Period Effects, Cohort Replacement, and the Narrowing Gender Wage Gap

Colin Campbell and Jessica Pearlman*
University of North Carolina at Chapel Hill
27 August 2012

* Authors contributed equally to the manuscript and are listed in alphabetical order.

ABSTRACT

Despite the abundance of sociological research on the gender wage gap, questions remain. In particular, the role of cohorts in narrowing the gender wage gap is under investigated. Using data from the Current Population Survey, we use Age-Period-Cohort analysis to uniquely estimate age, period, and cohort effects on the gender wage gap. We find that period effects have had a minimal impact on the gender wage gap, and that the narrowing of the gender wage gap that occurred between 1975 and 2009 is largely due to cohort replacement. Since the mid 1990s the gender wage gap has continued to close, absent of period effects. However, because of increasing cohort parity, period effects will likely be needed if the gender wage gap is to continue to close.

INTRODUCTION

Gender inequality is a central focus of sociological research. The gender gap in wages is of particular interest. To illustrate the primacy of the gender wage gap in sociological research, we need only consider the popularity of a few of the major works. For example, Blau and Kahn (2000), Budig and England (2001), England (1992), and Waldfogel (1997) have each been cited over 500 times.

Much of the research on the gender wage gap examines period trends, noting a narrowing of the gap since the 1970s (Blau & Kahn 2006a, 2006b; Cotter, Hermsen, & Vanneman 2004; O'Neill 2003). Other, less common research considers age trends in the gender wage gap, concluding that, as a result of motherhood penalties and time spent outside of the labor force, the gender wage gap increases with age (Budig & England 2001; Budig & Hodges 2010; Cotter et

al. 2004). Still, despite the abundance of research on the gender wage gap, important questions remain.

Most notably, the role of cohorts is under investigated. The potential for cohort variation in the gender wage gap is often acknowledged, but seldom tested. Instead, cohort differences are generally relegated to discussion sections, where researchers recognize the potentially great role cohorts may play in explaining gender wage inequality. Similarly, cohorts are often discussed descriptively, but excluded from multivariate analyses, or intercohort inequality is directly examined but restricted to certain high prestige occupations like doctors and lawyers. The exclusion of cohorts from formal models of gender wage inequality is significant for a number of reasons.

Firstly, the gender wage gap likely varies by cohort. Yet, because of the exclusion of cohort from models of gender wage inequality, the extent of the variation is unknown. While it seems plausible, and indeed likely, that gender wage inequality for more recent cohorts is less great than gender wage inequality in older cohorts, existing social science research does not offer a clear account of these variations because it fails to adequately specify multivariate models. Thus, an obvious and important question remains: to what extent are younger cohorts more equal than older cohorts?

Secondly, when cohort is excluded from models of the gender wage gap, period trends may be biased. In particular, abundant research notes a period decline in the gender wage gap. Yet, because these models do not account for cohort, it is unclear how much of this period decline is due to actual period effects and how much is due to cohort replacement. If we simultaneously model period and cohort, how has the gender wage gap changed over time?

In the research presented here, we draw data from the Currently Population Survey to examine period and cohort effects on the gender wage gap. We offer cohort specific estimates of the gender wage gap, and by simultaneously modeling age, period, and cohort, we offer a reassessment of the period trend in the gender wage gap. By separating period and cohort effects, our analysis offers a more nuanced understanding of temporal changes. Specifically, while past research clearly shows a narrowing the gender wage gap, we offer estimates of the unique role of period effects and cohort replacement in lessening gender wage inequality.

BACKGROUND

Estimating Period and Cohort Effects

For close to a century, sociologists and demographers have used age-period-cohort analysis to study time-specific phenomena. Put succinctly, age-period-cohort analysis identifies an outcome of interest (here, the phenomena of interest is the gap in wages between men and women), and then distinguishes three types of time-related variations in the outcome of interest: age effects (variation produced by the physiological or social process of aging), period effects (variations produced by events that simultaneously affect all ages), and cohort effects (variations produced by the timing of when an event was experienced such as birth or entering the labor market).

The distinction between age, period, and cohort effects are particularly important when researching the gender wage gap. We know that social processes associated with aging (e.g. motherhood or tenure) produce changes in wages. Similarly, we know that period events like the passing of federal legislation can change wage trajectories, and we know that there is potential

for wage variation by birth cohort. To fully understand temporal changes in the wage gap, we must attempt to separate the three effects.

