8.94	1.54	5.25	9.00
	(0.40)	(1.04)	(2.26)	(0.66)	(1.37)	(1.73)
2 children	1.96	5.94	9.77	0.98	4.01	7.99
	(0.40)	(0.62)	(1.41)	(0.64)	(1.37)	(1.51)
3+ children	n.a.	4.02	9.84	n.a.	2.06	6.32
		(2.82)	(0.41)		(0.94)	(2.30)
All	1.89	5.14	9.07	1.73	5.01	8.75
	(0.70)	(1.82)	(1.93)	(0.79)	(1.97)	(2.16)
Number of groups	1040	892	477	1112	958	465

Notes: There are some wage observations at age 20 for those in the highest education group (63 groups for men and 77 groups for women), but experience is zero by definition.

Table 3: Returns to Education (Specification 1): Levels Regressions

Dependent variable: log hourly wage	Specification 1			
	Levels Sample		First Differences Sample	
No. groups	6156		5675	
R^2	0.4401		0.4282	
Constant	1.8070***	(0.027)	1.8365***	(0.024)
Female dummy	-0.1897***	(0.010)	-0.2174***	(0.010)
Education 2	0.1163***	(0.015)	0.1369***	(0.014)
Education 3	0.3998***	(0.017)	0.4273***	(0.016)
Education 2 * female	0.0694***	(0.020)	0.0702***	(0.019)
Education 3 * female	0.0523**	(0.023)	0.0704***	(0.022)
Year dummies	Included		Included	

Notes: The notation (* female) shows a variable interacted with the female dummy. Standard errors are shown in brackets and the stars indicate coefficients that are significantly different from zero at the 1 percent (***), 5 percent (**) and 10 percent (*) levels.

Table 4: Returns to Education and Total Experience (Specification 2): Levels Regressions

Dependent variable: log hourly wage	Specification 2a		Specification 2b	
No. groups	5675		5675	
R^2	0.6259		0.6331	
Constant	1.1286***	(0.056)	1.0822***	(0.073)
Female dummy	-0.1974***	(0.008)	-0.0312	(0.103)
Education 2	0.1758***	(0.011)	0.1766***	(0.011)
Education 3	0.5633***	(0.013)	0.5719***	(0.013)
Education 2 * female	0.0399***	(0.015)	0.0424***	(0.015)
Education 3 * female	0.0580***	(0.018)	0.0429**	(0.018)
Exp. in year 1	0.2245***	(0.067)	0.2051**	(0.093)
Exp. in year 2	0.1180***	(0.027)	0.1665***	(0.038)
Exp. in year 3	0.1109***	(0.022)	0.1157***	(0.030)
Exp. in year 4	0.0489**	(0.021)	0.0632**	(0.028)
Exp. in year 5	0.0740***	(0.020)	0.0910***	(0.028)
Exp. in year 6	0.0543***	(0.019)	0.0473*	(0.027)
Exp. in years 7-8	0.0359***	(0.009)	0.0519***	(0.012)
Exp. in years 9-11	0.0366***	(0.007)	0.0320***	(0.009)
Exp. in years 12-16	0.0400***	(0.011)	0.0266*	(0.015)
Exp. in year 1 * female			-0.0598	(0.132)
Exp. in year 2 * female			-0.0630	(0.052)
Exp. in year 3 * female			-0.0216	(0.043)
Exp. in year 4 * female			-0.0242	(0.041)
Exp. in year 5 * female			-0.0358	(0.040)
Exp. in year 6 * female			0.0167	(0.037)
Exp. in years 7-8 * female			-0.0344**	(0.018)
Exp. in years 9-11 * female			0.0071	(0.013)
Exp. in years 12-16 * female			0.0276	(0.022)
Year dummies	Included		Included	

Notes: The notation (* female) shows a variable interacted with the female dummy. Standard errors are shown in brackets and the stars indicate coefficients that are significantly different from zero at the 1 percent (***), 5 percent (**) and 10 percent (*) levels. The sample includes only those groups in the first differences sample.

Table 5: Returns to Education, Full-time Experience and Part-time Experience (Specification 3): Levels Regressions

Dependent variable: log hourly wage	**Specification 3a**		**Specification 3b**	
No. groups	5675		5675	
R^2	0.6508		0.6558	
Constant	1.1836***	(0.040)	1.1419***	(0.057)
Female dummy	-0.1093***	(0.009)	-0.0386	(0.071)
Education 2	0.1795***	(0.011)	0.1917***	(0.011)
Education 3	0.5497***	(0.013)	0.5322***	(0.013)
Education 2 * female	0.0155	(0.015)	0.0035	(0.015)
Education 3 * female	0.0129	(0.018)	0.0295*	(0.018)
FT exp. in year 1	0.2071***	(0.047)	0.2511***	(0.071)
FT exp. in year 2	0.1451***	(0.022)	0.2049***	(0.031)
FT exp. in year 3	0.1134***	(0.018)	0.1247***	(0.026)
FT exp. in year 4	0.0578***	(0.018)	0.0891***	(0.026)
FT exp. in year 5	0.0921***	(0.019)	0.0938***	(0.028)
FT exp. in year 6	0.0463***	(0.019)	0.0729***	(0.027)
FT exp. in years 7-8	0.0475***	(0.009)	0.0550***	(0.012)
FT exp. in years 9-11	0.0419***	(0.007)	0.0386***	(0.009)
FT exp. in years 12-14	0.0376**	(0.016)	0.0402**	(0.019)
FT exp. in year 1 * female			-0.0337	(0.093)
FT exp. in year 2 * female			-0.1075***	(0.043)
FT exp. in year 3 * female			-0.0083	(0.036)
FT exp. in year 4 * female			-0.0498	(0.036)
FT exp. in year 5 * female			0.0012	(0.038)
FT exp. in year 6 * female			-0.0357	(0.037)
FT exp. in years 7-8 * female			-0.0134	(0.018)
FT exp. in years 9-11 * female			0.0170	(0.014)
FT exp. in years 12-14 * female			0.0481	(0.037)
PT exp. in years 1-2	-0.1480**	(0.014)	-0.5701***	(0.075)
PT exp. in year 3	-0.4509**	(0.041)	-0.4174***	(0.041)
PT exp. in years 4	0.2781**	(0.081)	0.2689***	(0.080)
PT exp. in years 5-7	-0.1062	(0.179)	-0.1023	(0.178)
PT exp. in years 1-2 * female			0.4446***	(0.075)
Year dummies	Included		Included	

Notes: The notation (* female) shows a variable interacted with the female dummy. Standard errors are shown in brackets and the stars indicate coefficients that are significantly different from zero at the 1 percent (***), 5 percent (**) and 10 percent (*) levels. The sample includes only those groups in the first differences sample. FT denotes full-time experience and PT denotes part-time experience.

Table 6: Returns to Education and Total Experience (Specification 2): First Difference Regressions

Dependent variable: first difference in log hourly wage	**Specification 2a**		**Specification 2b**	
No. groups	5675		5675	
R^2	0.1138		0.1166	
Δ Exp. in year 1	0.1407***	(0.020)	0.1657***	(0.022)
Δ Exp. in year 2	0.1258***	(0.020)	0.1688***	(0.024)
Δ Exp. in year 3	0.0641***	(0.020)	0.0673***	(0.023)
Δ Exp. in year 4	0.0437**	(0.020)	0.0564**	(0.024)
Δ Exp. in year 5	0.0353*	(0.021)	0.0462*	(0.024)
Δ Exp. in year 6	0.0341*	(0.021)	0.0662***	(0.026)
Δ Exp. in years 7-8	0.0098	(0.020)	0.0203	(0.023)
Δ Exp. in years 9-11	-0.0227	(0.021)	-0.0119	(0.024)
Δ Exp. in years 12-16	0.0174	(0.029)	0.0134	(0.035)
Δ Exp. in year 1 * female			-0.0355**	(0.017)
Δ Exp. in year 2 * female			-0.0714***	(0.024)
Δ Exp. in year 3 * female			0.0044	(0.024)
Δ Exp. in year 4 * female			-0.0152	(0.024)
Δ Exp. in year 5 * female			-0.0125	(0.026)
Δ Exp. in year 6 * female			-0.0454*	(0.026)
Δ Exp. in years 7-8 * female			-0.0120	(0.022)
Δ Exp. in years 9-11 * female			-0.0135	(0.024)
Δ Exp. in years 12-16 * female			0.0186	(0.047)
Year dummies	Included		Included	

Notes: The notation (* female) shows a variable interacted with the female dummy. Standard errors are shown in brackets and the stars indicate coefficients that are significantly different from zero at the 1 percent (***), 5 percent (**) and 10 percent (*) levels. The symbol Δ denotes the first difference.

