Atl Econ J (2017) 45:333–350
DOI 10.1007/s11293-017-9546-6

Millennials and the Gender Wage Gap in the U.S.: A Cross-Cohort Comparison of Young Workers Born in the 1960s and the 1980s

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Published online: 10 July 2017

Abstract Using two cohorts of young workers born in the early 1960s and early 1980s, this paper analyzes the temporal change in the U.S. gender wage gap and its determinants, which persists for both explained and unexplained reasons. Results suggest that the gender wage gap closed four (seven) percentage points at the mean (median) between cohorts. It finds cross-cohort evidence that young females' increasing returns to marriage and a changing occupational wage structure contributed to a narrowing of the gap. Nonetheless, the majority of this convergence remains unexplained due to relative improvements in unobservable institutional factors or heterogeneity for females. Compared to the previous generation, millennials likely entered a more progressive, female-friendly labor market. It is also possible that female millennials are more ambitious and competitive in their early years of work experience relative to females born in the 1960s.

Keywords U.S. gender wage gap · Millennials

JEL J01 · J16 · J31

Introduction

Research on the gender wage gap in the U.S. finds that despite substantial gains in women's earnings since the late 1970s, convergence slowed in the 1990s and early 2000s and continues to persist today. However, data from the 2011 American Community Survey indicate that women are increasingly becoming the sole or primary

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earner in American households and nearly a quarter of married women now earn more than their husbands, compared to 6% of married women in the 1960s (Wang et al. 2013). Overall, this shift is likely due to several factors including gender differences in employment during and after the Great Recession, changing family dynamics, and a rise in single-mother households.

How does the economic literature on the gender wage gap reconcile with these post-Great Recession trends? The majority of current research investigates the gender wage gap up until the 1990s and we know little of the early millennial generation experience, that is, young workers born in the 1980s. As social and labor market norms progress toward gender equality, we might expect female millennials to be different from young females of past generations. These differences, both measurable and unmeasurable, have likely impacted the female wage penalty. On average, millennials experienced different childhoods as it was more common for them to grow up in households with working mothers as well as fathers contributing relatively more to child-rearing and household production. Female millennials are relatively more educated, were exposed to a greater variety of career opportunities, and likely entered careers with more progressive norms toward working women (Wang et al. 2013). On average, they are also more likely to delay marriage and fertility in their early years of work experience (Taylor et al. 2011).

This paper compares young workers in two single-cohort longitudinal surveys, the NLSY79 and NLSY97, to investigate gender inequality among millennials in the current labor market. The earlier cohort is comprised of individuals born in the early 1960s, and the later cohort includes individuals born in the early 1980s. Given that labor market entrants have historically driven much of the gender wage gap convergence (Blau and Kahn 2007), the current study focuses on young workers rather than a representative sample of workers of all ages.

Unadjusted descriptive statistics depict moderate cross-cohort improvement in gender equality. For example, the gender log wage differential closes 2.4 log points at the mean and 3.5 log points at the median. In addition, the mean female percentile in the male wage distribution moved up four percentile points between cohorts. Indeed, 58% of male millennials out-earned female millennials, compared to 62% of young males 20 years prior.

This paper estimates temporal changes in the gender wage gap and its determinants to explore how and why the wage gap may have shifted across cohorts. The findings indicate that in 20 years, when controlling for the standard gender wage gap specification variables, the gap among young workers closed four percentage points at the mean and seven percentage points at the median. Estimates from quantile regression suggest that the female penalty increases across the wage distribution, and the shape of the distribution is nearly identical between cohorts. By comparing the determinants of wages by cohort and estimating cross-cohort temporal change, it suggests there are notable differences in family and job characteristics between the cohorts. Female millennials earn marriage premiums that are similar to the male experience of both cohorts. In terms of job characteristics, female millennials make a considerable improvement in the return to self-employment and are subject to a more favorable occupational wage structure. Moreover, cross-cohort changes in human capital contribute very little to convergence.

A Juhn et al. (1993) decomposition confirms a similar story of moderate convergence among young workers, although only 17% of it can be explained by changes in measured characteristics and prices. Institutional factors, such as a less discriminating labor market, or unobserved heterogeneity, such as attributes correlated with higher wages, are assumedly more favorable for female millennials relative to young females of the baby boomer generation.

Literature Review

Research on wage inequality continues to be an important topic studied by economists and other social scientists. One of the contributing factors of this inequality is the gender wage gap. Studies find that the after decades of unequal pay and a gender wage gap around 40%, the gap dramatically improved in the late 1970s through 1980s, slowed in the 1990s, and started to pick up again in the early 2000s (Blau and Kahn 2007). In 2011, the Bureau of Labor Statistics reported that the gap reached a low of 16.5% (Bureau of Labor Statistics 2011). While the overall trend is positive with women progressing toward equal pay, the gap continues to persist.

Explaining why the gender wage gap persists is complex. We know that several reasons are at play, some of which researchers can explain, and some of which remain unexplained speculation. Three types of reasons are summarized below: measurable factors, institutional factors, and unobserved heterogeneity.

