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The gender wage gap and the early-career effect: the role of actual experience and education level

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Abstract
This paper studies how the gender wage gap develops with work experience throughout the career. The contribution is twofold. First, the analysis applies matched employer-employee register data with information on actual, rather than potential, experience. Second, the career effect of the gender wage gap is allowed to differ by workers' education level. The male wage premium is small upon entry to the labor market, whereas it increases rapidly throughout the early career, before stabilizing. In contrast to the existing literature, the estimates reveal heterogeneity among high-educated workers, where the widening of the wage gap is much smaller for postgraduates than other college graduates.

JEL CLASSIFICATION
J16; J31; J71

1 | INTRODUCTION

The existence of a gender wage gap between observable equal workers is well documented. Recently, the evolvement of the male wage premium during the work career has received increased attention. Many studies find evidence of an early-career effect in the gender wage gap, where the gap is small upon entry to the labor market, increases rapidly in the early stages of the career, before stabilizing. The present paper addresses two shortcomings in this literature. First, the analysis applies matched employer-employee register data with information on actual, rather than potential, work experience. Second, the career effect of the gender wage gap is allowed to differ by workers' level of education. While the existing literature finds that the widening of the gender wage gap is largest among college

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graduates, this paper reveals heterogeneity among high-educated workers and shows the importance of separating between postgraduates and other college graduates.

There is an extensive literature on the sources of the gender wage gap, nicely surveyed by Blau and Kahn (2017). Labor market segregation with respect to industry and occupation continues to be an important explanatory factor behind the male wage premium. Based on matched employer-employee data, evidence of the gender wage gap within establishments is offered by Bayard *et al*. (2003) for the United States, Datta Gupta and Rothstein (2005) for Denmark, Korkeamäki and Kyyrä (2006) for Finland, Amuedo-Dorantes and De la Rica (2006) for Spain, and Heinze and Wolf (2010) for Germany. Although segregation in the labor market and worker heterogeneity explains a sizeable fraction of the gender wage gap, Bayard *et al*. (2003) find that almost half the male wage premium remains unexplained, indicating significant within-job wage discrimination. Addabbo and Favaro (2011) and Mussida and Picchio (2014) analyze the gender wage gap across education categories in Italy. They use quantile regressions to investigate the evolution of the gap along the wage distribution and find larger gap among the low educated, especially in the lower end of the distribution.

The early-career effect in the aggregate gender wage gap is previously documented by Manning and Swaffield (2008) using a sample of workers included in the British Household Panel Study. Recent analyses typically focus on college graduates and include Bertrand *et al*. (2010) on young professionals in the US financial and corporate sectors, Albrecht *et al*. (2018) on Swedish workers with a university degree in business or economics, and Reshid (2019) on Swedish university graduates in general. They all conclude that the gender wage gap increases rapidly during the early stages of the career. Kunze (2005) offers some contrarian evidence based on workers without college education. In an analysis of young West-German workers with 9–10 years of schooling followed by 2–3 years of apprenticeship training, she finds a large gender wage gap upon entry to the labor market, which stays constant during the early career. To my knowledge, Barth *et al*. (2017) and Goldin *et al*. (2017) are the only studies to compare the career developments in the gender wage gap across workers at different levels of education. Based on the 2000 Census of the United States combined with the Longitudinal Employer-Household Dynamics database, they show that the widening of the gender wage gap is larger among college graduates than among lower educated workers.

A drawback to most of the studies on career effects in the gender wage gap is the use of data on potential, rather than actual, work experience. In the early stages of the career, female workers often face interruptions in their work life with periods out of the labor force. Measures of potential work experience would in this case overestimate the experience of women. Regan and Oaxaca (2009) and Blau and Kahn (2013) document the bias from using potential versus actual work experience in analyses of the gender wage gap. Similarly, Antecol and Bedard (2002, 2004) emphasize the importance of actual experience data in the estimation of racial wage gaps.

This paper identifies the sources of the gender wage gap and studies how the gap develops with work experience throughout the career. The analysis is based on matched employer-employee register data for Norway covering hourly wages for all full-time workers 20–42 years old in 2010 and with information on actual work experience the previous 17 years. I separate between four levels of education: primary, high school, some college education (up to four years of duration), and postgraduates. In contrast to earlier studies, I allow for heterogeneous effects among high-educated workers by separating between workers with some college education (typically a bachelor's degree) and workers with a postgraduate degree. As emphasized by Lindley and Machin (2016), postgraduates account for a significant and growing share of the workforce, but their labor market performance is not much

studied. Estimating the male wage premium within education categories implies less unobserved heterogeneity between workers. In addition, labor markets may differ between low- and high-educated workers, for instance with respect to occupational choice. Family dynamics (like timing of childbirth) might also depend on workers' level of education and have consequences for the development of the gender wage gap along the career.

The dataset allows for a comparison of hourly wages of men and women working in the same firm with the same occupation and with other characteristics equal (including work experience, degree of labor mobility, and marital status). Women account for 41% of the observations and have on average 12% lower hourly wages than men. To identify the sources of the observed male wage premium, I use the Oaxaca-Blinder decomposition technique. Overall, about half the male wage premium is explained by differences in observable factors, while the remaining gap follows from lower returns to worker characteristics for women. The dominating factor is lower return to experience for female workers. This applies both in the private and in the public sector, for low- and high-educated workers and in cities and more sparsely populated regions. The bias from using potential, rather than actual, experience data is identified. While gender differences in the years of actual experience explain 16% of the overall wage gap, potential experience does not differ between men and women and has no contribution to the explanation of the male wage premium. Regarding the return to work experience, the estimates show that the bias from using potential rather than actual experience data could go either direction.

The analysis shows early-career effects in the gender wage gap, where the gap between observable equal workers is small upon entry to the labor market, while it increases rapidly throughout the early career, before stabilizing. While the existing literature finds that the widening of the gender wage gap is largest among college graduates, this paper reveals heterogeneity among high-educated workers. The estimates show that the increase in the male wage premium is almost twice as large for workers with up to four years of college education as for postgraduates. For the most educated workers, the widening of the gender wage gap is also smaller than for workers with primary education. To show how the choice of educational categories affects the results, the analysis is repeated for the combined group of all college-educated workers (including postgraduates). This reproduces the findings of Barth *et al*. (2017) and Goldin *et al*. (2017), where the increase in the male wage premium is largest for the most educated workers. When college-educated workers are not split into workers with some college education and postgraduates, important heterogeneity in the dynamics of the gender wage gap is lost.

The gender wage gap and its dynamics can vary with country-specific institutions, for instance the extent of family-friendly policies and the degree of gender discrimination in the labor market. The quantitative effects in this paper reflect the institutions and policies at work in Norway. Compared with other countries, the wage setting is characterized by strong labor unions and high minimum wages. Labor markets are affected by a strong welfare state offering strict regulation of labor conditions and insurance for unemployment and sickness for all workers. The results should, however, be of interest for international comparison. In addition, the paper addresses shortcomings in the literature—using actual experience data and allowing for heterogeneous effects among high-educated workers.

The data and the econometric strategy are presented in Section 2. Section 3 discusses the empirical results on the sources of the gender wage gap for all workers and for subgroups of workers with respect to education and geography. The evolution of the gender wage gap during the work career is investigated in section 4. Section 5 offers concluding remarks.

2 | DATA AND ECONOMETRIC STRATEGY

This paper applies matched employer-employee register data on individual wages for all workers in Norway in 2010. The dataset is computed from three administrative registers: employment, tax, and education. The employment register links workers and firms and gives information on work contracts for all employees. It includes the duration of the contract, the type of contract, and the number of hours worked per week. I calculate the number of hours worked per year, which is combined with data on annual wage income from the tax register to give a measure of hourly wages. The analysis concentrates on workers with full-time contracts (at least 30 h per week).[1] The employment register has information on work contracts back to 1993, which is used to calculate full-time work experience and degree of labor mobility for every individual. As a measure of mobility, I use the number of job changes relative to the total number of years the individual has been in the labor force.[2] As data on work contracts are not available prior to 1993, the analysis focuses on workers with complete history of work experience (between 20 and 42 years old in 2010). The education register gives detailed data on workers' level of education. I also have information on the age, gender, immigrant status, marital status, industry affiliation, occupation group, firm affiliation, and home region of all individuals.