T-tests show that the following pairs (denoted <>) of coefficients for the Δ Exp. variables (not interacted with female dummies) are significantly different at the 10 percent level or higher:

Specification 2a: 1<>3,4,5,6,7-8,9-11,12-16; 2<>3,4,5,6,7-8,9-11,12-16; 3<>5,6,7-8,9-11,12-16; 4<>7-8,9-11; 5<>9-11, 6<>9-11; 7-8<> 9-11.

Specification 2b: 1<>3,4,5,6,7-8,9-11,12-16; 2<>3,4,5,6,7-8,9-11,12-16; 3<>7-8,9-11; 4<>9-11; 5<>9-11; 6<>7-8,9-11.

Table 7: Returns to Education, Full-time Experience and Part-time Experience (Specification 3): First Difference Regressions

Dependent variable: first difference in log hourly wage	**Specification 3a**		**Specification 3b**	
No. groups	5675		5675	
R^2	0.1171		0.1211	
Δ FT exp. in year 1	0.1394***	(0.020)	0.1558***	(0.025)
Δ FT exp. in year 2	0.1145***	(0.020)	0.1484***	(0.026)
Δ FT exp. in year 3	0.0502***	(0.020)	0.0510**	(0.025)
Δ FT exp. in year 4	0.0304	(0.020)	0.0423*	(0.026)
Δ FT exp. in year 5	0.0153	(0.021)	-0.0062	(0.027)
Δ FT exp. in year 6	-0.0028	(0.022)	0.0373	(0.028)
Δ FT exp. in years 7-8	-0.0120	(0.021)	-0.0087	(0.025)
Δ FT exp. in years 9-11	-0.0223	(0.022)	-0.0351	(0.026)
Δ FT exp. in years 12-14	0.0171	(0.035)	-0.0071	(0.038)
Δ FT exp. in year 1 * female			-0.0257	(0.021)
Δ FT exp. in year 2 * female			-0.0626**	(0.026)
Δ FT exp. in year 3 * female			0.0045	(0.025)
Δ FT exp. in year 4 * female			-0.0181	(0.025)
Δ FT exp. in year 5 * female			0.0500*	(0.029)
Δ FT exp. in year 6 * female			-0.0825***	(0.031)
Δ FT exp. in years 7-8 * female			-0.0020	(0.026)
Δ FT exp. in years 9-11 * female			0.0445	(0.031)
Δ FT exp. in years 12-14 * female			0.1695**	(0.085)
Δ PT exp. in years 1-2	-0.1226***	(0.048)	-0.1547	(0.167)
Δ PT exp. in year 3	-0.2881***	(0.072)	-0.2873***	(0.073)
Δ PT exp. in years 4	-0.1068	(0.113)	-0.1013	(0.113)
Δ PT exp. in years 5-7	-0.1156	(0.279)	-0.1086	(0.279)
Δ PT exp. in years 1-2 * female			0.0354	(0.170)
Year dummies	Included		Included	

Notes: The notation (* female) shows a variable interacted with the female dummy. Standard errors are shown in brackets and the stars indicate coefficients that are significantly different from zero at the 1 percent (***), 5 percent (**) and 10 percent (*) levels. FT denotes full-time experience and PT denotes part-time experience. The symbol Δ denotes the first difference.
T-tests show that the following pairs (denoted <>) of coefficients for the Δ FT Exp. variables (not interacted with female dummies) are significantly different at the 10 percent level or higher:
Specification 3a: 1<>3,4,5,6,7-8,9-11,12-16; 2<>3,4,5,6,7-8,9-11,12-16; 3<>5,6,7-8,9-11; 4<>6,7-8,9-11; 5<>9-11, 6<>9-11.
Specification 3b: 1<>3,4,5,6,7-8,9-11,12-16; 2<>3,4,5,6,7-8,9-11,12-16; 3<>5,7-8,9-11; 4<>5,7-8,9-11; 6<>7-8,9-11.

Table 8. Ratio of Female/Male Wages By Education

Female Wage as Percentage of Male Wage	Specification				
	1	2a Levels	2a First Diffs.	3a Levels	3a First Diffs.
Education level 1	80.46	82.09	81.16	89.65	78.82
Education level 2	86.31	85.43	85.66	91.05	84.96
Education level 3	86.33	86.99	86.75	90.81	88.08

Notes: For specifications 1 and the other levels regressions, the ratio is calculated from the female and the female*education dummy variables. For the first differences regressions, the ratio is calculated as the mean difference between women and men in the (observed-predicted) ln wage, weighted by the group size as in the regression.

Table 9 Returns to Education (Specification 1): Levels Regressions by Education

Dependent variable: log hourly wage	**Education group 1**		**Education group 2**		**Education group 3**	
No. groups	2829		1423		1423	
R^2	0.3212		0.2160		0.1109	
Constant	1.8355***	(0.034)	1.9912***	(0.049)	2.2465***	(0.047)
Female dummy	-0.2172***	(0.010)	-0.1466***	(0.016)	-0.1464***	(0.020)
Year dummies	Included		Included		Included	

Notes: The notation (* female) shows a variable interacted with the female dummy. Standard errors are shown in brackets and the stars indicate coefficients that are significantly different from zero at the 1 percent (***), 5 percent (**) and 10 percent (*) levels. The sample includes only those groups in the first differences sample.

Table 10: Returns to Education and Total Experience (Specification 2a): First Difference Regressions by Education

Dependent variable: first difference in log hourly wage	**Education group 1**		**Education group 2**		**Education group 3**	
No. groups	2829		1423		1423	
R^2	0.1667		0.099		0.0545	
Δ Exp. in year 1	0.2044**	(0.028)	0.1318**	(0.041)	0.0819*	(0.049)
Δ Exp. in year 2	0.1786**	(0.027)	0.1325**	(0.043)	0.0426	(0.052)
Δ Exp. in year 3	0.0894**	(0.027)	0.0956**	(0.043)	0.0143	(0.052)
Δ Exp. in year 4	0.0750**	(0.027)	0.0700*	(0.043)	-0.0177	(0.052)
Δ Exp. in year 5	0.0633**	(0.028)	0.0842*	(0.044)	-0.0631	(0.054)
Δ Exp. in year 6	0.0773**	(0.027)	0.0218	(0.044)	-0.0354	(0.056)
Δ Exp. in years 7-8	0.0388	(0.026)	0.0301	(0.041)	-0.0659	(0.053)
Δ Exp. in years 9-11	0.0040	(0.027)	-0.0059	(0.042)	-0.1164*	(0.061)
Δ Exp. in years 12-16	0.0428	(0.034)	0.0344	(0.055)	-0.2498	(0.228)
Year dummies	Included		Included		Included	

Notes: The notation (* female) shows a variable interacted with the female dummy. Standard errors are shown in brackets and the stars indicate coefficients that are significantly different from zero at the 1 percent (***), 5 percent (**) and 10 percent (*) levels. The symbol Δ denotes the first difference.