First, it is known that measurable differences in human capital and job characteristics explain a portion of the gap. Although women now have relatively more years of education and their returns to higher education are rising faster relative to men's returns (DiPrete and Buchmann 2006), they still have fewer or disrupted years of experience. These temporary leaves both decrease human capital and delay training and promotions in workers' early careers (Mincer and Polachek 1974; Barron et al. 1993; O'Neill and Polachek 1993; Blau and Kahn 2006). Occupational choice is another important factor, whereby women are more likely to select into lower-paying, but mother-friendly jobs (Lowen and Sicilian 2009; Solberg and Laughlin 1995). While occupational segregation still plays a considerable role in explaining the wage gap, women began to narrow this gap in the 1980s by becoming more educated and therefore having a greater range of career choice (Blau and Khan 2006).

Secondly, given that a portion of the wage gap cannot be explained, one can speculate that institutional factors such as discrimination and social norms may also play a role in gender pay disparity. Of course, this is difficult to quantify. Experimental studies such as Neumark et al. (1996) and Goldin and Rouse (2000), find evidence of gender discrimination. Empirical studies that directly test for discrimination find evidence that sexism lowers labor market outcomes (Charles et al. 2009) and that productivity data in the U.S. manufacturing industry support the presence of gender discrimination (Burnette 2012). However, other studies support Becker's (2010) prediction that market forces reduce or eliminate discrimination in the long run (Black and Strahan 2001; Hellerstein et al. 2002).

Finally, the gender wage gap may be a result of unobserved heterogeneity. That is, the unexplained part of the gender wage gap may not be attributable to discrimination, but rather unobserved variable bias. Researchers cannot measure every attribute of a

worker's personality, effort, or preference for time spent working versus household production or leisure. The gender wage gap could be determined, in part, by women's lack of competitiveness (Gneezy et al. 2003), negotiation skills (Babcock and Laschever 2003), or negotiation initiation (Rigdon 2012; Leibbrandt and List 2012); however, other research argues that gender differences in competitiveness and the returns to psychological attributes have little effect on the gender wage gap (Manning and Saidi 2010; Manning and Swaffield 2005).

Research indicates that young women's wages are more equal to young men's wages and younger generations have historically driven much of the gender wage gap convergence (Blau and Khan 2007). This motivates the question of why younger generations have a more equal wage ratio, yet few papers focus on young workers, particularly in the current labor market. Manning and Swaffield (2005) find that although a gender wage gap does not exist in labor market entry, the gap is nearly 25% after ten years of experience, half of which can be explained by differences in human capital. Fortin (2008) finds evidence that gender differences in young worker's preferences for higher earnings versus family factors plays a small role in explaining the gender wage gap. Other papers that analyze the gender wage gap in young MBAs and lawyers find that women earn less than their male counterparts due to career interruptions and time spent child rearing (Bertrand et al. 2010; Wood et al. 1993).

While most papers in the gender wage gap research analyze the penalty among older generations of women with traditional attitudes about family, education, and career choice, this line of research focuses on younger workers. Yet, it is still unclear how young workers today differ from the young workers in the baby boomer generation. Analyzing time-series data to measure the change in the gender wage gap over time or cross-sectional data on young labor market entrants to measure the determinants of the wage gap can only tell us part of the story. This paper seeks to extend this line of research by analyzing the cross-cohort differences of young workers between two generations.

Data and Descriptive Statistics

This paper draws on two birth cohorts from the 1979 and 1997 National Longitudinal Survey of Youth (NLSY79 and NLSY97, respectively [Bureau of Labor Statistics 1979–2012, 1997–2014]). Each cohort is restricted to an analogous sample in order to attain age comparability between cohorts. The NLSY79 is a nationally representative sample of individuals aged 14 to 21 in 1979 who are interviewed from 1979 to 2010. In this cohort, which this paper refers to as the 1960s birth cohort, 13 waves from 1979 to 1991 are pooled, and the sample is restricted to individuals born between 1960 and 1962. In 1979, they are 17 to 19 years old and by the last measured wave, 1991, they are 29 to 31 years old.

Similarly, the NLSY97 is a nationally representative sample of individuals aged 12 to 16 in 1997 who are interviewed from 1997 to 2011. This cohort, referred to as the 1980s birth cohort, includes 13 waves from 1999 to 2011. It is restricted to include individuals born between 1980 and 1982, so that they are in the same age range across the 11 waves as the 1960s birth cohort. In summary, the birth cohorts represent two groups of young workers: one group born in the 1960s and working in the 1980s, i.e.,

the baby boomer generation, and the other group born in the 1980s and working in the 2000s, i.e., the millennial generation.[1]

Both cohorts are limited to individuals who work at least part-time for at least two waves. Given that this is a requirement of the fixed effects model, the sample is adjusted to be the same in the pooled ordinary least squares (OLS) models to allow for comparable samples. To further reduce heterogeneity and omit outliers, person-years are excluded if the young worker is enrolled in school or earning less than $1 or more than $200 per hour in 2000 dollars. These sample restrictions, along with the size of the NLS panels, limit the analysis to 4031 workers in the 1960s birth cohort and 4556 workers in the 1980s birth cohort.