The final dataset includes 578,810 workers, allocated to 100,499 different firms, 344 occupation groups, and 56 industries.[3] As seen from the descriptive statistics in Table 1, female workers account for 41% of the observations and have on average 12% lower hourly wages than men (calculated as the log differential). I separate between four levels of education: primary (no more than compulsory schooling), high school degree, some college education (1–4 years of duration), and postgraduates. Overall, 15% of workers have only primary education, 41% are high school educated, 31% have up to four years of college education, and 13% have a postgraduate degree. Among workers with some college education, the large majority (92%) have 3–4 years of higher education (equivalent to a bachelor's degree), whereas 5% and 3% have 2 years and 1 year of higher education, respectively. Immigrants account for 16% of all full-time workers, and 47% of workers live in cities (defined as labor market regions with more than 150,000 inhabitants). The share of immigrants is similar among men and women, whereas a larger share of female workers is highly educated and located in cities. The industry composition is very different across genders, with half the women employed in the public sector (health care, education, public administration). Women are slightly older than male workers, have lower degree of labor mobility, and are more likely to be married.[4]

Actual work experience is calculated as days of full-time experience from 1993 onward and is expressed in years. For workers with primary education or a high school degree, experience is measured from the age of 20, whereas for workers with some college education and postgraduates, experience is measured from 23 and 25 years of age, respectively. Experience varies from 0 to 17 years and equals 7.4 years on average. Male workers have on average 1.4 years longer experience than female workers.[5] Potential work experience, on the other hand, equals about 11 years for both men and women. Table 2 reports the differences between actual and potential work experience by gender and level of education.[6] For all worker groups, potential experience is on average about 2–4 years longer than actual experience, but the difference is larger for females than for males. This follows from periods where individuals are either part-time employed or unemployed. In addition, workers could start their careers as full-time employees at an older age than defined by the measure of potential experience. For all education categories, actual work experience is about one year longer for men than for women. Potential experience is more similar across genders, and among workers with primary education or a high school degree, the calculated years of potential experience are higher for female than for male workers (reflecting the higher average age of women in these education categories). These data illustrate the

TABLE 1 Descriptive statistics: male vs. female workers (mean values)

	Private & public sector			Private sector		Public sector	
	All	Men	Women	Men	Women	Men	Women
Log hourly wage	5.44	5.49	5.37	5.49	5.36	5.48	5.38
Actual work experience	7.4	8.0	6.6	8.1	7.0	7.4	6.3
Potential work experience	10.9	10.9	10.9	10.8	10.9	11.1	11.0
Labor mobility	0.12	0.13	0.10	0.13	0.11	0.11	0.09
Primary education	0.15	0.17	0.11	0.20	0.15	0.07	0.07
High school degree	0.41	0.48	0.31	0.53	0.42	0.24	0.21
College education	0.31	0.23	0.43	0.18	0.30	0.45	0.55
Postgraduate degree	0.13	0.12	0.15	0.09	0.13	0.24	0.17
Immigrant, western	0.11	0.11	0.12	0.10	0.12	0.12	0.11
Immigrant, non-western	0.05	0.05	0.05	0.05	0.05	0.05	0.05
City resident	0.47	0.45	0.51	0.45	0.54	0.47	0.47
Married	0.41	0.37	0.46	0.36	0.43	0.44	0.49
Age 20–24	0.11	0.13	0.08	0.14	0.10	0.07	0.05
Age 25–29	0.20	0.19	0.20	0.21	0.21	0.16	0.19
Age 30–34	0.24	0.24	0.25	0.23	0.24	0.25	0.26
Age 35–39	0.28	0.27	0.29	0.26	0.28	0.32	0.31
Age 40–42	0.17	0.17	0.18	0.16	0.17	0.20	0.19
Public employee	0.30	0.17	0.50				
No. of observations	578,810	341,113	237,697	284,612	117,906	56,501	119,791
Share of observations	1	0.59	0.41	0.71	0.29	0.30	0.70

The data cover full-time workers aged 20–42 in Norway in 2010. Actual work experience is calculated in days from 1993 onward and expressed in years. Labor mobility is measured as the number of job changes relative to the total number of years the individual has been in the labor force. High-educated workers are divided into two categories: workers with up to four years of college education and workers with a postgraduate degree. Western immigrants are defined as immigrants from Europe, Japan, North America, Australia, or New Zealand. The city group is defined as labor market regions with more than 150,000 inhabitants in 2010, which includes 7 out of 89 regions. The dummy for married equals 1 if the individual is married, divorced, or widowed. Public employees include those in education and healthcare industries and in public administration.

importance of using actual, rather than potential, work experience in analyses of gender differences in the labor market.

The first part of the analysis (documented in section 3) estimates the gender wage gap between equally productive workers and identifies the sources of the gap. Individual hourly wages are regressed on a gender dummy while controlling for observable worker characteristics, as well as industry, occupation, and firm fixed effects. The male wage premium is estimated for all workers, as well as for subgroups of workers defined by sector of employment (private vs. public), level of education, or region of residence (cities vs. the rest of the country). The estimation is based on variations of the following regression:

$$\ln w_{isoj} = \alpha \cdot male_i + X_i\beta + \mu_s + \gamma_o + \eta_j + \varepsilon_{isoj} \tag{1}$$

TABLE 2 Actual vs. potential work experience by gender and level of education (mean values)

	Actual experience	Potential experience
Primary education		
Men	6.4	9.5
Women	5.7	10.4
High school degree		
Men	9.0	11.5
Women	7.8	11.9
College education		
Men	7.8	11.0
Women	7.1	10.6
Postgraduate degree		
Men	6.8	9.3
Women	5.8	8.7

Actual work experience measures days of full-time experience since 1993, expressed in years. For workers with primary education or high school degree, experience is counted from the age of 20, whereas workers with some college education and postgraduates have experience from the age of 23 and 25, respectively. Details on the calculations of potential work experience are given in footnote 6.

where w_{isoj} is the hourly wage income for worker i in industry s, occupation o, and firm j, $male_i$ is a dummy that equals 1 if the worker is male, and α is the parameter of interest. The vector of observable worker characteristics (X_i) includes level of education, immigrant status, resident location, and marital status, as well as measures of labor mobility and actual work experience since 1993. Industry, occupation, and firm fixed effects are represented by μ_s, γ_o, and η_j, respectively.[7] The error term is given by ε_{isoj}, and β is a vector of parameters. The estimated male wage premium is thus based on a comparison of hourly wages of men and women who work in the same firm with the same occupation, who are equal with respect to years of work experience and degree of labor mobility, as well as other observable worker characteristics.

To identify the sources of the observed male wage premium, I use the Oaxaca-Blinder decomposition technique, which runs separate regressions for males and females allowing observable characteristics to be rewarded differently across genders.[8] The decomposition separates between differences in worker characteristics and differences in returns to worker characteristics as sources of the gender wage gap:

$$\ln\hat{w}^M - \ln\hat{w}^F = \overline{X^M}\hat{\beta}^M - \overline{X^F}\hat{\beta}^F = (\overline{X^M} - \overline{X^F})\hat{\beta}^* + (\hat{\beta}^M - \hat{\beta}^*)\overline{X^M} + (\hat{\beta}^* - \hat{\beta}^F)\overline{X^F} \tag{2}$$

Superscripts M and F refer to male and female workers, respectively. Mean values of worker characteristics (including industry and occupation groups) are given by $\overline{X^M}$ for men and $\overline{X^F}$ for women. The average return to worker characteristics is estimated in a pooled model including both male and female workers and is given by $\hat{\beta}^*$.[9] The predicted gender wage gap is given on the left-hand side of equation [2] and can be decomposed into three terms. The first term identifies the part of the male wage premium that can be explained by differences in worker characteristics between male and female workers (evaluated at the average return to these characteristics). The second and third terms compare male and female returns to worker characteristics, respectively, to the average return (evaluated at the mean value of the characteristic for the respective gender). The sum of these two terms captures the contribution to the wage gap from differences in returns to worker characteristics, either as a male advantage or as a female disadvantage, and is sometimes referred to as discrimination in the labor

market. However, if relevant differences between the genders (for instance levels of ambition) are not controlled for, the extent of discrimination is overestimated. On the other hand, if gender differences in observable characteristics are themselves due to discrimination, the extent of discrimination is underestimated. This could be the case if female workers face entry barriers into certain occupations or if lack of family-friendly policies affects women's opportunities to participate in the labor market.

The second part of the analysis (documented in section 4) focuses on the evolution of the gender wage gap during the work career, both aggregate and for subgroups of workers based on their level of education. First, I extend the regression in equation [1] to include an interaction term between the gender dummy and work experience and estimate the gender wage gap during the early stages of the career.[10] As work history is not available prior to 1993, the analysis is limited to 20- to 42-year-old workers and the first 17 years of their career. Second, to study how the male wage premium develops in the later stages of the career, I extend the dataset to include all workers between 20 and 59 years old and estimate the gender wage gap for different age-groups. In this estimation, work experience and degree of labor mobility are not included as control variables (since these variables have incomplete information for the older age-groups). Third, to check whether the findings from the 2010 data could be driven by differences between cohorts, I take advantage of the complete dataset for the period 1995–2010. By following five-year cohorts over time (in 1995, 2000, 2005, and 2010), I can identify how the male wage premium develops at different stages of the career.

3 | SOURCES OF THE GENDER WAGE GAP

3.1 | The aggregate gender wage gap: Private vs. public sector

Among all full-time workers between 20 and 42 years old in Norway in 2010, men on average earn 12% higher hourly wages than women.[11] This is comparable to international findings (see overview by Blau and Kahn, 2000). The gender wage gap can be due to differences in worker characteristics, including choice of workplace (industry, occupation, firm), or it can be due to differences in returns to these characteristics.

To estimate the gender wage gap between equal workers, I run hedonic wage regressions including a gender dummy, as described by equation [1] in Section 2. The findings are documented in the first column of Table 3. Controlling for observable worker characteristics, as well as occupation and firm fixed effects, reduces the gender wage gap from 12% to 6.1%. Comparing men and women working in the same firm with the same occupation, and with other characteristics equal (including work experience, level of education, and marital status), still leaves a male wage premium of 6.1%. This implies that about half the raw wage gap is explained by observable factors. The rest is due to different returns to characteristics between men and women.