Table 11: Returns to Education and Total Experience (Specification 2b): First Difference Regressions by Education

Dependent variable: first difference in log hourly wage	**Education group 1**		**Education group 2**		**Education group 3**	
No. groups	2829		1423		1423	
R^2	0.1769		0.1016		0.0595	
Δ Exp. in year 1	0.2445***	(0.030)	0.1487***	(0.048)	0.0499	(0.055)
Δ Exp. in year 2	0.2449***	(0.031)	0.1496***	(0.052)	0.0299	(0.062)
Δ Exp. in year 3	0.0784***	(0.029)	0.1381***	(0.053)	0.0265	(0.062)
Δ Exp. in year 4	0.0993***	(0.030)	0.0586	(0.054)	-0.0149	(0.059)
Δ Exp. in year 5	0.0797***	(0.030)	0.1178**	(0.055)	-0.0998	(0.064)
Δ Exp. in year 6	0.1301***	(0.034)	0.0234	(0.054)	-0.0186	(0.070)
Δ Exp. in years 7-8	0.0440	(0.029)	0.0323	(0.050)	-0.0122	(0.062)
Δ Exp. in years 9-11	0.0121	(0.029)	0.0088	(0.049)	-0.0825	(0.073)
Δ Exp. in years 12-16	0.0275	(0.039)	0.0764	(0.080)	-0.1937	(0.324)
Δ Exp. in year 1 * female	-0.0670***	(0.022)	-0.0200	(0.034)	0.0478	(0.038)
Δ Exp. in year 2 * female	-0.1204***	(0.031)	-0.0220	(0.047)	0.0144	(0.058)
Δ Exp. in year 3 * female	0.0476	(0.032)	-0.0637	(0.048)	-0.0330	(0.059)
Δ Exp. in year 4 * female	-0.0378	(0.031)	0.0234	(0.051)	-0.0155	(0.058)
Δ Exp. in year 5 * female	-0.0229	(0.033)	-0.0499	(0.051)	0.0665	(0.069)
Δ Exp. in year 6 * female	-0.0746**	(0.033)	0.0037	(0.051)	-0.0385	(0.075)
Δ Exp. in years 7-8 * female	0.0050	(0.030)	0.0024	(0.044)	-0.1099**	(0.062)
Δ Exp. in years 9-11 * female	-0.0041	(0.032)	-0.0182	(0.044)	-0.0873	(0.091)
Δ Exp. in years 12-16 * female	0.0593	(0.056)	-0.0616	(0.090)	-0.1195	(0.454)
Year dummies	Included		Included		Included	

Notes: The notation (* female) shows a variable interacted with the female dummy. Standard errors are shown in brackets and the stars indicate coefficients that are significantly different from zero at the 1 percent (***), 5 percent (**) and 10 percent (*) levels. The symbol Δ denotes the first difference.

T-tests show that the following pairs (denoted <>) of coefficients for the Δ Exp. variables (not interacted with female dummies) are significantly different at the 10 percent level or higher:

Education level 1: 1<>3,4,5,6,7-8,9-11,12-16; 2<>3,4,5,6,7-8,9-11,12-16; 3<>7-8,9-11; 4<>7-8,9-11; 5<>9-11, 6<>7-8,9-11.

Education level 2: 1<>4,6,7-8,9-11; 2<>4,6,7-8,9-11; 3<>6,7-8,9-11; 5<>6,9-11.

Education level 3: 1<>5,9-11; 2<>5, 3<>5.

Table 12. Ratio of Female/Male Wages By Education

Female Wage as Percentage of Male Wage	Specification			
	1	1 by Education	2a First Diffs	2a First Diffs by Education
Education level 1	80.46	80.48	81.16	81.99
Education level 2	86.31	86.36	85.66	85.50
Education level 3	86.33	86.38	86.75	86.22

Notes: For specifications 1 and the other levels regressions, the ratio is calculated from the female and the female*education dummy variables. For the first differences regressions, the ratio is calculated as the mean difference between women and men in the (observed-predicted) ln wage, weighted by the group size as in the regression.

Table 13: Returns to Education (Specification 1): Levels Regressions by Cohort

Dependent variable: log hourly wage	**Cohort 1**		**Cohort 2**		**Cohort 3**	
No. groups	3603		1594		439	
R^2	0.5797		0.5566		0.3453	
Constant	2.0395***	(0.038)	1.8732***	(0.033)	1.7376***	(0.049)
Female dummy	-0.2725***	(0.012)	-0.1653***	(0.014)	-0.1000***	(0.027)
Education 2	0.1510***	(0.017)	0.1259***	(0.020)	0.0236	(0.036)
Education 3	0.3724***	(0.018)	0.3190***	(0.024)	0.1600***	(0.056)
Education 2 * female	0.0734***	(0.022)	0.0337	(0.027)	0.0601	(0.049)
Education 3 * female	0.1326***	(0.025)	0.0560*	(0.032)	0.0285	(0.072)
Year dummies	Included		Included		Included	

Notes: The notation (* female) shows a variable interacted with the female dummy. Standard errors are shown in brackets and the stars indicate coefficients that are significantly different from zero at the 1 percent (***), 5 percent (**) and 10 percent (*) levels. The sample includes only those groups in the first differences sample.

Table 14: Returns to Education and Total Experience (Specification 2a): First Difference Regressions by Cohort

Dependent variable: first difference in log hourly wage	**Cohort 1**		**Cohort 2**		**Cohort 3**	
No. groups	3603		1594		439	
R^2	0.0935		0.156		0.2301	
Δ Exp. in year 1	0.1451**	(0.033)	0.0956**	(0.032)	0.0245	(0.051)
Δ Exp. in year 2	0.1278**	(0.034)	0.1009**	(0.032)	-0.0056	(0.053)
Δ Exp. in year 3	0.1014**	(0.033)	-0.0079	(0.032)	0.0059	(0.054)
Δ Exp. in year 4	0.0390	(0.033)	0.0459	(0.032)	-0.0532	(0.054)
Δ Exp. in year 5	0.0682**	(0.032)	0.0076	(0.033)	-0.0412	(0.064)
Δ Exp. in year 6	0.0636**	(0.032)	0.0157	(0.033)	0.0757	(0.069)
Δ Exp. in years 7-8	0.0296	(0.030)	0.0388	(0.032)	0.0887	(0.185)
Δ Exp. in years 9-11	0.0175	(0.030)	0.0092	(0.036)	(dropped)	
Δ Exp. in years 12-16	0.0658*	(0.036)	(dropped)		(dropped)	
Year dummies	Included		Included		Included	

Notes: The notation (* female) shows a variable interacted with the female dummy. Standard errors are shown in brackets and the stars indicate coefficients that are significantly different from zero at the 1 percent (***), 5 percent (**) and 10 percent (*) levels. The symbol Δ denotes the first difference.

Table 15: Returns to Education and Total Experience (Specification 2b): First Difference Regressions by Cohort

Dependent variable: first difference in log hourly wage	**Cohort 1**		**Cohort 2**		**Cohort 3**	
No. groups	3603		1594		439	
R^2	0.098		0.1614		0.256	
Δ Exp. in year 1	0.1828***	(0.036)	0.1128***	(0.037)	0.0294	(0.058)
Δ Exp. in year 2	0.1326***	(0.039)	0.1543***	(0.039)	0.1078*	(0.064)
Δ Exp. in year 3	0.0909**	(0.037)	-0.0180	(0.038)	0.0494	(0.059)
Δ Exp. in year 4	0.0704*	(0.038)	0.0515	(0.037)	-0.0950	(0.065)
Δ Exp. in year 5	0.0554	(0.036)	0.0473	(0.041)	0.0373	(0.080)
Δ Exp. in year 6	0.1156***	(0.038)	0.0142	(0.042)	0.0704	(0.092)
Δ Exp. in years 7-8	0.0409	(0.033)	0.0442	(0.036)	0.0887	(0.183)
Δ Exp. in years 9-11	0.0318	(0.033)	0.0030	(0.048)	(dropped)	
Δ Exp. in years 12-16	0.0586	(0.041)	(dropped)		(dropped)	
Δ Exp. in year 1 * female	-0.0665***	(0.025)	-0.0202	(0.026)	0.0208	(0.040)
Δ Exp. in year 2 * female	-0.0031	(0.037)	-0.0885***	(0.035)	-0.1723***	(0.058)
Δ Exp. in year 3 * female	0.0270	(0.036)	0.0301	(0.036)	-0.0733	(0.060)
Δ Exp. in year 4 * female	-0.0569	(0.037)	-0.0022	(0.034)	0.0925	(0.066)
Δ Exp. in year 5 * female	0.0391	(0.035)	-0.0657	(0.041)	-0.1339	(0.095)
Δ Exp. in year 6 * female	-0.0850**	(0.036)	0.0091	(0.040)	0.0253	(0.116)
Δ Exp. in years 7-8 * female	-0.0173	(0.029)	-0.0030	(0.035)	(dropped)	
Δ Exp. in years 9-11 * female	-0.0246	(0.028)	0.0169	(0.056)	(dropped)	
Δ Exp. in years 12-16 * female	0.0224	(0.048)	(dropped)		(dropped)	
Year dummies	Included		Included		Included	