Methodologically, age effects are integral to age-period-cohort analysis and are thusly included in our analyses. Substantively, age effects, for our purposes, are not of interest and are thusly largely excluded from our discussion. In short, while age effects are needed to properly identify period and cohort effects, because our interest is in period and cohort effects, we estimate but do not discuss age effects.

Period Effects and the Gender Wage Gap.

In general, most research on the gender wage gap has focused on period effects. Descriptively, the wage gap follows a simple pattern: between 1970 and 1990 the wage gap between men and women steadily narrowed, closing most rapidly in the 1980s; starting in the 1990s, progress stalled; the gap continued to close but at a much slower rate (Blau & Kahn 2000, 2006a, 2006b; Cotter et al. 2004; Marini 1989; O'Neill 2003).

This trend is often discussed as the result of changing times, an inevitable march toward equality, the product of period events. Clearly, there is strong theoretical reason to suspect period effects are the driving force behind the weakening wage gap. Most obviously, we can point to legal changes. Since the 1960s, the US government has passed various forms of equal employment legislation, such as the Civil Rights Act of 1964, the Equal Employment Opportunity Act of 1972, the Pregnancy Discrimination Act of 1978, the Civil Rights acts of 1991, with the intent of lessening gender discrimination. The path from legislation to a smaller wage gap is straightforward. Abundant evidence shows that discrimination plays a role in artificially depressing the wages of women (Bielby & Baron 1986; Budig & England 2001;

England et al 1988; Kilbourne et al 1994). Thus, a mechanism to reduce wage inequality is to reduce employment discrimination, and a mechanism to reduce employment discrimination is legislation. Some scholars have even suggested that legal and legislative avenues are a productive means to narrowing the wage gap (Reskin 1988). While it would be naïve to argue that equal employment legislation has eliminated gender discrimination from the workplace, it would be a worse mistake to contend that such legislation is without consequence, and thus legal changes offer strong theoretical motivation to expect period effects on the gender wage gap.

At the same time, as the federal government has offered more legal protections against gender-based discrimination, attitudes have also moved toward equality, offering an additional reason to suspect period effects. Since the 1970s, research has routinely noted increasing egalitarianism in gender attitudes (Brewster & Padavic 2000; Brooks & Bolzendahl 2004; Ferree 1974). For decades, there has been a near linear trend toward more progressive views of women working outside the home, increased support for female politicians, and less prejudiced views in general (Brewster & Padavic 2000; Brooks & Bolzendahl 2004; Cherlin & Walters 1981; Ferree 1974; Mason & Lu 1988). However, it is worth noting that Cotter and colleagues (2011) find that the move toward egalitarianism in gender attitudes stalled in the mid-1990s. Still, with attitude change we should expect new employment opportunities for women, and, consequently, period effects on the gender wage gap.

Legal changes and shifts in attitudes have the potential to help close the wage gap by increasing women's wages; recent shifts in the macro-economic structure have the potential to help close the wage gap by worsening the labor market position of men. In effect, recent period trends have the potential to close the wage gap by lowering the average male wage. Most notably, between 1970 and 1995, the manufacturing industry, home to high wages for low-skill

men, declined from 25 percent of total employment to 15 percent (Wright & Dwyer 2003). Similarly, the bargaining power and membership rolls of unions declined (Clawson & Clawson 1999). In 1954, close to 40 percent of the private sector workforce was unionized. By 2000, fewer than 10 percent were unionized (Western & Rosenfeld 2011). While the decline of unions has numerous consequences, one key consequence was a decline in wages, and because of uneven union membership rates among women and men, the weakening of unions further depressed the average male wage.

Cohort Replacement and the Gender Wage Gap

Research on the gender wage gap frequently discusses the overall trend in terms of period effects. When we consider recent changes in laws, the economic structure, the labor market, and attitudes, this is not surprising. These changes suggest the existence of strong period effects. However, attributing the narrowing of the gender wage gap to period effects may be imprudent. Instead, we must keep in mind the possible role of cohorts and cohort replacement.