Table 1 displays sample sizes and descriptive statistics of selected variables by birth cohort and gender.[2] Comparing young workers across cohorts, it is evident that females have made relatively greater advances in unadjusted wages, yet still earn about two dollars less than the average male. Both the average and the median female are better off in the later birth cohort, while male wages only improve at the mean, indicating increasing variation in the male wage distribution.

Several other cross-cohort differences are worth mentioning. First, there are large family differences as millennials seem to delay this stage relative to baby boomers.[3] Although females are still more likely to be married and have more children than males, millennials are less likely to be married and have fewer children in their early years of working. Young workers of both genders have slightly more years of work experience and education, on average, in the later birth cohort; however, females exceed males in their average years of education by 0.59 years in the earlier cohort and 0.64 years in the later cohort. Job characteristics generally follow the same pattern by gender, whereby across cohorts there is evidence for trends in deunionization, privatization, and an increase in the self-employment rate. Finally, work effort variables show that on average, young workers of both genders work more weeks, although fewer work full-time, in the later birth cohort. The decrease in full-time status may be voluntary or involuntary. On one hand, millennials may be choosing part-time work as a way to balance work and family demands versus not working at all. On the other hand, these young workers may be involuntarily working part-time hours due to economic reasons, i.e., the Great Recession.

Methodology

To start, the gender wage gap is analyzed using several indicators for wage inequality. These indicators, including the mean and median gender log wage differential, the implied female to male pay ratio, and the mean female percentile

[1] Retention is critical to the validity of longitudinal data sets. Until 1991, the NLSY79 retention rate was 90.9%, and up to 2011, the NLSY97 retention rate was 84.1%. While attrition likely reduces the precision of this paper's results, it could also bias the results if attrition is non-random.

[2] The National Longitudinal Surveys suggest that researchers do not use sample weights when implementing regression analysis on longitudinal data, and thus descriptive statistics and results are constructed using unweighted data.

[3] Of course, it is also possible that a larger percentage of this cohort will choose not to marry or not have children, but this statistic cannot be accurately measured at this early point in the individual's lifecycle.

Table 1 Descriptive statistics of selected variables by birth cohort and gender

	Males		Females		Change	
	1960s	1980s	1960s	1980s	Males	Females
Sample size						
Person-year units	17,385	14,779	15,568	13,598		
Persons	2171	2308	2130	2248		
Hourly wage per hour						
Mean	11.96	13.11	9.77	11.16	1.14	1.40
Median	10.26	10.24	8.38	9.08	−0.02	0.70
Married	36%	24%	46%	31%	−12%	−16%
Number of children	0.65	0.39	0.83	0.79	−0.26	−0.03
Years of education	11.9	12.7	12.5	13.3	0.74	0.78
Years of experience	1.2	1.3	1.1	1.2	0.06	0.05
Union	14%	11%	11%	9%	−0.02	−0.02
Self-employed	6%	7%	4%	5%	2%	1%
Public sector	9%	2%	13%	4%	−6%	−9%
Full-time	90%	81%	76%	70%	−9%	−7%
Annual weeks worked	44.2	45.8	42.2	45.2	1.6	3.0

Source: Data for the 1960s individuals include 4031 workers born between 1960 and 1962 from the 1979 NLSY, waves 1979 to 1991 (Bureau of Labor Statistics 1979–2012). Data for the 1980s individuals include 4556 workers born between 1980 and 1982 from the 1997 NLSY, waves 1999 to 2011 (Bureau of Labor Statistics 1997–2014).

in the male wage distribution, are common measures of wage inequality in the gender wage gap literature.

Next, the gender wage gap is estimated in the two birth cohorts using pooled to OLS and quantile regression at the .10, .25, median, .75, and .90 quantiles. This methodology compares workers to themselves at other points in time, as well as other workers. The dependent variable is the log of hourly wages in the worker's current job, where wages have been adjusted to 2000 dollars using the Consumer Price Index-All Urban Consumers (2017). Log wages are regressed on a female dummy variable and other variables controlling for demographics (age, age squared, race), family characteristics (number of children, marital status), human capital (years of schooling, years of experience, years of experience squared), job characteristics (occupation, self-employment, union status, public sector), and work effort (full-time, annual weeks worked). To explicitly test whether the gender wage gap has changed between cohorts and if the change is statistically significant, a third estimation using OLS and quantile regression includes both cohorts in a combined model with the addition of a 1980s birth cohort dummy and interactions of all independent variables with this cohort dummy.[4] Given the clustered nature of the data, the standard errors are corrected by clustering individuals in all pooled OLS regressions.

[4] A similar methodology is used by Avellar and Smock (2003) to compare the motherhood wage penalty across two birth cohorts.

Subsequently, temporal changes in the determinants of the wage gap are analyzed using pooled OLS and fixed effects models. While pooled OLS models are useful in fully exploiting the longitudinal data by incorporating time-invariant characteristics of individuals, they likely contain greater omitted-variable bias and underestimate the effect of discrimination in gender wage gap studies (Choudhury 1993). Thus, fixed effects models are estimated in order to control for unobserved heterogeneity. This methodology compares workers to themselves at other points in time and consequently only estimates coefficients for time-variant variables. While this does not permit estimation of the gender wage gap as gender is time-invariant, it does allow for the estimation of the determinants of the wage gap by splitting the cohorts by gender.