Notes: The notation (* female) shows a variable interacted with the female dummy. Standard errors are shown in brackets and the stars indicate coefficients that are significantly different from zero at the 1 percent (***), 5 percent (**) and 10 percent (*) levels. The symbol Δ denotes the first difference. The (Δ Exp. in years 7-8 * female) variable was dropped in the cohort 3 regression because too few groups of women had average experience in excess of 6 years in this cohort.
T-tests show that the following pairs (denoted <>) of coefficients for the Δ Exp. variables (not interacted with female dummies) are significantly different at the 10 percent level or higher:
Cohort 1: 1<>3,4,5,6,7-8,9-11,12-16; 2<>3,4,5,7-8,9-11; 3<>9-11; 5<>6; 6<>7-8,9-11;
Cohort 2: 1<>3,4,5,6,7-8,9-11,12-16; 2<>3,4,5,6,7-8,9-11,12-16; 3<>4,7-8,9-11;
Cohort 3: 1<>4; 2<>4,9-11,12-16; 3<>4; 4<>6; #

Table 16. Ratio of Female/Male Wages By Education and Cohort

Female Wage as Percentage of Male Wage	Unrestricted Sample		Sample Restricted to Maximum Experience of 8 Years	
	Specification		Specification	
	1	2a First Diffs	1	2a First Diffs
Education level 1:				
cohort 1	76.15	77.76	81.20	81.59
cohort 2	84.76	85.07	86.73	86.99
cohort 3	90.48	91.16	90.48	91.16
Education level 2:				
cohort 1	81.95	81.41	86.04	86.79
cohort 2	87.67	87.82	88.84	89.23
cohort 3	96.09	96.80	96.09	96.80
Education level 3:				
cohort 1	86.94	86.42	87.55	87.26
cohort 2	89.65	88.83	89.52	88.48
cohort 3	93.10	92.78	93.10	92.78

Notes: For specifications 1 and the other levels regressions, the ratio is calculated from the female and the female*education dummy variables. For the first differences regressions, the ratio is calculated as the mean difference between women and men in the (observed-predicted) ln wage, weighted by the group size as in the regression.

Figure 1. Ratio of female/male wages, full-time and all wages, 1978-1997.

Figure 2. Ratio of female/male full-time wages - 1978-97, by school leaving age: 1(<16), 2(17-18), 3(19+)

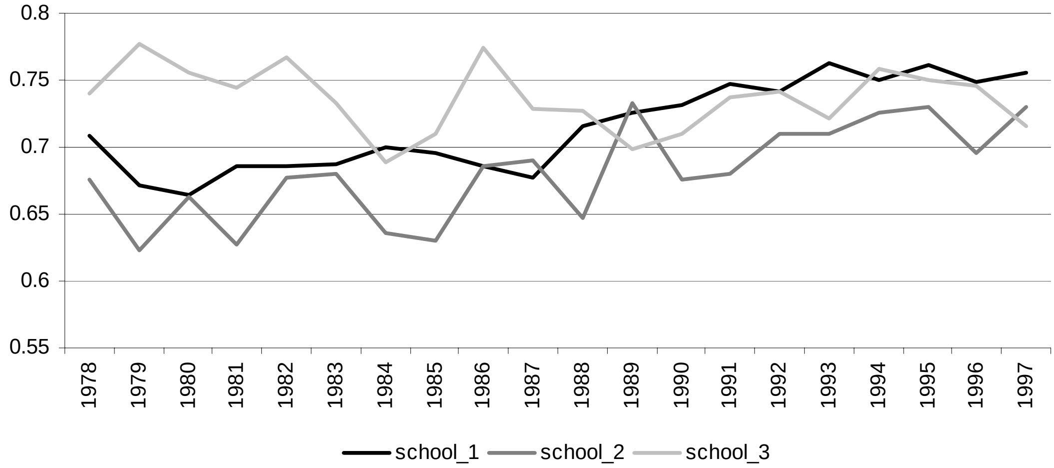


Figure 3. Employment rates for men and women aged 16-55, 1978-97.

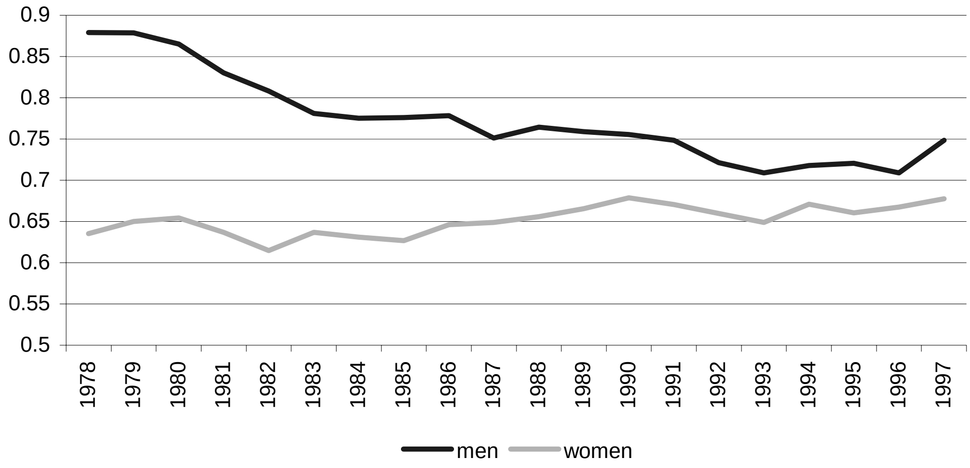


Figure 4. Employment for men 1978-1997 by school leaving age:
1(<16), 2(17-18), 3(19+)

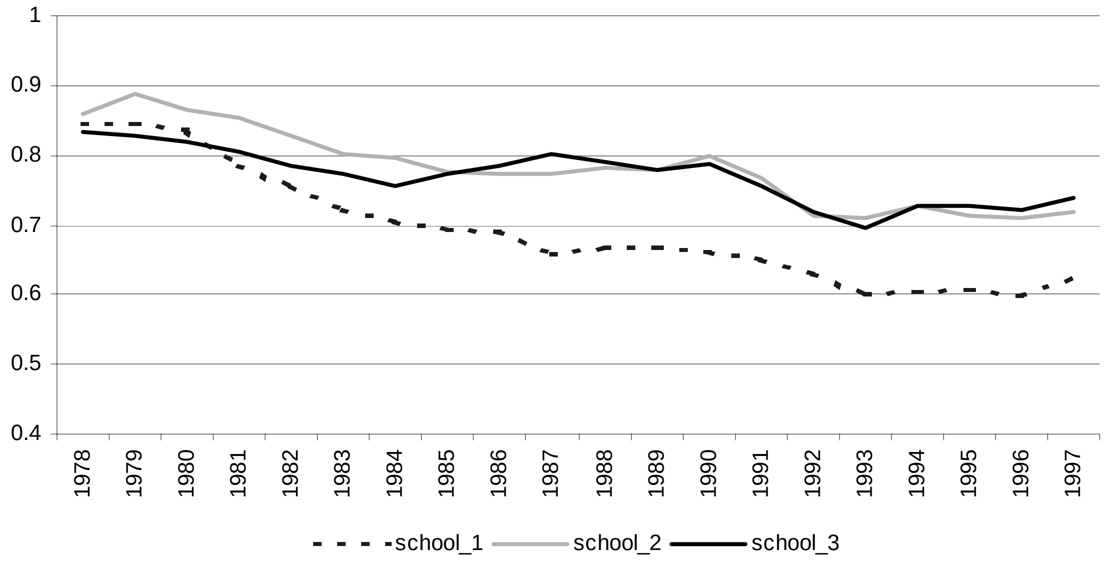


Figure 5. Employment for women 1978-1997 by school leaving age:
1(<16), 2(17-18), 3(19+)