To identify the sources of the gender wage gap, I use the Oaxaca-Blinder decomposition technique, as explained in relation to equation [2] in Section 2. The decomposition is based on regressions without firm fixed effects, given in the last three columns of Table 3. The pooled regression controlling for worker characteristics, as well as industry and occupation fixed effects, gives a male wage premium of 7.3%, indicating that 39% of the raw gap is explained by differences in worker characteristics across genders. The contribution from each characteristic is documented in the first column of panel A of Table 4. The main observable factor explaining the male wage premium is gender segregation in the labor market with respect to industry affiliation, which accounts for about half the premium. Women are more likely to work in low-wage industries. Half the female workers are employed in the public sector (public administration, education, and health care), whereas typical high-wage industries like

TABLE 3 Hedonic wage regressions, pooled and separately for men and women

Dependent variable	Log hourly wage	Log hourly wage	Log hourly wage	Log hourly wage
Gender	**All**	**All**	**Men**	**Women**
Male	0.061*** (0.0011)	0.073*** (0.0011)		
High school degree	0.064*** (0.0014)	0.078*** (0.0013)	0.078*** (0.0015)	0.067*** (0.0024)
College education	0.142*** (0.0017)	0.177*** (0.0017)	0.174*** (0.0021)	0.17*** (0.0028)
Postgraduate degree	0.222*** (0.0022)	0.28*** (0.0021)	0.27*** (0.0026)	0.276*** (0.0035)
Experience	0.035*** (0.0003)	0.036*** (0.0003)	0.046*** (0.0004)	0.024*** (0.0005)
(Experience)^2	−0.0012*** (0.0000)	−0.0012*** (0.0000)	−0.0016*** (0.0000)	−0.0008*** (0.0000)
Immigrant, Western	−0.004*** (0.0013)	−0.002* (0.0013)	0.000 (0.0017)	−0.005** (0.0021)
Immigrant, non-Western	−0.018*** (0.002)	−0.022*** (0.002)	−0.018*** (0.0026)	−0.024*** (0.0031)
City resident	0.01*** (0.0014)	0.035*** (0.0009)	0.036*** (0.0011)	0.035*** (0.0014)
Mobility	−0.008*** (0.0028)	0.031*** (0.0028)	0.023*** (0.0034)	0.03*** (0.0045)
Married	0.034*** (0.0009)	0.036*** (0.0009)	0.042*** (0.0012)	0.024*** (0.0014)
Firm fixed effects	Yes	No	No	No
Obs.	578,810	578,810	341,113	237,697
Adjusted R^2	0.51	0.39	0.42	0.32

All regressions include industry fixed effects at the 2-digit level (56 industries), occupation fixed effects at the 4-digit level (344 occupations), and a constant term. Firm fixed effects (100,499 distinct firms) are included in the first regression. Definitions of other control variables are given in the notes to Table 1. Standard errors are given in parenthesis. ***, **, and * indicate significance at the 1, 5, and 10 per cent level, respectively.

business services, oil-related industries, and transport industries are dominated by male workers. Top female occupations include teacher, nurse, shop employee, secretary, and office worker. Differences in years of actual work experience explain 16% of the wage gap. On average, men have 1.4-year longer experience than women. Gender differences in the level of education, on the other hand, favor women and work in the opposite direction. The male wage premium exists even though female full-time workers are better educated than men. Almost 60% of female workers have higher education (some college or postgraduate degree), whereas only 35% of men are high-educated. The other worker characteristics do not differ much across genders.

The remaining 61% of the male wage premium reflects differences in returns to worker characteristics and can be seen as discrimination in the labor market (documented in the first column of panel B of Table 4). The dominating factor is work experience. As seen above, women have shorter experience than men, which explains some of the gap. But more importantly, the return to experience is much lower for female workers. One extra year of experience increases hourly wages by 2.2% and 1.2% for men and women, respectively (calculated from the mean level of experience across all workers, 7.4 years). Different return to experience for male and female workers is the main factor behind the gender wage gap and accounts for as much as ¾ of the raw gap. Other worker characteristics with

TABLE 4 Oaxaca–Blinder decomposition of the gender wage gap

	All employees	Private employees	Public employees
Predicted male–female wage gap	0.12	0.133	0.099
Panel A: Explained by differences in characteristics			
Education	−0.031	−0.022	0.002
Experience	0.019	0.018	0.009
Immigrant status	0.000	0.000	−0.000
City resident	−0.002	−0.004	−0.000
Mobility	0.001	0.001	0.000
Married	−0.003	−0.003	−0.002
Industry	0.061	0.027	0.006
Occupation	0.002	0.015	0.065
Total	0.047 (39%)	0.032 (24%)	0.08 (81%)
Panel B: Explained by differences in returns			
Education	0.005	0.01	−0.01
Experience	0.091	0.045	0.085
Immigrant status	0.001	0.001	0.002
City resident	0.001	−0.006	−0.004
Mobility	−0.001	−0.003	−0.001
Married	0.007	0.011	0.002
Industry	−0.017	0.004	0.000
Occupation	−0.002	0.002	0.033
Constant	−0.012	0.037	−0.088
Total	0.073	0.101	0.019

The decomposition of the gender wage gap is based on separate wage regressions for male and female workers given in Table 3 (for all employees) and Table A1 (for private and public employees separately).

unequal returns for men and women include education and marital status, but their contribution to the overall wage gap is much smaller. Being married adds 4.2% to male wages, compared with 2.4% to female wages, indicating that family life affects the wage profiles of men and women differently.

To check whether the large share of female workers employed in the public sector drives the findings above, I do the same analysis separately for private and public employees. The hedonic wage regressions are documented in Table A1 in the appendix, whereas the corresponding decompositions of the gender wage gaps are given in the two last columns of Table 4. Excluding public sector workers leaves 402,518 observations with female workers accounting for 29%. The size of the raw gender wage gap is now 13.3%, and a smaller share of the gap is explained by differences in characteristics between men and women (down from 39% to 24%). Not surprisingly, gender segregation in the labor market is dominated by the public sector, where wages on average are lower than in the private sector. Without public employees, the combination of industry affiliation and occupation group explains 32% of the male wage premium. The other findings remain and are not affected by the exclusion of public employees. Lower return to work experience among women is still an important factor behind the gender wage gap, accounting for 34% of the raw gap. One extra year of experience increases hourly wages by 2.1% and 1.8% for men and women, respectively (calculated from the mean level of experience across all private sector workers, 7.8 years).

When considering the public sector separately, the analysis is based on 176,292 observations with female workers accounting for 70%. Compared with the private sector, the male wage premium is lower (equals 10%) and as much as 81% of the gap is explained by differences in observable characteristics between the genders.[12] Female workers are more likely to have low-wage occupations, they have shorter work experience, and they are less likely to be postgraduates. Consistent with the literature highlighting a dynamic component of the private-public wage gap (Rattsø and Stokke, 2020), the return to experience is lower in the public compared with the private sector, However, the difference in returns to experience between male and female workers represents a significant contribution to the gender wage gap. One extra year of experience increases hourly wages by 1.7% and 0.7% for men and women, respectively (calculated from the mean level of experience across all workers in the public sector, 6.6 years).

To highlight the importance of using actual experience data when studying the gender wage gap, I perform the same analysis based on potential work experience. The Oaxaca-Blinder decompositions and the underlying gender-specific wage regressions are given in Tables A2 and A3, respectively, in the appendix. While gender differences in the years of actual work experience explain 16% of the overall wage gap, potential experience does not differ between men and women and has no contribution to the explanation of the male wage premium. This holds for both sectors of employment. Regarding the return to work experience, the bias from using potential rather than actual experience data could go either direction. In the private sector, the return to experience for male workers is independent of whether actual or potential experience data are used, whereas female workers have lower returns based on actual compared with potential experience. This implies that using potential experience data underestimates the importance of gender differences in the return to experience for the wage gap (reducing the contribution from 34% to 11%). In the public sector, both male and female workers receive larger returns to experience when the estimation is based on potential experience data, and in this case, the gender differences in returns to experience are overestimated.

3.2 | Heterogeneity of the gender wage gap: Education and geography

The analysis is extended by considering possible heterogeneity in the gender wage gap with respect to education and geography. The analysis is performed for private sector workers. First, separate wage regressions for men and women by level of education are documented in Table A4 in the appendix with the corresponding Oaxaca-Blinder decompositions in Table 5. The raw unadjusted gender wage gap varies from 14% for workers with primary education and postgraduates to 18% and 20% for workers with some college education and high school educated workers, respectively. Differences in worker characteristics explain 40–45% of the male wage premium. Gender segregation in the labor market is the main explanatory factor (women are more likely to work in low-wage industries and low-wage occupations). Further, female workers have shorter work experience than men. For postgraduates, differences in the length of experience explain 21% of the gender wage gap, whereas the contribution is around 9% in the other education categories.

The gender wage gap between observable equal workers varies from 7 to 8% for primary-educated workers and postgraduates to 11% for the two mid-leveled education categories. Lower return to work experience for women is the dominating factor accounting for close to 40% of the raw wage gap. In the lowest education category, one extra year of experience increases hourly wages by 2% and 1.5% for men and women, respectively (calculated from the mean level of experience across all private sector workers, 7.8 years). The return to experience increases with the level of education, but the difference

TABLE 5 Oaxaca–Blinder decomposition of the gender wage gap by education category

	Primary	High school	College	Postgraduate
Predicted male-female wage gap	0.138	0.199	0.183	0.136
Panel A: Explained by differences in characteristics				
Experience	0.011	0.017	0.017	0.029
Immigrant status	0.000	0.001	0.000	–0.000
City resident	–0.002	–0.003	–0.002	–0.002
Mobility	0.003	0.000	0.000	–0.000
Married	–0.005	–0.002	–0.001	0.000
Industry	0.038	0.039	0.02	0.018
Occupation	0.015	0.039	0.038	0.018
Total	0.06 (43%)	0.091 (46%)	0.072 (39%)	0.063 (46%)
Panel B: Explained by differences in returns				
Experience	0.051	0.025	0.074	0.051
Immigrant status	0.005	–0.000	–0.000	0.001
City resident	0.001	–0.005	–0.006	–0.001
Mobility	–0.000	–0.004	–0.007	–0.003
Married	0.011	0.01	0.012	0.014
Industry	–0.001	0.001	0.003	–0.03
Occupation	0.01	–0.008	0.004	–0.002
Constant	0.001	0.089	0.031	0.043
Total	0.078	0.108	0.111	0.073

For each education category, the decomposition of the gender wage gap is based on separate wage regressions for male and female private sector workers given in Table A4.

between the genders is still significant. Among workers with up to four years of college education, one extra year of experience increases hourly wages by 2.7% and 2% for men and women, respectively. The exception is workers with a high school degree, where the return to experience is more similar across genders and differences in returns contribute to only 13% of the wage gap.