Pooled OLS and fixed effects models are estimated for four groups: men in the 1960s birth cohort, men in the 1980s birth cohort, women in the 1960s birth cohort, and women in the 1980s birth cohort.[5] A combined model, one with both male cohorts and the other with both female cohorts, is estimated using pooled OLS and fixed effects to test the signs and statistical significance of the cross-cohort changes.

While multivariate regression analysis is helpful in exploring cross-cohort changes, it is limited in its ability to identify whether the determinants are shifting due to changes in individuals' quantities of measured characteristics, prices of these characteristics, or simply the effect of the residual. Subsequently, a decomposition of the gender wage gap between the birth cohorts is implemented using the Juhn-Murphy-Pierce (JMP) decomposition method (Juhn et al. 1993) and applied in the gender wage gap literature by Blau and Khan (1997, 2006).[6] The JMP decomposition identifies four components that determine the change in the wage gap between two periods, in this analysis, the 1960s birth cohort and the 1980s birth cohort. These four components are: changes in the measured labor market characteristics of females compared to males, changes in the prices of measured labor market characteristics, changes in the unmeasured labor market characteristics of females compared to males (commonly referred to as the gap effect, which may reflect female's relative improvement in unmeasured characteristics and/or reduced gender discrimination in the labor market), and changes in the prices of unmeasured labor market characteristics.

By limiting the data to individuals 31 years of age and younger, it is acknowledged that the analysis is limited to estimating the effects of variables for young workers only.[7] It does not investigate wage differences for a representative sample. The intent of this paper is to assess and decompose the temporal change among young workers born in the 1960s versus the 1980s. Given that both cohort samples are limited to young workers, the estimated models and decomposition will likely overestimate or underestimate the results in the same direction, and this will have a negligible effect on the assessment of temporal change.

[5] For all fixed effects models, the Hausman test indicates a need for a fixed effects model versus a random effects model.

[6] Although the JMP decomposition method is widely used in the wage inequality literature, it is not without shortcomings. These papers, along with Datta Gupta et al. (2006) and Lemieux (2006), describe some of the issues surrounding the technique.

[7] Previous research finds that the motherhood penalty decreases with delayed fertility (Buckles 2008; Miller 2011). Thus, the coefficient on the number of children in the female-only models is likely overestimated compared to other analyses that measure the motherhood penalty using a sample of women who have reached the end of their child-bearing age.

Results

Indicators of Wage Inequality

Table 2 presents wage inequality indicators for the two birth cohorts, as well as the change in indicators between cohorts. To start, as evident by the increasing standard deviations of log wages, wage inequality rose between cohorts, and relatively more among men (0.053 log points compared to 0.044 among women). The gender differential in log wages fell 0.024 log points at the mean and 0.035 log points at the median. Similarly, the implied female to male pay ratio among young workers rose from 82% in the 1960s birth cohort to nearly 87% in the 1980s birth cohort. Another indicator to consider is the mean female percentile in the male wage distribution, which controls for changes in the wage structure, e.g., rising skill prices. On average, in the 1960s birth cohort, young women out-earn 38% of young men, and in the 1980s birth cohort, young women out-earn 42% of young men. Collectively, these trends indicate further improvement in gender equality for young millennials, and although the 20-year changes in the indicators are relatively small in economic size compared to the trends measured in the 1970s and 80s, they are generally consistent with the slower convergence measured in the 1990s (Blau and Khan 2006).

Pooled OLS Results

Results summarizing the female coefficient from pooled OLS and quantile regression models are found in Table 3. Using OLS (median) regression, an 18.6 (17.1) percentage point penalty for women is estimated in the earlier birth cohort, and a 14.4 (10.3) percentage point penalty for women is estimated in the later birth cohort. While one could infer a four to seven percentage point convergence in the gender wage gap by

Table 2 Wage inequality indicators

	1960s	1980s	Change
Standard deviation			
Males	0.498	0.551	0.053
Females	0.503	0.547	0.044
Gender log wage differential (mean)	0.085	0.061	−0.024
Gender log wage differential (median)	0.087	0.052	−0.035
Implied female/male pay ratio [a]	0.819	0.865	0.046
Mean female percentile in the male wage distribution [b]	37.96	41.95	3.99

Source: Data for the 1960s individuals include 4031 workers born between 1960 and 1962 from the 1979 NLSY, waves 1979 to 1991 (Bureau of Labor Statistics 1979–2012). Data for the 1980s individuals include 4556 workers born between 1980 and 1982 from the 1997 NLSY, waves 1999 to 2011 (Bureau of Labor Statistics 1997–2014).

[a] Computed as exp.(ln w_f) / exp.(ln w_m), where ln w_f is the average log female wage and ln w_m is the average log male wage.

[b] Computed by assigning each woman a percentile ranking in the indicated year's male wage distribution and calculating the female mean and median of these percentiles.