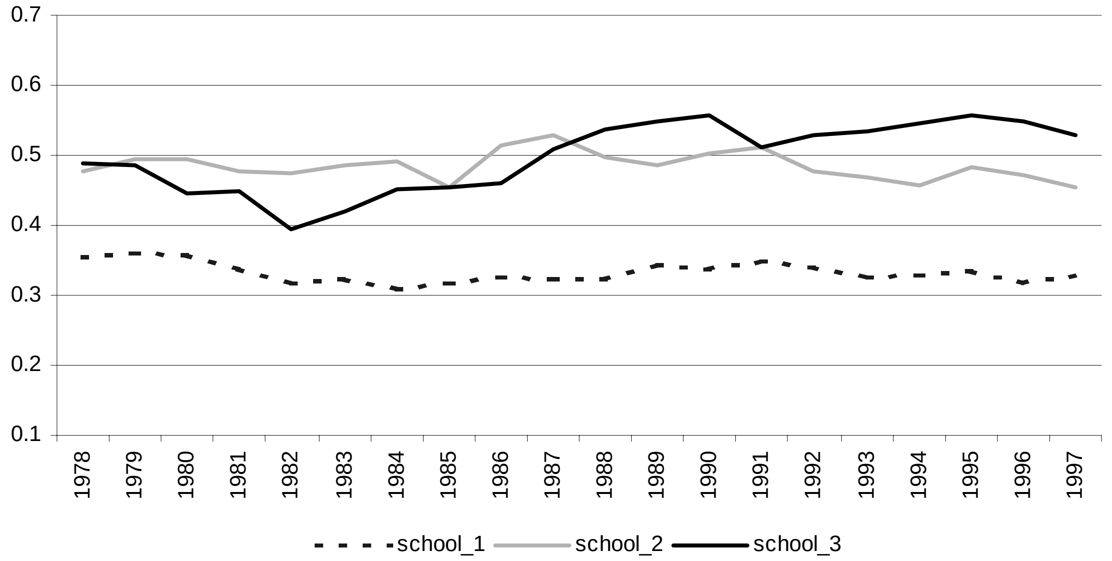


Figure 6. Full-time employment by number of children, men, 1978-97.

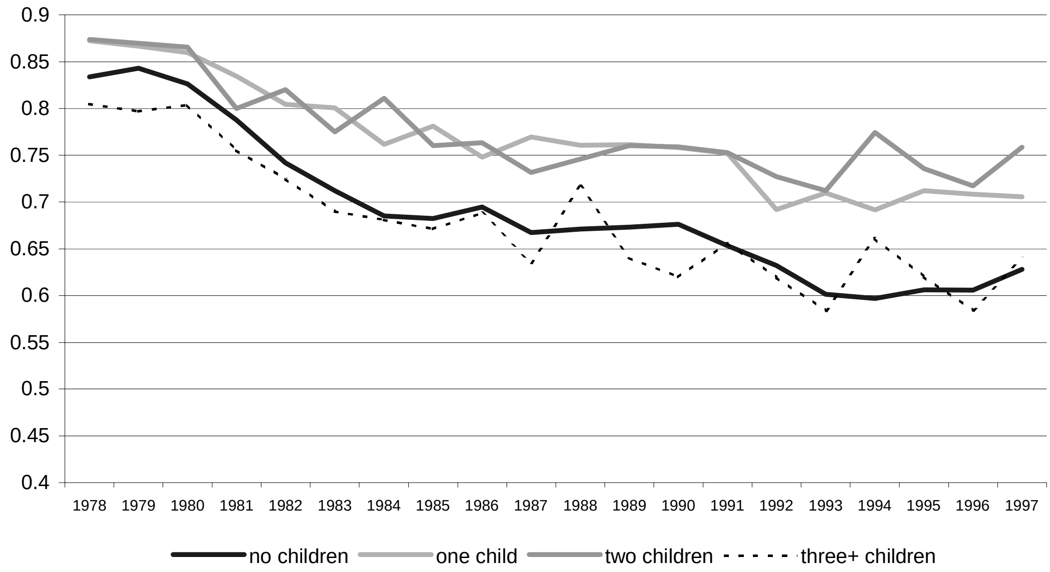


Figure 7. Full time employment by number of children, women, 1978-97.

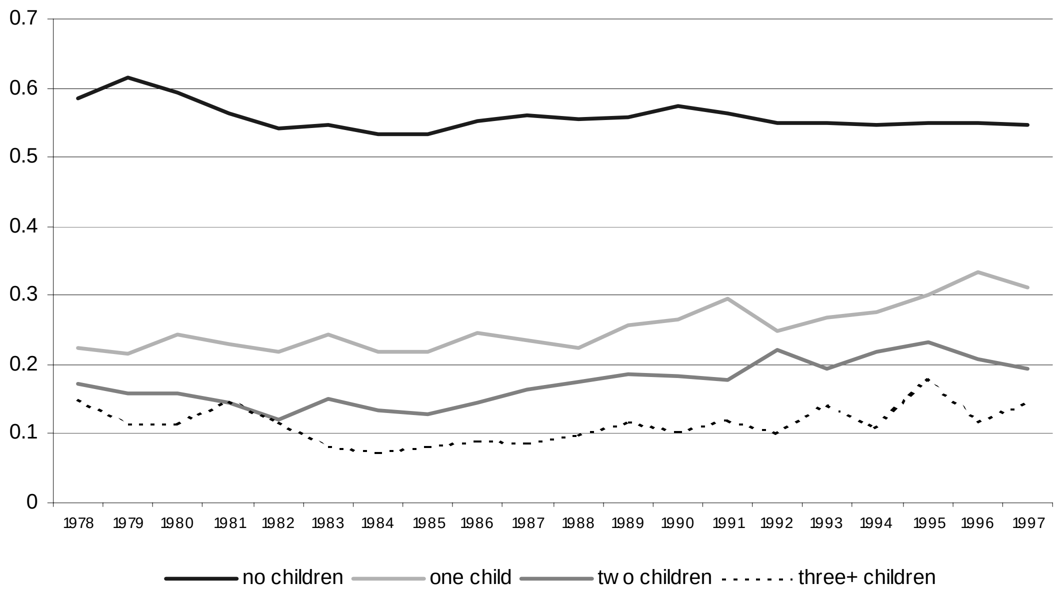


Figure 8. Employment age profiles, 1978-97.

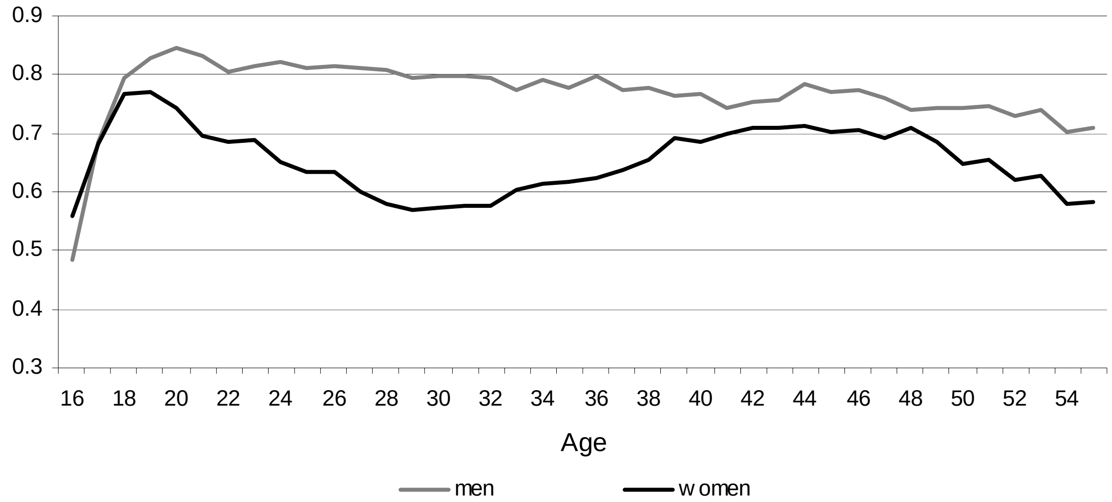


Figure 9. Employment age profile - women, full-time and part-time employment, 1978-97.