Second, to check for heterogeneous effects with respect to geography, I separate between city regions and the rest of the country. Cities are defined as labor market regions with at least 150,000 inhabitants, which account for seven out of 89 regions and 47% of all workers. Separate wage regressions for men and women by type of region are documented in Table A5 in the appendix with the corresponding Oaxaca-Blinder decompositions in Table 6. The sources of the gender wage gap are similar across the geographical dimension, and different returns to experience between men and women have the largest contribution to the wage gap in both cities and the rest of the country. In cities, one extra year of experience increases hourly wages by 2.4% and 2% for men and women, respectively. In the rest of the country, the return to experience for male and female workers equals 2% and 1.5%, respectively. Higher average return to experience in cities compared with the rest of the country is consistent with the literature on the dynamic urban wage premium (Carlsen *et al*., 2016; De la Roca and Puga, 2017).

TABLE 6 Oaxaca–Blinder decomposition of the gender wage gap by geography

	Cities	Rest of country
Predicted male–female wage gap	0.127	0.164
Panel A: Explained by differences in characteristics		
Education	−0.021	−0.017
Experience	0.015	0.021
Immigrant status	0.000	0.000
Mobility	0.000	0.001
Married	−0.002	−0.003
Industry	0.02	0.04
Occupation	0.014	0.02
Total	0.026 (20%)	0.062 (38%)
Panel B: Explained by differences in returns		
Education	0.001	0.017
Experience	0.046	0.051
Immigrant status	0.000	0.001
Mobility	−0.005	−0.000
Married	0.012	0.009
Industry	0.003	0.003
Occupation	0.006	−0.003
Constant	0.038	0.024
Total	0.101	0.102

For city regions and the rest of the country, the decomposition of the gender wage gap is based on separate wage regressions for male and female private sector workers given in Table A5.

To sum up, lower return to experience for female workers is the main factor behind the gender wage gap. This is true both in the private and in the public sector, for low- and high-educated workers, and in cities and more sparsely populated regions.

4 | THE GENDER WAGE GAP DURING THE CAREER

Motivated by the large differences in returns to work experience between men and women, I analyze the evolution of the male wage premium during the work career. First, the dataset of all private sector workers aged 20–42 years old in 2010 with complete history of work experience is applied to study the gender wage gap in the early stages of the career. Table 7 documents regressions with interaction terms between the male dummy and work experience, while controlling for worker characteristics (including degree of labor mobility and marital status) as well as occupation and firm fixed effects. Based on the estimated coefficients in the first column, Figure 1 illustrates the development of the aggregate male wage premium during the first 17 years of the career. Consider a male and female worker with the same level of education, working in the same firm, with the same occupation, and with other characteristics equal. Upon entry to the labor market, the gender wage gap is 3.5%, whereas after 5 years of work experience, the male worker has a wage premium of 9%, which increases further to 12% after 10 years, and then stabilizing. As a check of robustness, I apply a more flexible functional

TABLE 7 The gender wage gap during the early career

Dependent variable	Log hourly wage	Log hourly wage	Log hourly wage	Log hourly wage	Log hourly wage	Log hourly wage
Education category	**All**	**Primary**	**High school**	**College**	**Postgraduate**	**College and Postgraduate**
Male	0.035*** (0.003)	0.003 (0.0083)	0.066*** (0.0052)	0.014** (0.0068)	0.011 (0.0072)	0.012** (0.0048)
Experience	0.035*** (0.0007)	0.03*** (0.0024)	0.028*** (0.0012)	0.028*** (0.0015)	0.049*** (0.0019)	0.036*** (0.0011)
$(\text{Experience})^2$	−0.0012*** (0.0000)	−0.0011*** (0.0001)	−0.001*** (0.0001)	−0.0006*** (0.0001)	−0.0014*** (0.0001)	−0.001*** (0.0001)
Experience x Male	0.014*** (0.0008)	0.019*** (0.0026)	0.008*** (0.0013)	0.019*** (0.0019)	0.012*** (0.0023)	0.016*** (0.0014)
$(\text{Experience})^2$ x Male	−0.0006*** (0.0001)	−0.0008*** (0.0002)	−0.0003*** (0.0001)	−0.0007*** (0.0001)	−0.0005*** (0.0002)	−0.0006*** (0.0001)
Education controls	Yes	No	No	No	No	No
Obs.	402,518	73,891	200,801	86,104	41,722	127,826
Adjusted R^2	0.55	0.45	0.51	0.51	0.59	0.55

All regressions control for observable worker characteristics (immigrant status, resident location, mobility, marital status) and include occupation and firm fixed effects, as well as a constant term. Standard errors are given in parenthesis. ***, **, and * indicate significance at the 1, 5, and 10 per cent level, respectively.

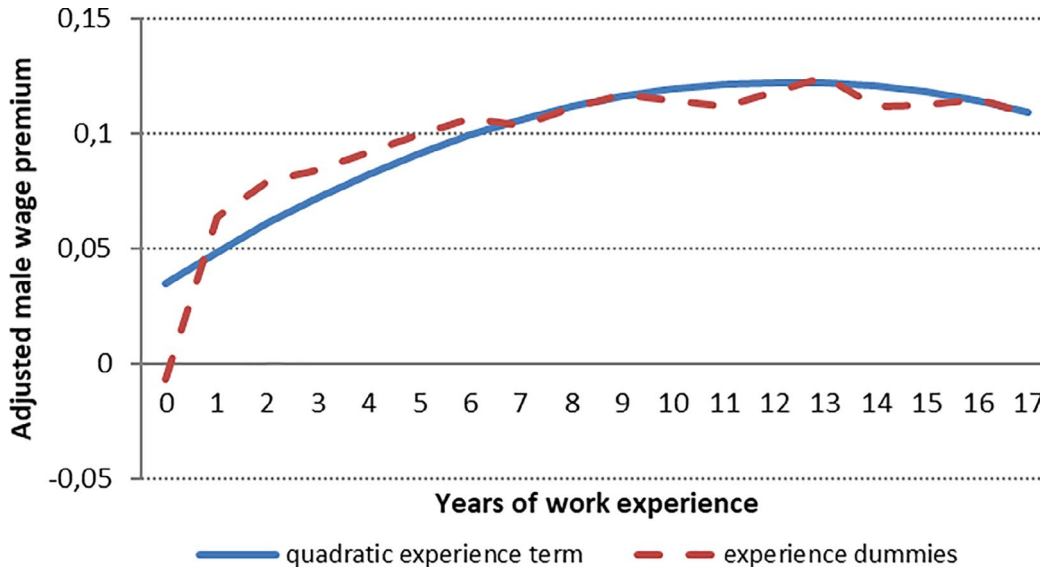

FIGURE 1 Adjusted male wage premium during the early career, 2010 data. [Colour figure can be viewed at wileyonlinelibrary.com]

form with year-by-year experience dummies, rather than the quadratic experience function. The estimation is available from the author as Table B1 in an external online appendix.[13] As seen from the dotted line in Figure 1, the findings are consistent.

The increase in the male wage premium during the early career is consistent with the recent evidence on gender differences in accepting and receiving requests for tasks with low promotability (Babcock *et al*., 2017). The dynamics of the wage gap can also follow from gender discrimination in the labor market, changes in family situation that affect men and women differently, gender differences in levels of ambition, or from differences in unobserved abilities that are revealed over time. The early-career effect in the gender wage gap is previously documented by Manning and Swaffield (2008) and for college-educated workers by Bertrand *et al*. (2010), Albrecht *et al*. (2018) and Reshid (2019). Kunze (2005) provides some contrasting evidence for workers with 9–10 years of schooling followed by 2–3 years of apprenticeship training, where the gender wage gap is large upon entry to the labor market and stays constant during the early career. Barth *et al*. (2017) and Goldin *et al*. (2017) compare workers at different levels of education and find that the widening of the gender wage gap is largest among college graduates.