Table 3 Female coefficient from pooled OLS and quantile regression models by birth cohort

	OLS	Quantile				
		0.1	0.25	0.5	0.75	0.9
1960s birth cohort	−0.186	−0.134	−0.153	−0.171	−0.189	−0.215
	(0.010)	(0.008)	(0.005)	(0.006)	(0.007)	(0.008)
1980s birth cohort	−0.144	−0.084	−0.091	−0.103	−0.147	−0.166
	(0.012)	(0.008)	(0.006)	(0.005)	(0.007)	(0.010)
Combined cohorts (temporal change)	0.040	0.053	0.059	0.066	0.045	0.051
	(0.015)	(0.011)	(0.008)	(0.008)	(0.010)	(0.013)

Source: Data for the 1960s individuals include 4031 workers born between 1960 and 1962 from the 1979 NLSY, waves 1979 to 1991 (Bureau of Labor Statistics 1979–2012). Data for the 1980s individuals include 4556 workers born between 1980 and 1982 from the 1997 NLSY, waves 1999 to 2011 (Bureau of Labor Statistics 1997–2014).

Notes: Results are from a log hourly earnings regression. The regressions control for age, race, marital status, number of children, education, experience, union status, self-employment, public sector, full-time status, annual weeks worked, occupation, region, and urban location. Combined cohort models control for cohort. Standard errors are in parentheses and clustered by individual. All coefficients are statistically significant at the 1% level.

comparing these two models, the size and statistical significance of this change is explicitly tested by estimating a combined model with a cohort dummy and interactions of the cohort dummy with the independent variables. Accordingly, the results find evidence of a statistically significant 4.0 (6.6) percentage point decrease in the female wage penalty.

Quantile regression results suggest that OLS overestimates the penalty, although this difference is quite larger in the 1980s birth cohort. This results in a larger temporal change in the median gender wage gap, which is closer to 7 percentage points. Consistent with previous literature, the female wage penalty increases across the wage distribution, meaning high-earning women are subject to the highest penalties (Garcia et al. 2001). The shape of the distribution is generally the same in both cohorts, where the wage penalty for females in the top 10% of the wage distribution is about 8 percentage points higher than the wage penalty for females in the bottom 10% of the wage distribution.

Table 4 displays the determinants of wages by gender and cohort estimated by pooled OLS. A few differences between cohorts are significant enough to mention. First, female millennials now earn an 11 percentage point marriage premium that is similar to the male experience in both male birth cohorts. Similarly, the combined model estimates a statistically significant 6 percentage point temporal change between cohorts, although this premium is reduced one percentage point if the married female also has children. This finding is consistent with the trend that the marriage premium is increasing over time for women (Avellar and Smock 2003) and suggests a shift in the role that female millennials play as wives and primary or dual-income earners. Second, returns to human capital remain mostly unchanged between cohorts. Females of both cohorts benefit from slightly higher returns to education and millennial males benefit from a small increase in their return to experience; however, the cross-cohort changes in the combined model are statistically insignificant. Third, female millennials make large

Table 4 Determinants of wages from pooled OLS models by birth cohort and gender

Category	Variable	Males		Females		Combined cohorts (temporal change)	
		1960s	1980s	1960s	1980s	Males	Females
Family characteristics	Married	0.107***	0.110***	0.039***	0.108***	−0.003	0.057***
		(0.014)	(0.018)	(0.012)	(0.016)	(0.023)	(0.021)
	No. of children	0.025***	0.027***	0.007	0.007	0.006	0.009
		(0.008)	(0.011)	(0.008)	(0.007)	(0.013)	(0.011)
	Married*children	−0.010	0.002	−0.015*	−0.034***	0.010	−0.024*
		(0.010)	(0.016)	(0.010)	(0.011)	(0.019)	(0.015)
Human capital	Education	0.048***	0.044***	0.056***	0.057***	−0.006	0.002
		(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)
	Experience	0.113***	0.121***	0.112***	0.114***	0.009	0.002
		(0.009)	(0.009)	(0.009)	(0.011)	(0.013)	(0.015)
Job characteristics	Union	0.027	0.201***	−0.010	0.160***	0.176***	0.177***
		(0.018)	(0.019)	(0.020)	(0.024)	(0.026)	(0.031)
	Self-employed	0.052***	0.436***	−0.271***	0.335***	0.384***	0.603***
		(0.034)	(0.040)	(0.051)	(0.059)	(0.053)	(0.078)
	Public sector	0.013***	0.048*	0.009	0.022	0.037	0.021
		(0.018)	(0.028)	(0.015)	(0.020)	(0.033)	(0.025)
	Management	0.261***	0.384***	0.184***	0.477***	0.118*	0.289**
		(0.041)	(0.060)	(0.045)	(0.111)	(0.072)	(0.121)
	Professional	0.376***	0.349***	0.251***	0.404***	−0.031	0.150
		(0.044)	(0.060)	(0.045)	(0.110)	(0.075)	(0.120)
	Services	0.077*	0.005	−0.048	−0.057	−0.071	−0.006
		(0.039)	(0.058)	(0.043)	(0.110)	(0.070)	(0.120)

Table 4 (continued)