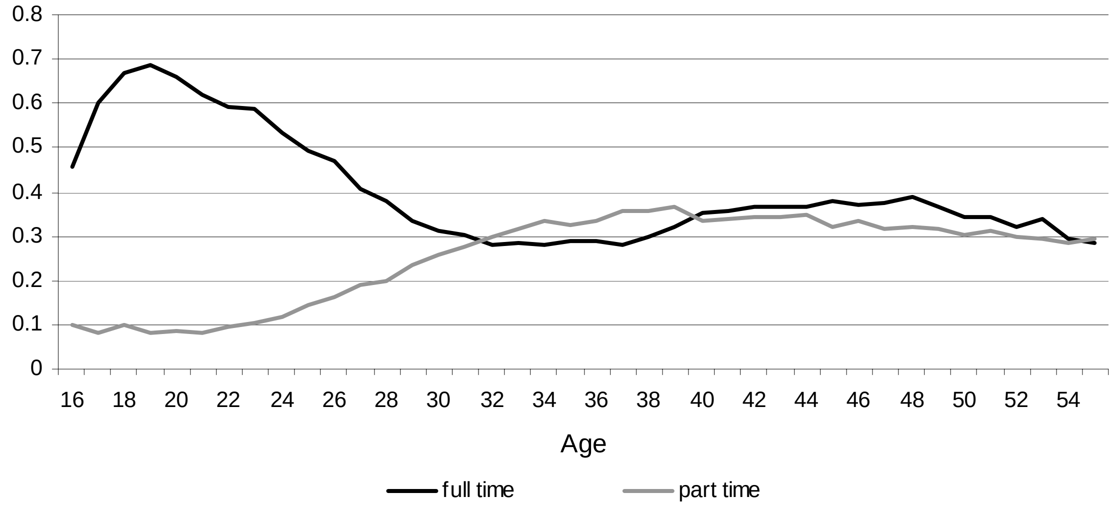


Figure 10. Full time employment by cohort, men, 1978-97.

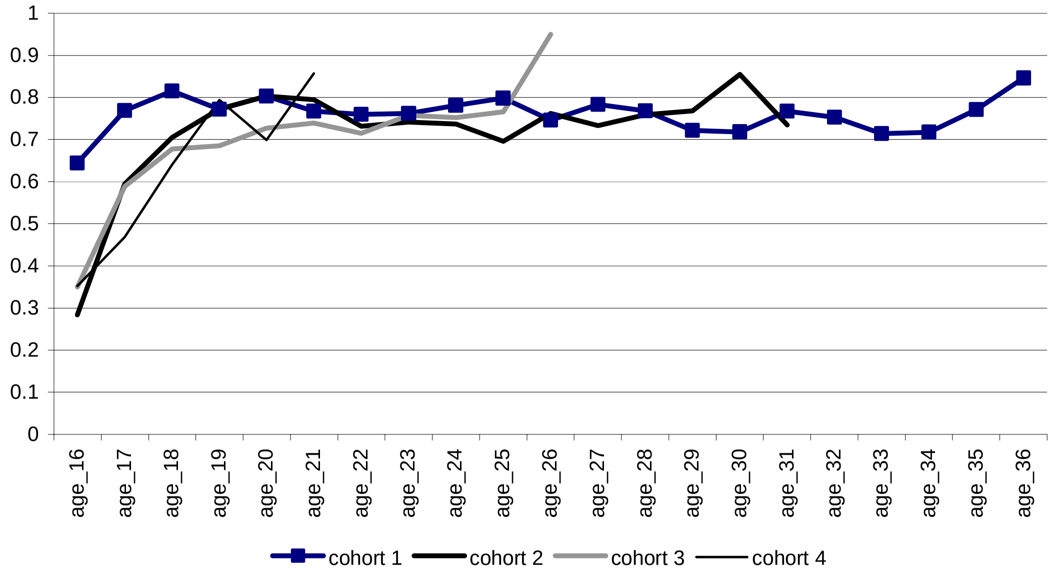


Figure 11. Full time employment by cohort, women, 1978-97.

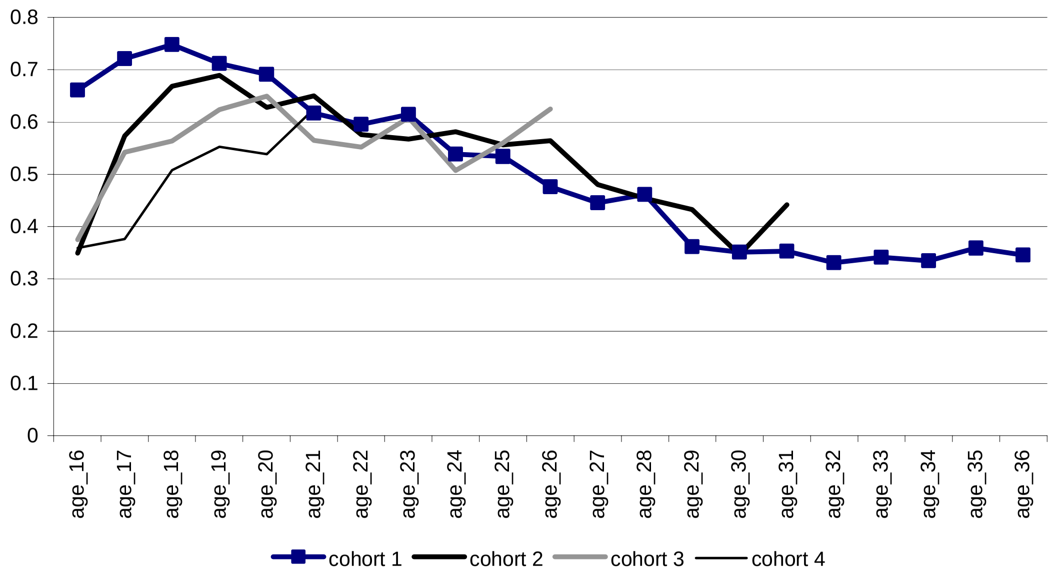


Figure 12. Part time employment by cohort, women, 1978-97.

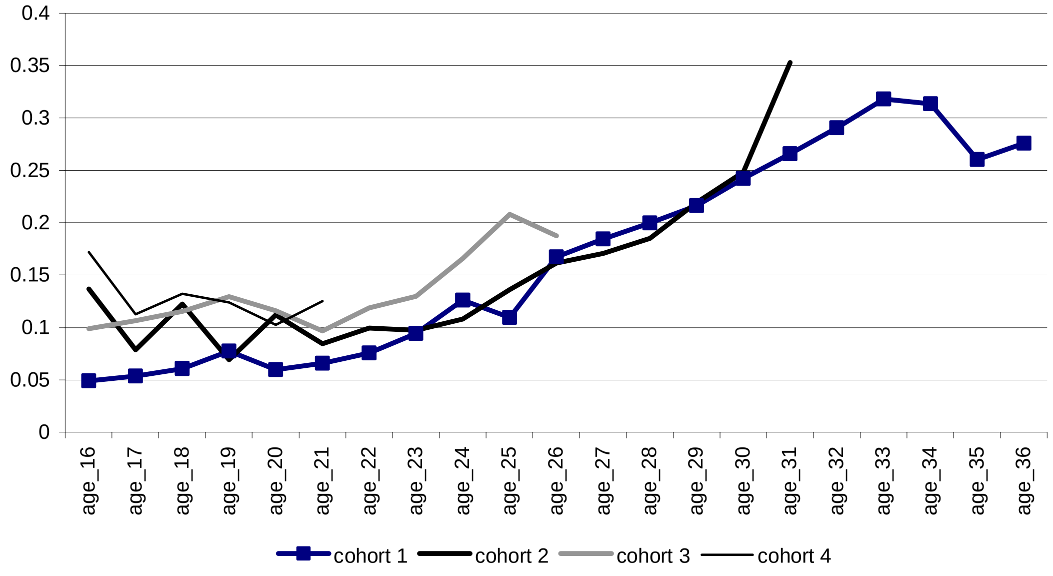


Figure 13. Wages and experience - female/male ratio by education - specification 2b in levels