In research on the gender wage gap, cohorts are usually used in one of three ways. In the first way, researchers examine period changes in the gender wage, control for an array of demographic and work related variables, and then discuss cohorts without formally including cohorts in their models. In the second way, researchers select a single birth cohort and chart the gender wage gap of that cohort over time. In the third way, researchers follow multiple cohorts within a single occupation group. All three ways are problematic. In the first, because cohort is excluded from the model, the amount of variance attributed to period effects is likely overestimated. In the second, cohort and period are confounded, making it impossible to separate cohort effects from period effects. In the third, the findings are restricted to a single occupation,

limiting the overall generalizability. The under investigation of cohorts in gender wage gap research is unfortunate. There are clear theoretical reasons to suspect cohorts are driving the closing of the gender wage gap.

Social contexts and historical circumstances vary from cohort to cohort. All birth cohorts uniquely experience social changes. More recent cohorts of women have enjoyed better educational opportunities (Buchmann, DiPrete, & McDaniel 2008), had more egalitarian personal relationships (Thornton and Young-Demarco 2001), and experienced more accommodating workplaces. Moreover, marriage patterns and fertility behavior vary by cohort. Women's control over fertility has increased with new birth control technologies (Goldin & Katz 2002), more recent cohorts of women are having fewer children (Chen & Morgan 1991), and more recent cohorts are delaying marriage (Goldstein & Kenney 2001). This is not to say that younger cohorts experience complete gender equality, but to note the potential for variation in work experiences by cohort.

Given the unique circumstances experienced by each cohort, it seems plausible that cohort replacement may play a large role in the closing of the gender wage gap. However, it is unlikely that the closing of the gender wage gap is the product of just period effects or just cohort effects. Instead, it is likely that both period effects and cohort effects play a critical role in the closing of the gender wage gap. Yet, to better understand temporal changes in the gender wage gap, we must separate period and cohort effects and determine the unique contribution of each. Thus, to fully explore the role of cohorts, we must simultaneously estimate period and cohort effects.

DATA AND METHODS

Sample

We use data from the March supplements of the Current Population Survey (CPS) from 1976 through 2010. The CPS is the most nationally representative survey of individual earnings that is conducted on an annual basis. Unlike the Panel Study of Income Dynamics, which is restricted to persons selected in a few specific years, the CPS sample is designed to be nationally representative in each survey year.

Our sample includes respondents aged 26-64 in the respective survey year who had wage or salary earnings in the prior year. The sample thus consists of wage and salary earners aged 25-64 in 1975-2009.[1] Because many respondents younger than age 25 may still be in school, their wages may not accurately reflect their later earning power. Therefore we exclude these respondents in order to reduce confounding effects due to incomplete educational attainment. Similarly, we also exclude individuals older than 65 because they are past normal retirement age. Because the labor market forces that influence income from self-owned businesses differ markedly from those impacting wage and salary income, we exclude self-employed persons and those with business income. Our final sample consists of 1,821,708 persons.

Measures

Our dependent variable is the log of the respondent's hourly wage in the year prior to survey data collection. To construct this variable, we divide total annual earnings by total

[1] As is discussed in more detail in the section on variable description, we also exclude respondents born before 1935.

number of hours worked. The latter is calculated by multiplying the usual number of hours worked by the weeks worked in the prior year.[2]

Our key independent variables are gender, age, period, and cohort. We measure each of age, period, and cohort by five-year intervals. Therefore, age is measured as age 25-29, 30-34, 35-39, etc., with the oldest group being aged 60-64. Period is measured by the time frames 1975-79, 1980-84; the most recent interval is 2005-2009. Cohort is measured by five-year intervals based on the respondent's year of birth. While some notable changes did occur earlier, employment opportunities for women did not begin to dramatically expand until the 1960s. Therefore we focus on cohorts of women whose careers were most likely to benefit from these changes: cohorts born from 1935 onward. Our oldest cohort was born in the years 1935-39; the youngest cohort was born in the years 1980-1984.

Additional independent variables include the standard set of covariates used to predict earnings, and in particular which relate to the gender wage gap, including race/ethnicity, educational attainment, marital status, and the total number of children in the household as well as the number of children under 5 years of age. We also include variables for industry and occupation based on the detailed three digit codes defined by the United States Census. The CPS does not include a variable for years of work experience.

Method of Analysis

[2] We also conduct all analyses using the log of the respondent's annual earnings in the year prior to survey data collection as the dependent variable, and restricting our analysis to persons who usually worked at least 35 hours a week for a minimum of 50 weeks during the year for which earnings are reported. Because the findings from these models are very similar to the findings that use log hourly wages, we only report the findings from log hourly wages. Results for annual wages are available from the authors upon request.