Category	Variable	Males		Females		Combined cohorts (temporal change)	
		1960s	1980s	1960s	1980s	Males	Females
	Sales	0.257***	0.146***	0.070	0.191*	−0.115	0.121
		(0.049)	(0.058)	(0.048)	(0.109)	(0.076)	(0.121)
	Administrative	0.166***	0.141***	0.078*	0.321***	−0.021	0.244**
		(0.040)	(0.058)	(0.042)	(0.109)	(0.070)	(0.118)
	Laborer	0.285***	0.347***	0.133***	0.518***	0.057	0.381***
		(0.039)	(0.057)	(0.046)	(0.124)	(0.068)	(0.134)
	Production	0.257***	0.208***	0.082*	0.253***	−0.052	0.175
		(0.040)	(0.057)	(0.043)	(0.111)	(0.069)	(0.121)
	Transportation	0.235***	0.177***	0.130*	0.268***	−0.058	0.133
		(0.041)	(0.057)	(0.069)	(0.119)	(0.070)	(0.138)
Work effort	Full-time	0.038*	0.080***	0.046***	0.083***	0.041	0.039**
		(0.019)	(0.018)	(0.012)	(0.014)	(0.026)	(0.018)
	Annual weeks	0.449***	0.180***	0.436	0.134***	−0.279***	−0.313***
		(0.037)	(0.040)	(0.033)	(0.042)	(0.054)	(0.053)

Source: Data for the 1960s individuals include 4031 workers born between 1960 and 1962 from the 1979 NLSY, waves 1979 to 1991 (Bureau of Labor Statistics 1979–2012). Data for the 1980s individuals include 4556 workers born between 1980 and 1982 from the 1997 NLSY, waves 1999 to 2011 (Bureau of Labor Statistics 1997–2014).

Notes: Results are from a log hourly wage regression. The regressions also control for age, age squared, race, region, experience squared, and an urban location dummy. The excluded occupation category is farming and forestry. Combined cohort models control for cohort. Standard errors are in parentheses and clustered by individual. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

improvements in their occupational wage structure. Males, on the other hand, experience an occupational wage structure that is detrimental to the later cohort. In addition to differences in occupations, the return to self-employment increases for both genders, where self-employed women (men) experience a sizable 60 (38) percentage point increase across cohorts. Fourth, there is a similar change in the return to work effort for both genders. The wage premium for full-time work increases 4 percentage points and the premium for annual weeks worked falls.

Fixed Effects Results

Thus far, it is possible that unmeasured factors affect both wages and its determinants, leading to omitted variable bias which is likely greater in the pooled OLS estimates. Furthermore, it is possible that the type of individual with particular characteristics, such as a parent or an individual with a certain occupation or level of education, shifts over time in measured and unmeasured ways. For those reasons, fixed effects models are employed to control for stable, unobserved heterogeneity. The results from the fixed effects models are summarized in Table 5. A brief comparison of the fixed effects and pooled OLS results follow.

First, relative to the pooled OLS results, a smaller yet still positive and statistically significant 3 percentage point increase in the marriage premium is evident for millennial females. Second, whereas the OLS estimates little change and statistical significance in the return to human capital, fixed effects result in lower returns to education and experience for both male and female millennials. Specifically, the temporal change in the return to education for females (males) is a 1.5 (1.1) percentage point reduction, and the temporal change in the return to experience is a 3.0 (1.4) percentage point reduction. Third, like the OLS model suggests, female millennials are considerably better off in their returns to occupations. To a large extent, the fixed effects model estimates even larger, more statistically significant temporal changes in the occupational wage structure relative to the OLS model. Fourth, unlike the OLS results, female millennials are better off in their returns to work effort compared to male millennials. Across cohorts, the wage premium for full-time work increases a statistically significant 5.4 percentage points for females, but the smaller 2.2 percentage point increase for males is statistically insignificant.

JMP Decomposition Results

Table 6 summarizes the JMP decomposition of changes in the gender wage gap between the 1960s birth cohort and the 1980s birth cohort. The results indicate that the gap closed .049 log points, or approximately 4.9 percentage points, between generations. Measured characteristics and their corresponding prices explain 17% of this convergence, while 83% of this change remains unexplained. Decomposition results from the first two components, explained characteristics and explained prices, are grouped to reflect the four categories used above: family characteristics, human capital, job characteristics, and work effort.

Historically, human capital improvements among females have played a large role in gender wage convergence (Blau and Khan 2006; Datta Gupta et al. 2006). However, this is not the case with millennial females, as changes in education and experience had

Table 5 Determinants of wages from fixed effects models by birth cohort and gender