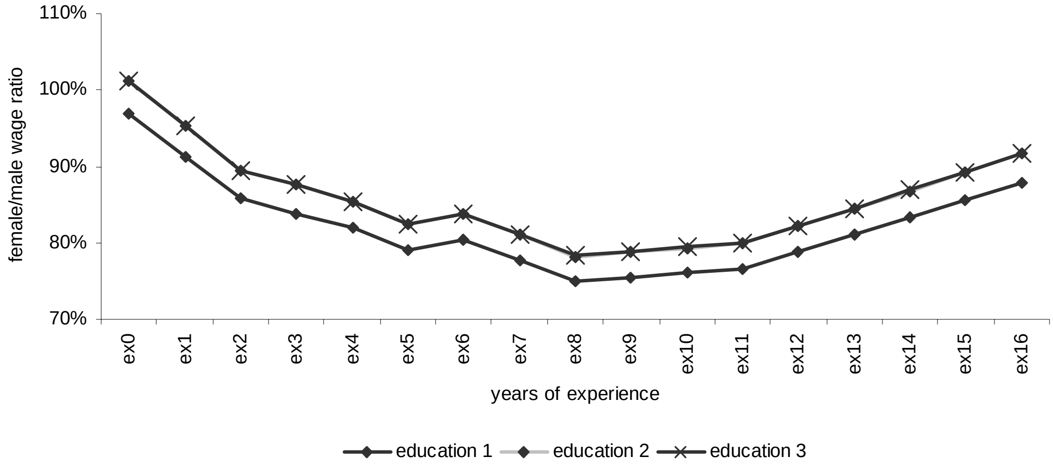


Figure 14. Wages and experience - female/male ratio by education - specification 2b in first differences

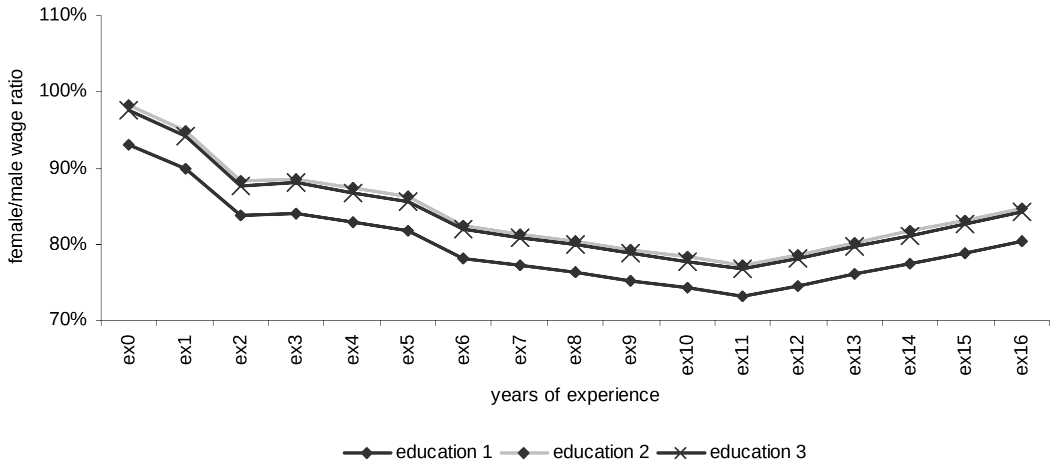


Figure 15. Bias resulting from unobserved heterogeneity, by gender

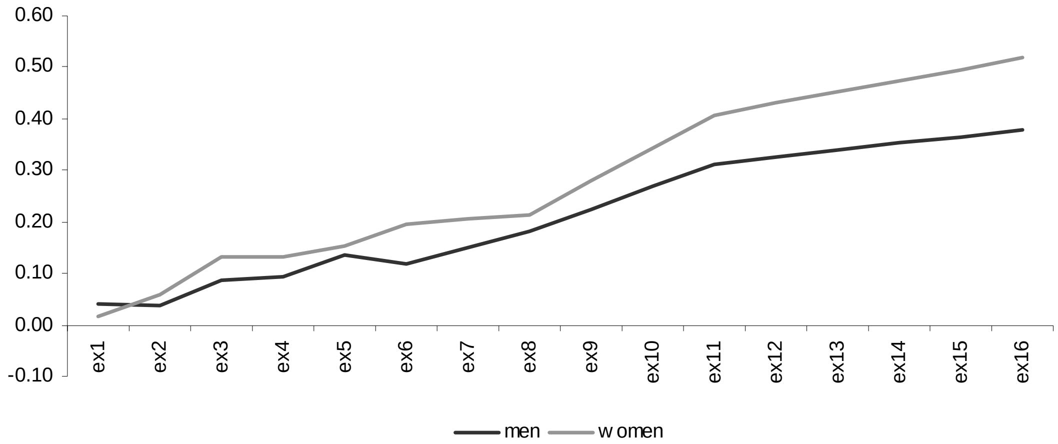


Figure 16. Wages and experience - female/male ratio by education - specification 2b by education in first differences

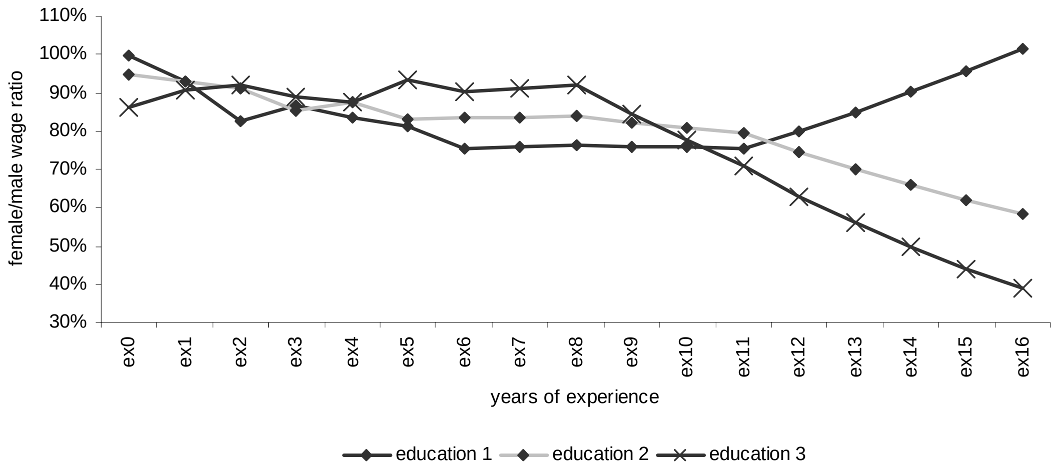
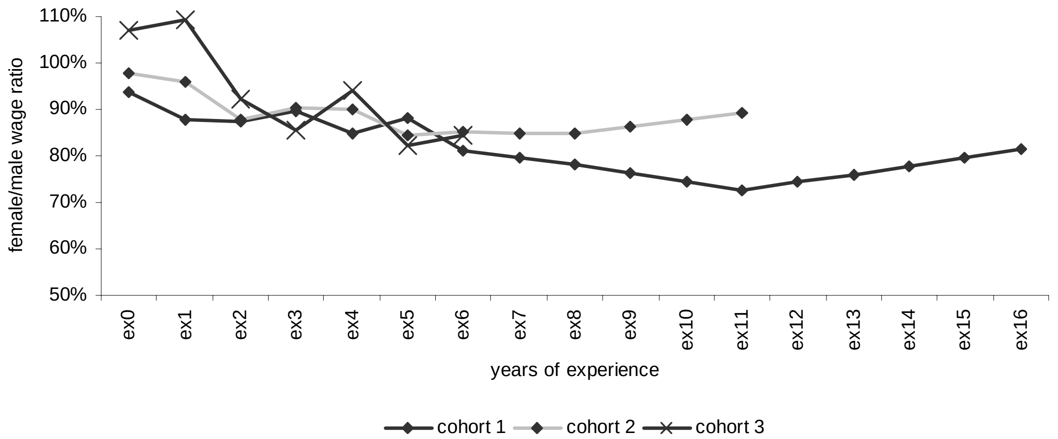