In order to decompose the gender wage gap into age, period, and cohort effects, we rely on a series of ordinary least squares regression models with log hourly wages as the dependent variable and with the unit of analysis being the individual respondent. We estimate the base gender wage gap by an indicator (0/1) variable which has a value of 1 for female respondents. Age, period, and cohort differences in the gender wage gap are estimated by a series of interaction terms between gender (female) and variables for age, period, and cohort respectively. In order to allow for the greatest flexibility in terms of age, period, and cohort effects, we model these variables in a non-parametric manner, with a 0/1 indicator variable for each of the 5 year age, period, and cohort intervals described above. One five year interval for each type of effect serving as the reference category for that effect. The reference categories are the ages 25-29, the calendar years 1975-79, and the birth cohorts 1935-39. The models also include main effects for age, period and cohort, which can be interpreted as the age, period and cohort effects for male wages. In order to ensure that our findings are nationally representative, all analyses use the probability sampling weights provided by the CPS.

We estimate a series of five models. In the first model we decompose the gender wage gap into age, period, and cohort effects, using the interaction terms described above. In the second model we add variables for basic demographic characteristics: race/ethnicity, marital status, and number of children in the household. In the third model we add variables to capture the respondent's human capital, namely education level. In the fourth and fifth models we include additional variables for occupation and industry measured at the two digit level (Model 4) and the more detailed three digit level (Model 5). Models 2 through 5 allow us to assess the proportion of the age, period, and cohort effects in Model 1, which are accounted for by the various additional covariates.

A notable criticism of analyses using age, period, and cohort categories is that the findings may be sensitive to the categories chosen. Therefore we explored the robustness of our findings by conducting additional analyses using 4 year intervals for age, period, and cohort, and by specifying varying references groups. The results are very similar to the reported models, with the same trends regarding the contribution of age, period, and cohort to the gender wage gap. Results from the alternative models are available upon request.

An alternative method sometimes used to decompose age, period, and cohort effects is a hierarchical linear model with fixed effects for age and cross-classified random effects for period and cohort. We determined that this type of modeling strategy would be inappropriate for our analysis for the following reasons. The hierarchical APC models are based on the assumption that the age, period, and cohort effects are independent of each other; the model estimation process thus forces an orthogonality constraint on these three effects. If the impact of age, period, and cohort are in fact inter-dependent, the hierarchical APC models will therefore produce invalid results. In our sample, while ages are approximately equally represented in the different time Periods (and vice versa),[3] the relationship between cohort with age and period is unbalanced. For instance, older age categories are more highly represented by earlier birth cohorts; later birth cohorts are concentrated at younger ages in the sample. In addition, older and younger cohorts are concentrated at earlier and later periods respectively. Combined with the fact that aggregate (i.e. not accounting specifically for age, period, and cohort) trends in the gender wage gap over time have been generally smooth and unidirectional, the relationship between cohort with period and age representation in the sample results in the independence of age, period, and cohort effects being a practical impossibility.

[3] Because we restrict the sample to cohorts born after 1935, there is some correlation between age and period as the early periods (before 2000) include only persons at relatively younger ages.

RESULTS

Descriptive Statistics

Figure 1 shows the average male and female log hourly wages and the gender wage gap by period and cohort. The figure shows the aggregate effects of period or cohort when the effects of the other variable is not accounted for.

FIGURE 1 HERE

The top panel of Figure 1 shows the trend in period effects. Overall, the gender wage gap declined steadily from 1975 through early 1990s before plateauing until 1999. The gender wage gap then continued to narrow, but at a slower rate. The period trend shown in the top panel of Figure 1 is consistent with past research on the gender wage gap.

The bottom panel of Figure 1 shows the average gender wage gap by cohort. The wage gap declined continuously and steeply as a function of cohort between the earliest birth year of 1935-39 and the youngest birth year of 1980-84. Each successive 5 year female cohort came closer to parity with the respective male cohort by an additional .05 in log hourly wages. The descriptive statistics reported in Figure 1 suggest notable period and cohort effects. However, because the descriptive statistics do not account for competing effects, the reliability of these trends is uncertain, demonstrating the need for multivariate analysis.