		Males		Females		Combined Cohort (temporal change)	
		1960s	1980s	1960s	1980s	Males	Females
	Person-years	17,385	14,779	15,568	13,598	32,164	29,166
	Persons	2171	2308	2130	2248	4058	3975
	Avg. person-years	8.0	6.4	7.3	6.0	7.9	7.3
Category	Variable						
Family characteristics	Married	0.103***	0.124***	0.074***	0.105***	0.013	0.029*
		(0.010)	(0.013)	(0.010)	(0.013)	(0.016)	(0.016)
	No. of children	0.059***	0.051***	0.045***	0.061***	0.014	0.019**
		(0.007)	(0.009)	(0.008)	(0.007)	(0.011)	(0.010)
	Married*children	−0.019***	0.002	−0.033***	−0.032***	0.003	−0.007
		(0.007)	(0.012)	(0.008)	(0.009)	(0.014)	(0.012)
Human capital	Education	0.055***	0.024***	0.070***	0.026***	−0.011**	−0.015***
		(0.007)	(0.004)	(0.007)	(0.004)	(0.005)	(0.005)
	Experience	0.099***	0.086***	0.111***	0.079***	−0.014	−0.030***
		(0.006)	(0.008)	(0.008)	(0.009)	(0.010)	(0.011)
Job characteristics	Union	0.070*	0.124***	0.007	0.095***	0.061**	0.120***
		(0.040)	(0.014)	(0.045)	(0.015)	(0.028)	(0.033)
	Self-employed	0.086***	0.396***	−0.256***	0.226***	0.313***	0.510***
		(0.015)	(0.017)	(0.020)	(0.020)	(0.023)	(0.028)
	Public sector	0.042***	0.067***	0.076***	0.037**	0.044*	−0.032
		(0.014)	(0.024)	(0.013)	(0.019)	(0.027)	(0.023)
	Management	0.071***	0.242***	0.117***	0.409***	0.174***	0.318***
		(0.023)	(0.041)	(0.043)	(0.057)	(0.045)	(0.072)

Table 5 (continued)

		Males		Females		Combined Cohort (temporal change)	
		1960s	1980s	1960s	1980s	Males	Females
	Professional	0.157***	0.238***	0.114***	0.355***	0.100**	0.277***
		(0.025)	(0.041)	(0.042)	(0.056)	(0.046)	(0.071)
	Services	−0.019	−0.033	−0.041	0.000	−0.040	0.051
		(0.022)	(0.039)	(0.041)	(0.056)	(0.043)	(0.070)
	Sales	0.040	0.081**	0.031	0.195***	0.012	0.174**
		(0.026)	(0.040)	(0.044)	(0.056)	(0.046)	(0.072)
	Administrative	0.008	0.078**	0.024	0.272***	0.046	0.267***
		(0.023)	(0.040)	(0.041)	(0.056)	(0.044)	(0.070)
	Laborer	0.104***	0.235***	0.087**	0.510***	0.104***	0.431***
		(0.020)	(0.039)	(0.043)	(0.075)	(0.042)	(0.087)
	Production	0.112***	0.160***	0.117***	0.273***	0.022	0.173**
		(0.021)	(0.040)	(0.042)	(0.059)	(0.043)	(0.073)
	Transportation	0.091***	0.110***	0.092*	0.259***	−0.007	0.178**
		(0.023)	(0.039)	(0.057)	(0.061)	(0.043)	(0.085)
Work	Full-time	−0.014	0.003	−0.005	0.047***	0.022	0.054***
effort		(0.010)	(0.010)	(0.008)	(0.009)	(0.015)	(0.012)
	Annual weeks	0.301***	0.163***	0.285***	0.161***	−0.190***	−0.154***
		(0.027)	(0.035)	(0.027)	(0.034)	(0.045)	(0.044)

Source: Data for the 1960s individuals include 4031 workers born between 1960 and 1962 from the 1979 NLSY, waves 1979 to 1991 (Bureau of Labor Statistics 1979–2012). Data for the 1980s individuals include 4556 workers born between 1980 and 1982 from the 1997 NLSY, waves 1999 to 2011 (Bureau of Labor Statistics 1997–2014).

Notes: Results are from a log hourly wage regression. The regressions also control for age, age squared, race, region, experience squared, and an urban location dummy. The excluded occupation category is farming and forestry. Combined cohort models control for cohort. Standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table 6 Decomposition of changes in the gender pay gap, 1960s birth cohort to 1980s birth cohort

Decomposition Component	Effect	Std. Error
Change in differential	−0.049	
Explained	−0.008	
Unexplained	−0.041	
Observed characteristics (x's)		
All x's	−0.045**	0.005
Family (married, number of children, married*children)	−0.003	
Human capital (years of schooling, years of experience)	0.001	
Job characteristics (occupation, self-emp., union status, public sector)	−0.039	
Work effort (full-time, annual weeks worked)	−0.007	
Observed prices (beta's)		
All beta's	0.045**	0.006
Family (married, number of children, married*children)	−0.002	
Human capital (years of schooling, years of experience)	0.003	
Job characteristics (occupation, self-emp., union status, public sector)	0.041	
Work effort (full-time, annual weeks worked)	0.000	
Unexplained differential	−0.041	
Gap effect	−0.045**	0.015
Unobserved prices	0.005**	0.005

Source: Data for the 1960s individuals include 4031 workers born between 1960 and 1962 from the 1979 NLSY, waves 1979 to 1991 (Bureau of Labor Statistics 1979–2012). Data for the 1980s individuals include 4556 workers born between 1980 and 1982 from the 1997 NLSY, waves 1999 to 2011 (Bureau of Labor Statistics 1997–2014).