Columns (2)–(5) of Table 7 offer an analysis of the early-career effect within each education category, and Figure 2 illustrates the corresponding developments in the adjusted gender wage gap during the first 17 years of the career. The findings reveal heterogeneity among high-educated workers, where the increase in the gender wage gap is almost twice as large for workers with some college education (typically a bachelor's degree) as for postgraduates (master and PhD level). For workers with a postgraduate degree, the gender wage gap increases by 6.6 percentage points (from 1% initially to 7.6% after 17 years), whereas for workers with up to four years of college education, the increase is 11.4 percentage points (from 1.4% initially to 12.8% after 17 years). The widening of the gender wage gap among postgraduates is also smaller than for the least educated workers with only primary education, where the gap increases by 8 percentage points (from 0.3% initially to 8.3% after 17 years). Workers with a high school degree differ somewhat from the other education categories in the sense that the

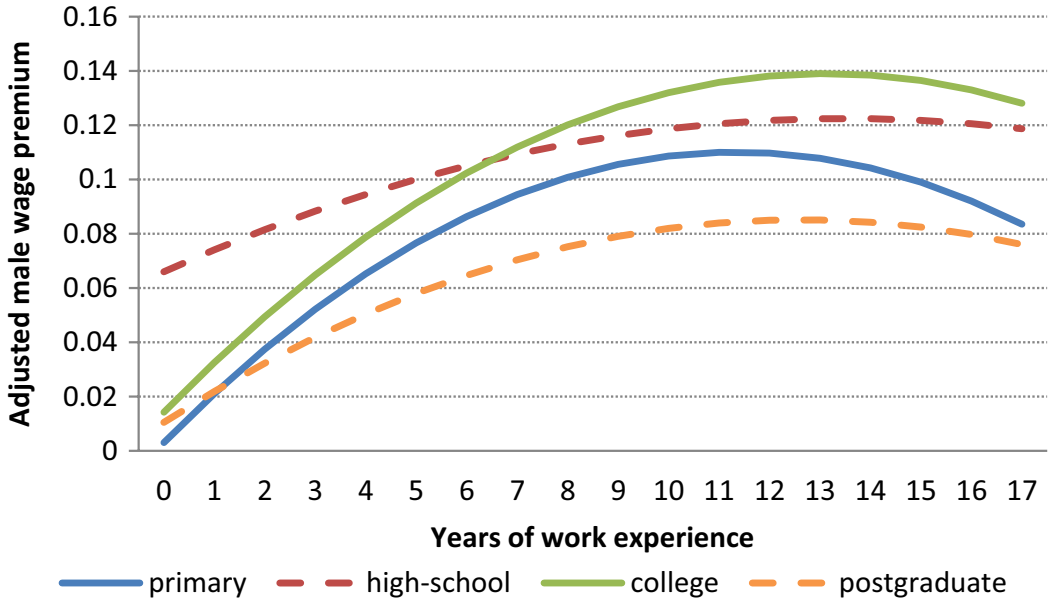

FIGURE 2 Adjusted male wage premium during the early career by level of education, 2010 data. [Colour figure can be viewed at wileyonlinelibrary.com]

initial wage gap is larger (equals 6.6%), whereas the increase over time is more modest (5.3 percentage points). This can be related to the findings of Kunze (2005) mentioned above, who study workers with an education level comparable to high school education in the present paper.

To show how the choice of educational categories affects the results, the last column of Table 7 estimates the early-career effect for the combined group of all college-educated workers (including postgraduates). As illustrated in Figure 3, this reproduces the findings of Barth *et al*. (2017) and Goldin *et al*. (2017), where the increase in the male wage premium is largest for the most educated workers. During the first 17 years of the career, the gender wage gap increases by 11.6 percentage points for college/postgraduates, compared with an increase of 5.3 and 8 percentage points among workers with high school and primary education, respectively. When college-educated workers are not separated into workers with some college education and postgraduates, important heterogeneity in the dynamics of the gender wage gap is lost.[14]

Second, to analyze the evolution of the male wage premium in later stages of the career, I apply the complete dataset of all full-time private sector workers aged 20–59 years old in 2010. This includes 666,692 observations with 29% female workers. As work experience prior to 1993 is not available, I do not have the complete work history of older workers. To identify the gender wage gap at different stages of the career, I use age as a proxy and divide the dataset into eight 5-year age-groups. The gender wage gap is estimated within each age-group while controlling for worker characteristics as well as occupation and firm fixed effects.[15] The development in the adjusted male wage premium over the course of the career is illustrated in Figure 4.

The gender wage gap between observable equal workers is low when entering the labor market, whereas it increases rapidly during the early career, before stabilizing for workers above 40 years old. Among workers with up to four years of college education, the male wage premium increases from 5% in the youngest age-group (25–29 years old), via 8.8% for those 30–34 years old, to 13.3% among workers 35–39 years old. For older age-groups, the gap remains stable at around 14%. The pattern

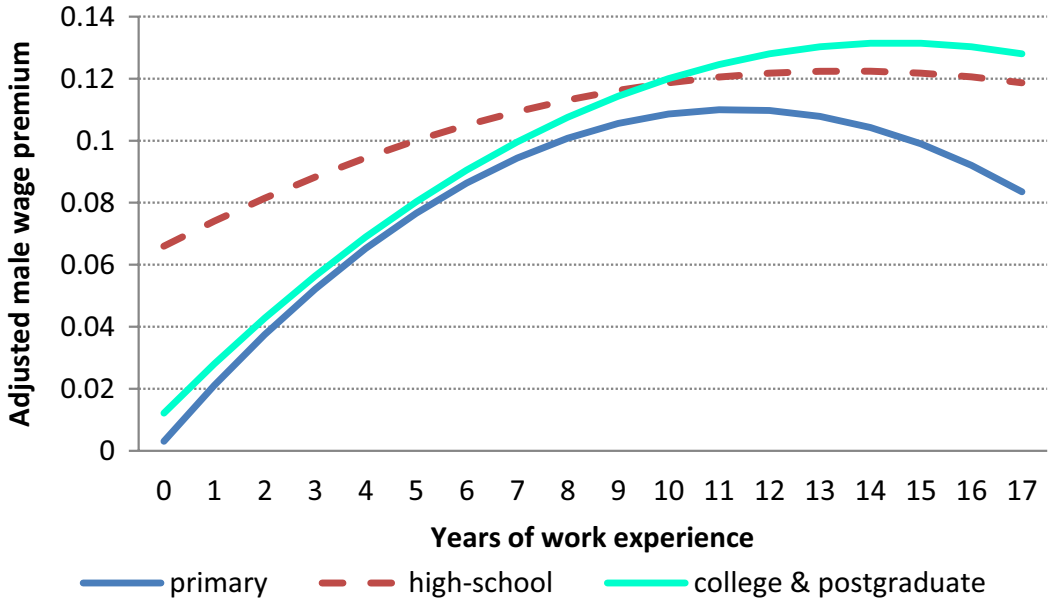

FIGURE 3 The role of educational classification: treating all college-educated workers (including Postgraduates) as one category. [Colour figure can be viewed at wileyonlinelibrary.com]

is similar for the other education categories, and again, the increase in the wage gap is much smaller among postgraduates than other college-educated workers.[16]

To check whether family situation contributes to the increase in the gender wage gap in the early stages of the career, I compare the development for single and married women (relative to all men). Figure 5 shows how the adjusted male wage premium changes with age for the two groups of female workers.[17] Due to low share of married women in the youngest age-group and low share of single women in the oldest age-group, the analysis focuses on workers aged 25–54. At the start of the career (25–29 years old), both single and married women face a male wage premium of about 4–5 per cent. In the next 10 years, the gender wage gap increases to 11% and 15% for single and married women, respectively, before stabilizing. The larger increase in the wage gap among married women suggests that entering family life is an important mechanism behind the early-career effect.

Another aspect is related to whether the increasing male premium stems from transitions between employers or within-firm wage increases. Using data on workers with complete work history (25–42 years old in 2010), I separate out those that change employer at least once during two consecutive years since 1993 (degree of labor mobility larger than zero). This group is referred to as 'job movers', whereas the rest are labeled 'job stayers'. Job movers account for 2/3 of the workers and the share of women is 27% and 37% among job movers and job stayers, respectively. Based on regressions with interaction terms between the male dummy and work experience, Figure A1 in the appendix illustrates the development of the adjusted male wage premium during the first 17 years of the career for the two groups of workers.[18] The rapidly increasing gender wage gap during the early career is prevalent among both job movers and job stayers, indicating that the findings are not driven solely by transitions between employers.

Smaller gender wage gap among young workers (as documented in Figure 4) can reflect a career effect, where wage differences between men and women vary over the course of their career. The alternative understanding is that wage differences between genders increase with age because

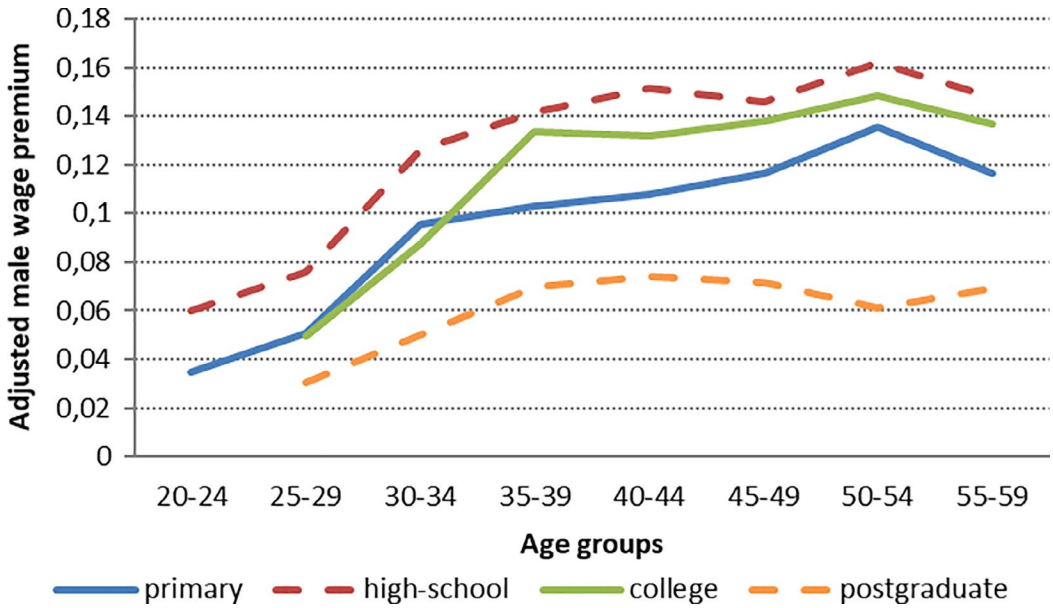

FIGURE 4 Adjusted male wage premium different age-groups, 2010 data, 20–59 years old. [Colour figure can be viewed at wileyonlinelibrary.com]

of differences between cohorts. Each new cohort entering the labor market faces better conditions than the previous one (with respect to degree of discrimination, family-friendly policies etc.), and thus, the gender wage gap is smallest for the youngest workers. To separate between career and cohort effects, I take advantage of register data for all full-time private sector workers in Norway during 1995–2010 to follow the same cohorts over several years. I focus on 5-year cohorts and