Multivariate Results

For ease of interpretation, we present only figures depicting the overall trend in the gender wage gap as estimated from the multivariate models. The full models with coefficients for all variables can be found in the appendix (Table A1). In the discussion that follows, 'unadjusted' gender wage gaps refer to estimates from Model 1, a model without demographic and employment covariates; 'adjusted' wage gaps refer to estimates from Model 5 where we include all covariates. Both the unadjusted and adjusted effects of period and cohort respectively control for the effect of age and cohort and cohort and period, respectively.

INSERT FIGURE 2 HERE

Using the estimates from Model 1 presented in Table A1, Figure 2 shows the unadjusted gender wage gap by period net of age and cohort.[4] We see that the gender wage gap narrows from 1975 to 1994, before rising slightly between 1994 and 1999 and plateauing thereafter. Changes between successive periods up until 1995 are statistically significant ($p <= .05$; see Table A2 in Appendix), but there is not a statistically significant change in the gender wage gap between 1995 and 2009.[5]

The gender wage gap by period, controlling for age and cohort and adjusted for demographic and employment characteristics, using the coefficients from Model 5, is also shown in Figure 2, and largely mirrors the unadjusted model but with a smaller gap. From Table A1, we

[4] For Figure 2, the gender wage gap is calculated as the coefficient for female (the gender wage gap in the reference period of 1975-1979) plus the interaction term for female and the respective period (the additional contribution to the gender wage gap in the specific period). Figure 1 and 3 (for cohort and age) are constructed in the same manner, using the interaction terms for female and cohort or female and age respectively.

[5] As shown in Table 1, in Model 1, each of the interaction terms for female and period are significant, indicating that the gender wage gap in each subsequent time period differs from the reference gender wage gap in 1975.

see that race, marital status, number of children in the home, educational attainment, occupation and industry together accounts for just over .1 log hourly wages of the gender wage gap and that this contribution is fairly constant over time. Depending on the specific period, these demographic and employment characteristics thus account for 25-30% of the period specific gender wage gap.[6]

Due to the fact that the gender wage gap plateaus (or rises insignificantly) after 1999, the aggregate drop in the gender wage gap of .05 log hourly wages between 1994 and 2009 shown in the top panel of Figure 1 is in fact a result of cohort replacement, changes in the age distribution of the female and male labor force, or both. Overall, while the gender wage gap narrows by .25 log annual wages between 1975 and 2009 as shown in Figure 1, less than 40% of this change (.1 log hourly wages) is actually due to the period effects shown in Figure 1. Overall, the net period effects are minimal, and the continued period decline in the gender wage gap has occurred without period effects since the mid 1990s.

INSERT FIGURE 3 HERE

Figure 3 shows the unadjusted and adjusted wage gap by cohort net of age and period. Here we see that the gender wage gap falls steeply between the 1935-39 birth cohort and the 1950-54 birth cohort. The gender wage gap continues to narrow, but at a slightly slower rate through the 1975-1979 birth cohort, and then begins to level. Changes between successive

[6] Our covariates account for a smaller portion of the period specific gender wage gap compared to results found in Blau and Kahn (2007). This may be due to the fact that we do not control for such factors as years of work experience, total number of children born or union representation. It also may be related to the fact that Blau and Kahn do not control for cohort effects in their model; therefore the unadjusted wage gap itself is measured in a completely different manner.

cohorts are statistically significant, except for differences between the 1975-79 and 1980-84 cohorts (see Table A2). The aggregate effects of cohort differences shown in the bottom panel of Figure 1 indicate that from the 1935-39 birth cohort through the 1980-84 birth cohort, the gender wage gap narrowed from approximately .55 log hourly wages to .1 log hourly wages. When period and age are controlled for, as shown in Figure 3, the gender wage gap narrows from approximately .53 log hourly wages to just under .2 log hourly wages. Therefore, most of the cohort changes in the gender wage gap remain even after age and period effects are accounted for.

The adjusted cohort gender wage gap—also depicted in Figure 3—shows that while the combined effect of the covariates accounts for nearly one third of the gender wage gap for birth cohort 1935-39, the contribution of the covariates has fallen to nearly 0 for the cohort born in 1980-1984. The unimportance of the covariates for later birth cohorts likely reflects the educational gains made by progressive cohorts of women as well as the inroads made into previously male dominated industries and occupations, particularly in professional fields. It also likely reflects the fact that the younger cohorts in the sample are only included at younger ages. Due to their younger age, they are much less likely to have children and therefore the motherhood wage gap is less likely to be relevant.