Notes: Specification controls for age, age squared, race, region, experience squared, and an urban location dummy. Standard errors of the all x's effect and all prices effect, and approximate standard errors of the gap effect and unmeasured prices effect, are derived using the method by the appendix to Datta Gupta et al. (2006).

**Statistically significant at the .05 level.

little to do with convergence across cohorts. Instead, among observable characteristics, convergence is attributable to females upgrading occupations, improving their relative levels of work effort, and having fewer children in their early years of work experience. Collectively, the job characteristics category, which mostly accounts for changes in occupations between the cohorts, accounted for over 80% of the fall in the gender wage gap due to observable characteristics.

Similar to the earlier finding that the mean female percentile in the male wage distribution increased four percentiles between the cohorts, the gap effect indicates that young women moved up the male residual wage distribution by .045 log points, or approximately 4.5 percentage points. This finding is likely due to a combination of reasons. Compared to young females in the earlier birth cohort, female millennials working in the 2000s may have more favorable unmeasurable skills, e.g., competitiveness, ambition, or negotiation, or they may have entered the labor market with less gender discrimination and/or more favorable supply and demand conditions for females. This finding is consistent with Weinberger and

Kuhn's (2010) conclusion that the majority of the gender wage gap convergence from 1959 to 1999 was attributable to unobservable labor market factors.

The results suggest that changes in prices, on the other hand, proved unfavorable to females in the later birth cohort. Both measured prices and unmeasured prices increase the gender wage gap, although changes in measured prices account for the majority of this increase. Indeed, the gap increases .045 log points due to detrimental changes in measured prices, which is largely driven by changes in the returns to occupations. Thus, although young females in the labor market today have upgraded their occupations, the prices attached to these occupations have declined. The only factor price to close the gap is the price of family characteristics, whereby marriage and children are less costly for young women working in the 2000s.

Conclusion

This paper analyzes the gender wage gap in the millennial generation, an age group that has seen little attention in this line of economic literature. It uses two cohorts of young workers born in the early 1960s and the early 1980s to examine temporal change in the gender wage gap and its determinants and decompose the changes into explainable and unexplainable components.

Descriptive statistics and multivariate regression methods depict moderate and statistically significant cross-cohort convergence, although decomposing the female-male differential suggests that much of this convergence remains unexplained. Pooled OLS and fixed effects results provide evidence of a favorable shift in the marriage premium for female millennials so that marriage has a comparable effect on wages independent of gender. This finding is consistent with the anecdotal trend of females entering marriage as dual income earners as opposed to supporting wives and supplementary income earners. These models also provide considerable cross-cohort evidence for a changing occupational wage structure that favors millennial females and disfavors millennial males. Additionally, both genders benefit from increasing returns to self-employment. The implication of cross-cohort changes in work effort is uncertain. Between cohorts, the return to full-time work increases for both genders, though fixed effects imply this improvement is twice as large for females. On average, millennials of both genders work relatively more annual weeks per year compared to the baby boomer generation, yet the return on this effect falls.

In decomposing the gap, it is concluded that that while these observable factors may have played a small role in the convergence toward gender equality among millennials, unmeasurable factors played a larger role. A gap effect of the same magnitude is measured as the total change in the wage differential. Interpretation of this gap effect remains ambiguous, but one might expect it to be a combination of unobservable institutional factors and heterogeneity. Compared to baby boomers, millennials may have entered a more progressive, gender-equal labor market, or females in particular may have more favorable labor market supply and demand conditions. Moreover, the unmeasurable characteristics between males and females may have narrowed over time. Female millennials may be more ambitious, more competitive, or have a greater willingness and ability to negotiate wages in their early years of work experience.

Younger generations have historically driven much of the gender wage gap convergence (Blau and Khan 2007), and this paper finds that the gender wage gap continues to converge for young millennials. Of course, the long-term effect of this progress is unknown. Policy implications arise from the determinants of the gender wage gap, which are both internal and external. Policies aimed at internal barriers should encourage women to select into higher-paying occupations through female-friendly programs that focus on science, technology, engineering, and math (STEM) education.

Policies aimed at external barriers, such as discrimination and work environments, are also necessary. Government and employer policies that encourage the integration of work, household, and family responsibilities, as well as progressive work environments, are critical in the long path to gender wage equality. Increasing the availability of policies designed for both women and men enables a shift in work and family responsibilities. For example, on-site childcare makes it convenient for parents to combine work and family, and family leave for new fathers allows men to take on more household responsibilities. Another policy implication arises from the issue of women self-selecting in lower-paying jobs.

This paper contributes a modest and initial step in exploring gender inequality among the current labor market's youngest workers. Data limitations are undoubtedly a factor in its ability to measure these worker's attributes as we do not yet have access to information covering their full life-cycle. As the initial group of millennials born in the 1980s age pass childbearing years, future research can analyze their labor market behavior in the longer term. Furthermore, future work on this topic could investigate a full compensation gap that considers not only the wage gap, but the gap in benefits coverage between men and women. It would be interesting to find if accounting for fringe benefits, such as retirement benefits, flexible working arrangements, or paid vacation days, narrows or widens the existing gender wage gap.

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