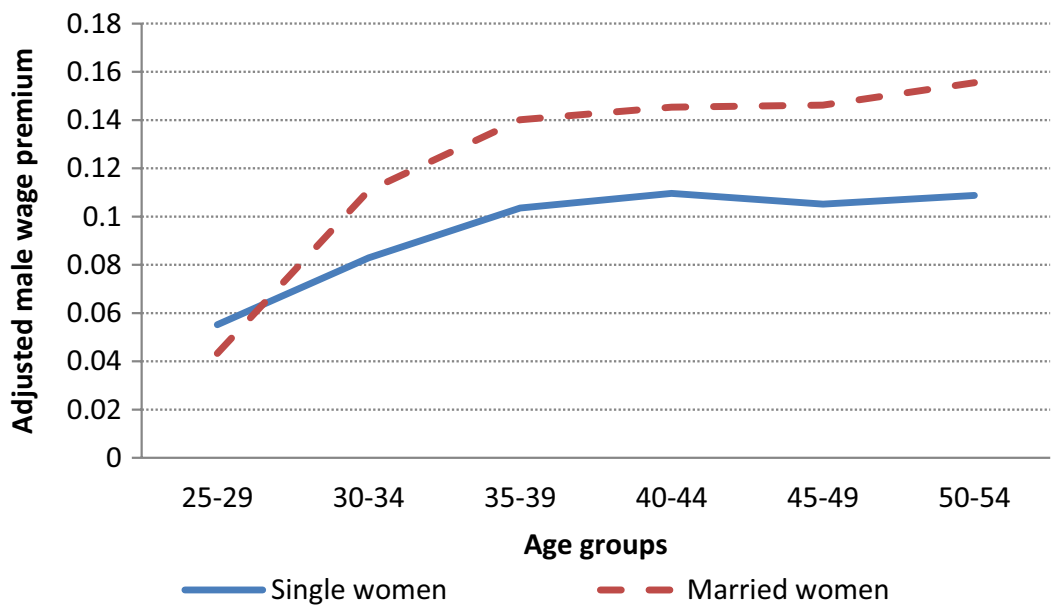

FIGURE 5 Adjusted male wage premium different age-groups, 2010 data, 25–54 years old: single vs. married women (relative to all men). [Colour figure can be viewed at wileyonlinelibrary.com]

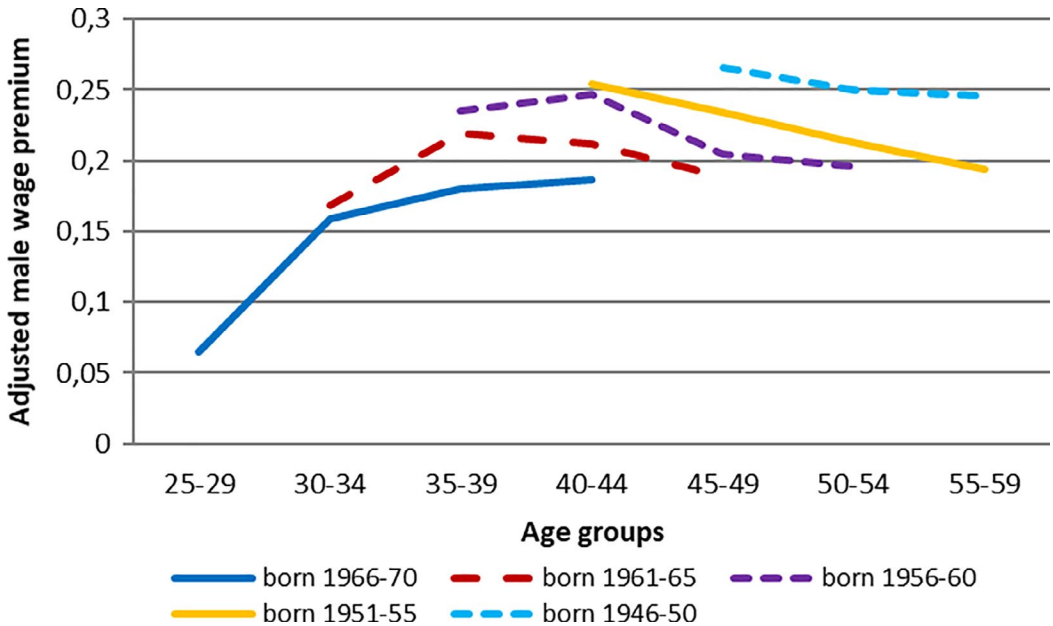

FIGURE 6 Adjusted male wage premiums, 1995 – 2010, five cohorts of workers with up to four years of college education. [Colour figure can be viewed at wileyonlinelibrary.com]

estimate gender wage gaps for the years 1995, 2000, 2005, and 2010. The analysis is based on a total of 3,637,204 observations (with 28% female workers) and uses daily wages as dependent variable (since data on hours worked per week is not available for the entire period).[19] The estimated male wage premium for different cohorts is documented in Table A6 in the appendix, separating between four education categories. Each number in the table corresponds to the estimated coefficient on the male dummy in a wage regression controlling for immigrant status, resident location, and firm fixed effects. Data on occupation group are not available for the entire period, which implies that the estimated wage gaps are biased upwards, but the changes over time can shed some light on important mechanisms. The development in the male wage premium for a given 5-year cohort is seen along the respective diagonal in the table. The main finding is that the career effect is significant and consistent with the pattern in Figure 4.

The development in the estimated gender wage gap during 1995–2010 for five different cohorts with up to four years of college education is illustrated in Figure 6. The youngest cohort is born in 1966–1970 and is observed as 25–29 years old in 1995 and up to 40–44 years old in 2010. During this period, the gender wage gap increases rapidly. In 1995, the estimated male wage premium equals 6.5% and five years later; the same cohort (now 30–34 years old) has a male wage premium of 15.9%. In 2005, the premium has increased to 18% and then it seems to stabilize and equals 18.6% in 2010 when the cohort is 40–44 years old. The oldest cohort is born in 1946–50 and is observed as 45–49 years old in 1995 and up to 55–59 years old in 2005. During this period, the estimated gender wage gap is constant at around 25%. The broad picture is a rapidly increasing gender wage gap in the early stages of the career, which stabilizes or decreases later in the career (typically among workers above 40 years old). This pattern is common to all education categories. There is also some evidence of between cohort effects in the sense that the gender wage gap is lower in 2010 than in 1995 for all age-groups.

5 | CONCLUDING REMARKS

This paper offers an analysis of the sources of the gender wage gap and investigates how the gap develops with work experience throughout the career. A drawback to most of the studies on career effects in the gender wage gap is the use of potential, rather than actual, work experience. The present analysis contributes to the literature by applying matched employer-employee register data with information on actual work experience and by estimating the career effect of the gender wage gap for workers at different levels of education (particularly by allowing for heterogeneous effects among high-educated workers). The dataset facilitates a comparison of hourly wages of men and women working in the same firm with the same occupation, and with other characteristics equal. Overall, about half the male wage premium is explained by differences in observable factors, whereas the remaining gap follows from lower returns to worker characteristics for women. The dominating factor is lower return to experience for female workers. This applies both in the private and in the public sector, for low- and high-educated workers, and in cities and more sparsely populated regions.

The analysis shows early-career effects in the gender wage gap, where the gap between observable equal workers is small upon entry to the labor market, whereas it increases rapidly throughout the early career, before stabilizing. While the existing literature finds that the widening of the gender wage gap is largest among college graduates, this paper reveals heterogeneity among high-educated workers and highlights the importance of separating between postgraduates and other college graduates. The estimates show that the increase in the male wage premium is almost twice as large for workers with up to four years of college education as for postgraduates. To show how educational classification affects the results, the analysis is repeated for the combined group of all college-educated workers (including postgraduates). This reproduces the findings of Barth *et al*. (2017) and Goldin *et al*. (2017), where the increase in the male wage premium is largest for the most educated workers. When high-educated workers are not split into workers with some college education and postgraduates, important heterogeneity in the dynamics of the gender wage gap is lost.

Future analysis should pursue these issues in more detail by studying how the timing of childbirth and number of children affect the evolution of the gender wage gap throughout the early career and in particular consider differences between low- and high-educated women.

ACKNOWLEDGMENTS

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NOTES

[1] Workers with more than two contracts, as well as workers with one full-time and one part-time contract, are excluded. For workers with two full-time contracts, I allow for a maximum of 3 months of overlap between the contracts. To avoid extreme observations, the top and bottom 1% of the wage distribution are excluded.