Figure 17. Wages and experience - female/male ratio by cohort - specification 2b by education in first differences



Appendix A: Example Construction of the Experience Variable

An example of the construction of the experience variable is presented in the following table. A woman appears in the 1997 data as 27 years old with 2 children, born when she was 23 and 26. The woman was born in 1970 and thus belongs to cohort 2. She is recorded as having left continuous full-time education at age 20. Information about her employment rate is therefore required for the years 1991-1996. The following table shows the matched groups in each year of potential experience. The bottom row shows the 5-year bands from which the employment rates are drawn. If single years were being used rather than the 5-year bands, the woman would simply have been matched with similar 21 year-olds in 1991. Matching with 21-year olds across the years 88-92 allows much larger cell sizes.

Appendix Table A1: Example of Group Matching

	Year of Potential Experience					
	1991	1992	1993	1994	1995	1996
Matched Group:						
Gender	female	female	female	female	female	female
Age	21	22	23	24	25	26
Cohort	2	2	2	2	2	2
Education group	3	3	3	3	3	3
Number of children	0	0	1	1	2	2
Age band for youngest child	0	0	1	1	1	1
Age band for 2nd youngest child	0	0	0	0	1	1
Data Years:						
For cohort 2	88-92	89-93	90-94	91-95	92-96	93-97

Appendix Table B1: Returns to Education (Specification 1): Levels Regressions by Cohort - limited to 8 years of experience

Dependent variable: log hourly wage	Cohort 1		Cohort 2		Cohort 3	
No. groups	1400		1132		439	
R^2	0.7164		0.6067		0.3453	
Constant	1.9532***	(0.173)	1.8863***	(0.061)	1.7376***	(0.049)
Female dummy	-0.2083***	(0.015)	-0.1424***	(0.016)	-0.1000***	(0.027)
Education 2	0.1011***	(0.021)	0.1321***	(0.022)	0.0236	(0.036)
Education 3	0.3184***	(0.023)	0.3362***	(0.026)	0.1600***	(0.056)
Education 2 * female	0.0579**	(0.027)	0.0241	(0.029)	0.0601	(0.049)
Education 3 * female	0.0753***	(0.029)	0.0317	(0.034)	0.0285	(0.072)
Year dummies	Included		Included		Included	

Notes: The notation (* female) shows a variable interacted with the female dummy. Standard errors are shown in brackets and the stars indicate coefficients that are significantly different from zero at the 1 percent (***), 5 percent (**) and 10 percent (*) levels. The sample includes only those groups in the first differences sample.

Appendix Table B2: Returns to Education and Total Experience (Specification 2a): First Difference Regressions by Cohort - limited to 8 years of experience

Dependent variable: first difference in log hourly wage	Cohort 1		Cohort 2		Cohort 3	
No. groups	1400		1132		439	
R^2	0.2259		0.2077		0.2301	
Δ Exp. in year 1	0.0754*	(0.042)	0.0921**	(0.038)	0.0245	(0.051)
Δ Exp. in year 2	0.0589	(0.043)	0.0976***	(0.037)	-0.0056	(0.053)
Δ Exp. in year 3	0.0329	(0.042)	-0.0099	(0.037)	0.0059	(0.054)
Δ Exp. in year 4	-0.0299	(0.043)	0.0442	(0.037)	-0.0532	(0.054)
Δ Exp. in year 5	-0.0029	(0.043)	0.0093	(0.039)	-0.0412	(0.064)
Δ Exp. in year 6	-0.0043	(0.043)	0.0083	(0.038)	0.0757	(0.069)
Δ Exp. in years 7-8	-0.0874**	(0.044)	0.0197	(0.041)	0.0887	(0.185)
Year dummies	Included		Included		Included	

Notes: The notation (* female) shows a variable interacted with the female dummy. Standard errors are shown in brackets and the stars indicate coefficients that are significantly different from zero at the 1 percent (***), 5 percent (**) and 10 percent (*) levels. The symbol Δ denotes the first difference.
T-tests show that the following pairs (denoted <>) of coefficients for the Δ Exp. variables are significantly different at the 10 percent level or higher:
Cohort 1: 1<>3,4,5,6,7-8; 2<>4,5,6,7-8; 3<>4,78; 4<>7-8; 5<>78; 6<>7-8;
Cohort 2: 1<>3,4,5,6,7-8; 2<>3,4,5,6,7-8; 3<>4;
Cohort 3: 1<>4; 4<>6;

Appendix Table B3: Returns to Education and Total Experience (Specification 2b): First Difference Regressions by Cohort - limited to 8 years of experience

Dependent variable: first difference in log hourly wage	**Cohort 1**		**Cohort 2**		**Cohort 3**	
No. groups	1400		1132		439	
R^2	0.2352		0.2154		0.256	
Δ Exp. in year 1	0.1121***	(0.045)	0.1090***	(0.042)	0.0294	(0.058)
Δ Exp. in year 2	0.0625	(0.047)	0.1504***	(0.043)	0.1078*	(0.064)
Δ Exp. in year 3	0.0221	(0.045)	-0.0217	(0.042)	0.0494	(0.059)
Δ Exp. in year 4	-0.0029	(0.047)	0.0472	(0.042)	-0.0950	(0.065)
Δ Exp. in year 5	-0.0214	(0.046)	0.0429	(0.046)	0.0373	(0.080)
Δ Exp. in year 6	0.0366	(0.048)	0.0075	(0.047)	0.0704	(0.092)
Δ Exp. in years 7-8	-0.0972**	(0.051)	-0.0058	(0.050)	0.0887	(0.183)
Δ Exp. in year 1 * female	-0.0647***	(0.024)	-0.0204	(0.026)	0.0208	(0.040)
Δ Exp. in year 2 * female	-0.0007	(0.035)	-0.0881***	(0.035)	-0.1723***	(0.058)
Δ Exp. in year 3 * female	0.0278	(0.034)	0.0328	(0.036)	-0.0733	(0.060)
Δ Exp. in year 4 * female	-0.0482	(0.035)	0.0023	(0.034)	0.0925	(0.066)
Δ Exp. in year 5 * female	0.0553	(0.033)	-0.0562	(0.041)	-0.1339	(0.095)
Δ Exp. in year 6 * female	-0.0669*	(0.034)	0.0074	(0.040)	0.0253	(0.116)
Δ Exp. in years 7-8 * female	0.0243**	(0.038)	0.0502	(0.046)	(dropped)	
Year dummies	Included		Included		Included	

Notes: The notation (* female) shows a variable interacted with the female dummy. Standard errors are shown in brackets and the stars indicate coefficients that are significantly different from zero at the 1 percent (***), 5 percent (**) and 10 percent (*) levels. The symbol Δ denotes the first difference.
T-tests show that the following pairs (denoted <>) of coefficients for the Δ Exp. variables (not interacted with female dummies) are significantly different at the 10 percent level or higher:
Cohort 1: 1<>3,4,5,6,7-8; 2<>4,5,7-8; 3<>7-8; 4<>7-8; 5<>6, 7-8; 6<>7-8;
Cohort 2: 1<>3,4,5,6; 2<>3,4,5,6,7-8; 3<>4;
Cohort 3: 1<>4; 2<>4; 3<>4; 4<>6;