[2] The definition of labor mobility is restricted to job changes in two consecutive years, whereas job changes after one or more years out of the labor market are excluded. Due to lack of occupation data for the full period of study, I do not distinguish between upward and downward mobility.

[3] Workers in the primary sectors (agriculture, fishery, and forestry) are excluded from the analysis.

[4] An individual is defined as married if he/she is currently married or has previously been married (divorced/widowed).

[5] It should be noted that the data do not identify maternity spells. Paid maternity leave is counted as part of the experience, but if the absence from the labor market is extended beyond the regulated period with paid leave, the length of work experience is affected.

[6] For workers with primary education or a high school degree, potential experience is calculated as the worker's age in 2010 minus 20. To be comparable with the data on actual experience, the measure of potential experience is adjusted for the oldest cohorts. Workers born in 1968–1972 are 21–25 years old in 1993, which implies that actual experience is not measured from 20 years of age for these cohorts. For those born in 1972, actual experience is calculated from the age of 21, so potential experience follows as the worker's age in 2010 minus 21. Similar adjustments are made for the four other cohorts (for the oldest cohort, potential experience equals age minus 25). For workers with some college education, potential experience is calculated from the age of 23 and with adjustments for the two oldest cohorts that are 24–25 years old in 1993. For postgraduates, potential experience follows as the worker's age in 2010 minus 25, and as all workers are 25 years of age or younger in 1993, no further adjustments are needed.

[7] When firm fixed effects are included, industry fixed effects do not add any new information and are dropped from the regression.

[8] Based on the estimation in equation [1], the observed gender wage gap can be decomposed into an explained part due to differences in characteristics and an unexplained residual. However, this approach has its limitations compared with the Oaxaca-Blinder decomposition, because the relative importance of each characteristic in explaining the gap depends on the order in which they are introduced in the regression. In addition, the Oaxaca-Blinder approach is able to relate the unexplained part of the gap to differences in returns to characteristics.

[9] The pooled regression model includes the gender dummy, as suggested by Jann (2008).

[10] The main specification introduces experience as a quadratic function, but as a check of robustness, experience is also represented by year-by-year dummies.

[11] Among all full-time workers aged 20–59 years old, men on average earn 15% more than women.

[12] Given that public sector wage formation in Norway is guided by policy, typically attempting equalization of wages across individuals with equal qualifications, this finding is not surprising.

[13] A set of figures and tables describing alternative model specifications is available as an external online appendix: https://sites.google.com/site/hildegunnestokke/.

[14] As labor force participation can differ between immigrants and natives, the analysis is repeated for the native population as a check of robustness. Oaxaca-Blinder decomposition of the aggregate gender wage gap reproduces the findings in section 3, where the return to experience is much lower for female workers. Further, the early-career effect in the wage gap and the heterogeneity among high-educated workers are confirmed for the native population. The results are available from the author as Tables B2 and B3 and Figure B1 in the external online appendix.

[15] Work experience and degree of labor mobility are not included as controls in these regressions because data are incomplete for older workers.

[16] An Oaxaca-Blinder decomposition of the aggregate gender wage gap by four 10-year age-groups (20–29 years old to 50–59 years old) is available from the author as Table B4 in the external online appendix. The raw unadjusted wage gap increases monotonically by age, whereas the adjusted wage gap increases rapidly in the early stages of the career before stabilizing. The share of the wage gap explained by differences in worker characteristics is much higher for the youngest and oldest age-groups (around 30–40%) compared with the two middle age-groups (around 11–13%). Gender segregation in the labor market with respect to industry and occupation is the main explanatory factor for all age-groups, but especially in the youngest and oldest group. For workers younger than 50, differences in the level of education are to the advantage of women, whereas among workers 50–59 years old, men are slightly more educated than women, which explains a small part of the gap for this age-group.

[17] The regressions control for worker characteristics, as well as occupation and firm fixed effects.

[18] The underlying regressions are available from the author as Table B5 in the external online appendix.

[19] The number of workers in each cohort can vary over time, as workers enter and leave the labor market and change education category.

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APPENDIX

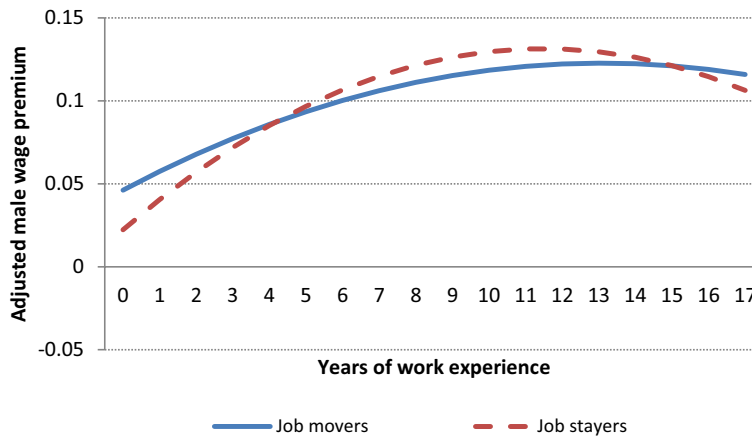

FIGURE A1 Adjusted male wage premium during the early career: job movers vs. job stayers. [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE A1 Hedonic wage regressions, separately for private and public employees

	Private employees			Public Employees		
Dependent variable	**Log hourly wage**	**Log hourly wage**	**Log hourly wage**	**Log hourly wage**	**Log hourly wage**	**Log hourly wage**
Gender	**All**	**Men**	**Women**	**All**	**Men**	**Women**
Male	0.101*** (0.0014)			0.018*** (0.0016)		
High school degree	0.071*** (0.0015)	0.075*** (0.0016)	0.055*** (0.0032)	0.08*** (0.0031)	0.078*** (0.0047)	0.077*** (0.0039)
College education	0.173*** (0.0019)	0.172*** (0.0023)	0.162*** (0.0037)	0.177*** (0.0035)	0.168*** (0.0051)	0.179*** (0.0045)
Postgraduate degree	0.287*** (0.0025)	0.274*** (0.0029)	0.29*** (0.0049)	0.256*** (0.004)	0.241*** (0.0058)	0.263*** (0.0054)
Experience	0.045*** (0.0004)	0.049*** (0.0004)	0.037*** (0.0008)	0.02*** (0.0005)	0.032*** (0.0008)	0.015*** (0.0007)
$(\text{Experience})^2$	−0.0016*** (0.0000)	−0.0018*** (0.0000)	−0.0012*** (0.0000)	−0.0006*** (0.0000)	−0.0011*** (0.0000)	−0.0006*** (0.0000)
Immigrant, Western	−0.003* (0.0017)	−0.002 (0.0019)	−0.004 (0.0032)	−0.002 (0.0021)	0.007** (0.0033)	−0.006** (0.0027)
Immigrant, non-Western	−0.027*** (0.0025)	−0.023*** (0.0029)	−0.031*** (0.0047)	−0.011*** (0.0032)	−0.001 (0.0049)	−0.014*** (0.0041)
City resident	0.045*** (0.0011)	0.042*** (0.0013)	0.054*** (0.0022)	0.012*** (0.0014)	0.006*** (0.0021)	0.016*** (0.0018)
Mobility	0.036*** (0.0034)	0.028*** (0.0039)	0.049*** (0.0068)	0.004 (0.0046)	−0.007 (0.007)	0.004 (0.0059)
Married	0.037*** (0.0012)	0.044*** (0.0014)	0.019*** (0.0022)	0.03*** (0.0014)	0.029*** (0.0023)	0.026*** (0.0018)
Obs.	402,518	284,612	117,906	176,292	56,501	119,791
Adjusted R^2	0.40	0.42	0.35	0.35	0.47	0.29

All regressions include industry and occupation fixed effects, and a constant term. Standard errors are given in parenthesis. ***, **, and * indicate significance at the 1, 5, and 10 per cent level, respectively.

TABLE A2 Oaxaca–Blinder decomposition of the gender wage gap: Potential experience

	All employees	Private employees	Public employees
Predicted male–female wage gap	0.12	0.133	0.099
Panel A: Explained by differences in characteristics			
Education	–0.03	–0.022	0.002
Potential experience	–0.003	–0.002	0.001
Immigrant status	0.000	0.001	–0.000
City resident	–0.002	–0.004	–0.000
Mobility	0.002	0.001	0.000
Married	–0.003	–0.002	–0.001
Industry	0.067	0.03	0.008
Occupation	0.009	0.02	0.067
Total	0.04 (33%)	0.022 (17%)	0.077 (78%)
Panel B: Explained by differences in returns			
Education	0.003	0.006	–0.01
Potential experience	0.072	0.014	0.109
Immigrant status	–0.001	–0.000	0.001
City resident	–0.001	–0.008	–0.006
Mobility	–0.000	–0.003	0.000
Married	0.015	0.019	0.005
Industry	–0.022	0.001	0.002
Occupation	–0.002	–0.001	0.036
Constant	0.016	0.083	–0.115
Total	0.08	0.111	0.022

The decomposition of the gender wage gap is based on separate wage regressions for male and female workers given in Table A3.

TABLE A3 Hedonic wage regressions using potential experience

	All		Private sector		Public sector	
Dependent variable	**Log hourly wage**	**Log hourly wage**	**Log hourly wage**	**Log hourly wage**	**Log hourly wage**	**Log hourly wage**
Gender	**Men**	**Women**	**Men**	**Women**	**Men**	**Women**
High school degree	0.087*** (0.0015)	0.073*** (0.0024)	0.086*** (0.0017)	0.065*** (0.0031)	0.082*** (0.0046)	0.08*** (0.0039)
College education	0.171*** (0.0021)	0.174*** (0.0028)	0.168*** (0.0023)	0.172*** (0.0037)	0.166*** (0.0051)	0.179*** (0.0045)
Postgraduate degree	0.271*** (0.0026)	0.282*** (0.0036)	0.277*** (0.003)	0.307*** (0.005)	0.239*** (0.0058)	0.262*** (0.0054)
Potential experience	0.047*** (0.0004)	0.037*** (0.0006)	0.048*** (0.0005)	0.045*** (0.0009)	0.039*** (0.0009)	0.028*** (0.0008)
(Potential experience)^2	−0.0015*** (0.0000)	−0.0013*** (0.0000)	−0.0016*** (0.0000)	−0.0015*** (0.0000)	−0.0012*** (0.0000)	−0.0011*** (0.0000)
Immigrant, Western	−0.012*** (0.0017)	−0.013*** (0.0021)	−0.014*** (0.0019)	−0.014*** (0.0031)	−0.003 (0.0032)	−0.01*** (0.0027)
Immigrant, non-Western	−0.058*** (0.0026)	−0.042*** (0.0031)	−0.065*** (0.0029)	−0.057*** (0.0047)	−0.027*** (0.0048)	−0.024*** (0.004)
City resident	0.034*** (0.0011)	0.036*** (0.0014)	0.04*** (0.0013)	0.056*** (0.0022)	0.004** (0.0021)	0.017*** (0.0017)
Mobility	0.056*** (0.0035)	0.057*** (0.0045)	0.061*** (0.0039)	0.087*** (0.0068)	0.024*** (0.007)	0.019*** (0.0059)
Married	0.045*** (0.0012)	0.009*** (0.0015)	0.049*** (0.0014)	0.002*** (0.0023)	0.025*** (0.0023)	0.015*** (0.0018)
Obs.	341,113	237,697	284,612	117,906	56,501	119,791
Adjusted R^2	0.42	0.32	0.41	0.35	0.48	0.29

All regressions include industry and occupation fixed effects, and a constant term. Standard errors are given in parenthesis. ***, **, and * indicate significance at the 1, 5, and 10 per cent level, respectively.

TABLE A4 Separate wage regressions for men and women by education category

Dependent variable	Log hourly wage	Log hourly wage	Log hourly wage	Log hourly wage
Education category	**Primary**	**High school**	**College**	**Postgraduate**
Panel A: Men				
Experience	0.053*** (0.001)	0.037*** (0.0006)	0.047*** (0.0012)	0.059*** (0.0014)
(Experience)^2	−0.0021*** (0.0001)	−0.0013*** (0.0000)	−0.0013*** (0.0001)	−0.0017*** (0.0001)
Immigrant, Western	−0.001 (0.0045)	−0.006** (0.0027)	0.005 (0.0045)	0.009* (0.0052)
Immigrant, non-Western	0.003 (0.0055)	−0.033*** (0.0046)	−0.042*** (0.0075)	−0.023*** (0.0084)
City resident	0.027*** (0.0031)	0.033*** (0.0017)	0.075*** (0.003)	0.067*** (0.004)
Mobility	0.09*** (0.0086)	0.006 (0.0053)	−0.01 (0.0099)	−0.045*** (0.0107)
Married	0.049*** (0.0037)	0.037*** (0.0018)	0.055*** (0.0031)	0.049*** (0.0037)
Obs.	55,763	151,136	51,249	26,464
Adjusted R^2	0.28	0.34	0.36	0.41
Panel B: Women				
Experience	0.039*** (0.0021)	0.031*** (0.0012)	0.031*** (0.0015)	0.045*** (0.0021)
(Experience)^2	−0.0015*** (0.0001)	−0.001*** (0.0001)	−0.0007*** (0.0001)	−0.0011*** (0.0001)
Immigrant, Western	−0.011 (0.0085)	−0.006 (0.0052)	0.002 (0.0057)	−0.002 (0.0069)
Immigrant, non-Western	−0.037*** (0.0098)	−0.023*** (0.008)	−0.031*** (0.0094)	−0.019* (0.0116)
City resident	0.026*** (0.0059)	0.043*** (0.0033)	0.084*** (0.004)	0.068*** (0.006)
Mobility	0.089*** (0.0182)	0.047*** (0.0113)	0.046*** (0.012)	−0.023 (0.0145)
Married	0.018*** (0.0062)	0.011*** (0.0034)	0.027*** (0.0039)	0.019*** (0.0053)
Obs.	18,128	49,665	34,855	15,258
Adjusted R^2	0.23	0.22	0.26	0.35

All regressions include industry and occupation fixed effects, and a constant term. Standard errors are given in parenthesis. ***, **, and * indicate significance at the 1, 5, and 10 per cent level, respectively.

TABLE A5 Separate wage regressions for men and women by geography

	Cities			Rest of country		
Dependent variable	**Log hourly wage**	**Log hourly wage**	**Log hourly wage**	**Log hourly wage**	**Log hourly wage**	**Log hourly wage**
Gender	**All**	**Men**	**Women**	**All**	**Men**	**Women**
Male	0.101*** (0.0018)			0.102*** (0.002)		
High school degree	0.066*** (0.0023)	0.068*** (0.0027)	0.054*** (0.0046)	0.076*** (0.0019)	0.08*** (0.0021)	0.056*** (0.0043)
College education	0.182*** (0.0028)	0.178*** (0.0033)	0.178*** (0.0051)	0.162*** (0.0027)	0.165*** (0.0032)	0.144*** (0.0054)
Postgraduate degree	0.291*** (0.0034)	0.275*** (0.004)	0.3*** (0.0062)	0.281*** (0.0042)	0.274*** (0.0048)	0.278*** (0.0087)
Experience	0.049*** (0.0006)	0.054*** (0.0007)	0.042*** (0.0011)	0.041*** (0.0005)	0.045*** (0.0006)	0.031*** (0.0011)
$(\text{Experience})^2$	−0.0017*** (0.0000)	−0.0019*** (0.0000)	−0.0014*** (0.0001)	−0.0014*** (0.0000)	−0.0016*** (0.0000)	−0.001*** (0.0001)
Immigrant, Western	−0.003 (0.0023)	−0.002 (0.0028)	−0.004 (0.004)	−0.003 (0.0024)	−0.002 (0.0027)	−0.005 (0.005)
Immigrant, non-Western	−0.025*** (0.0032)	−0.023*** (0.0038)	−0.024*** (0.0057)	−0.023*** (0.0042)	−0.018*** (0.0048)	−0.033*** (0.0085)
Mobility	0.029*** (0.0049)	0.013** (0.0058)	0.054*** (0.0088)	0.041*** (0.0047)	0.039*** (0.0052)	0.04*** (0.0105)
Married	0.04*** (0.0017)	0.049*** (0.002)	0.02*** (0.0029)	0.035*** (0.0016)	0.041*** (0.0018)	0.018*** (0.0033)
Obs.	191,928	127,702	64,226	210,590	156,910	53,680
Adjusted R^2	0.42	0.44	0.36	0.37	0.38	0.29

All regressions include industry and occupation fixed effects, and a constant term. Standard errors are given in parenthesis. ***, **, and * indicate significance at the 1, 5, and 10 per cent level, respectively.

TABLE A6 Cohort analysis 1995–2010 by education category

	Adjusted gender wage gap			
Primary	**1995**	**2000**	**2005**	**2010**
Age-group				
20–24	0.091	0.017[1]	0.037	0.013[1]
25–29	0.153	0.13	0.066	0.079
30–34	0.195	0.172	0.155	0.121
35–39	0.215	0.19	0.18	0.122
40–44	0.208	0.198	0.172	0.157
45–49	0.192	0.169	0.172	0.163
50–54	0.202	0.172	0.159	0.163
55–59	0.176	0.174	0.177	0.164
High school	**Adjusted gender wage gap**			
Age–group				
20–24	0.061	0.04	0.042	0.048
25–29	0.136	0.126	0.102	0.101
30–34	0.222	0.203	0.166	0.156
35–39	0.277	0.25	0.215	0.192
40–44	0.28	0.259	0.232	0.212
45–49	0.287	0.248	0.237	0.218
50–54	0.275	0.255	0.236	0.231
55–59	0.274	0.254	0.239	0.22
College	**Adjusted gender wage gap**			
Age–group				
25–29	0.065	0.087	0.055	0.048
30–34	0.168	0.159	0.128	0.099
35–39	0.235	0.219	0.18	0.171
40–44	0.254	0.247	0.212	0.186
45–49	0.266	0.234	0.204	0.189
50–54	0.288	0.25	0.213	0.196
55–59	0.275	0.238	0.246	0.194
Postgraduate	**Adjusted gender wage gap**			
Age–group				
25–29	0.031	0.063	0.029	0.039
30–34	0.091	0.079	0.06	0.053
35–39	0.145	0.134	0.107	0.086
40–44	0.134	0.148	0.112	0.105
45–49	0.137	0.13	0.104	0.095
50–54	0.12	0.103	0.086	0.087
55–59	0.174	0.173	0.089	0.078

Each number in the table corresponds to the estimated coefficient on the male dummy in a wage regression controlling for immigrant status, resident location, and firm fixed effects. Superscript '1' indicates that the estimated coefficient is not statistically significantly different from zero at the 5% level.