INSERT FIGURE 4 AND FIGURE 5 HERE

Figures 4 and 5 show the relationship between the unadjusted gender wage gaps from Figures 2 and 3 with male wages by period (controlling for age and cohort) and cohort

(controlling for age and period) respectively.[7] We see from Figures 4 and 5 that for both period and cohort, the pattern of the gender wage gap closely mirrors that of male wages. That is, as male wages decrease across successive cohorts or periods, the gender wage gap narrows. By contrast, when male wages increase, the gender wage gap widens.

CONCLUSION

The results from the multivariate analysis demonstrate the importance of simultaneously accounting for age, period, and cohort effects. In each case, the impact of age, period, and cohort are transformed when additional effects are accounted for. When age and cohort are controlled for, what appears to be a narrowing of the gender wage gap after 1994 is shown to be an artifact of cohort replacement effects. Because successive cohorts do experience a continuous narrowing of the gender wage gap (until the birth cohort of 1980-84), and the younger cohorts are more fully represented in later periods, what appears to be a narrowing of the gender wage gap for all women in the periods after 1994 is in fact due to the presence of additional women of younger cohorts in the labor market.

The fact that changes in the gender wage gap since the mid 1990s are due to cohort replacement has implications for our understanding of workplace inequality for women. Significant declines in the gender wage gap across periods represent changes in the labor market which benefit all women regardless of age or cohort. Such improvements appear to have stalled since the mid 1990s. The changes since then occur entirely due to the labor market experiences of young women joining the labor force, who have since surpassed men of similar cohorts in

[7] In Figures 5 and 6, the male wages are calculated by the intercept from Model 1 + the respective period or cohort coefficient. Age is set at the reference category of 25-29. For cohort findings, period is set at the reference category and vice versa.

terms of educational attainment and who have made inroads into many high paying occupations, particularly in professional occupations. Women in older age cohorts have failed to make up any further ground vis a vis the men of similar ages and cohorts.

The fact that the trends in the gender wage gap across period and cohort match so closely with trends in the male wages suggests that much of the changes in the gender wage gap is driven by male earning power rather than female wages. In particular, as the United States manufacturing base has declined since the 1970s, male wages have stagnated particularly for men without a college degree (Kalleberg 2011). Much of the narrowing of the cohort specific gender wage gap since the 1970s may be a result of this decline in male earning power. To the extent that this is the case, the lower gender wage gap for successive cohorts cannot be interpreted as true gains for women. However, women's gains in education as well as the continued decline in occupational segregation (Tomoscovic-Devey & Skaggs 2002) also likely account for a good portion of the decline in the gender wage gap across successive cohorts through 2009. As has been shown, for the youngest cohort, factors such as education, occupation and industry account for a negligible portion of the gender wage gap. Therefore any future wage gains for women are unlikely to occur as the result of cohort specific characteristics such as educational attainment and occupational selection. Rather, for the gender wage gap to decline further overall, changes would need to occur in hiring and promotion practices within occupations and industries; changes which would be more likely to have equal impact on all women in the labor force. In other words, for the gender wage gap to continue to decline, we must see a decline in the period specific gender wage gaps going forward.

References

Bielby, William T., and James N. Barron. 1986. Men and Women at Work: Sex Segregation and Statistical Discrimination. *American Journal of Sociology* 91: 759-99.

Blau, Francine D., and Lawrence M. Kahn. 2000. Gender Differences in Pay. *Journal of Economic Perspectives* 14:75-99.

_____. 2006a. The Gender Pay Gap: Going, Going,…But Not Gone. In Francine Blau, Mary Brinton, David Grusky (Eds), *The Declining Significance of Gender*. New York: Russell Sage Foundation.

_____. 2006b. The US Gender Pay Gap in the 1990s: Slowing Convergence. *Industrial and Labor Relations Review* 60:45-66.

Brewster, Karin L., and Irene Padavic. 2000. Change in Gender-Ideology, 1977-1996: The Contribution of Intracohort Change and Population Turnover." *Journal of Marriage and Family* 62:477-87.

Brooks, Clem, and Catherine Bolzendahl. 2004. The Transformation of US Gender Role Attitudes: Cohort Replacement, Social-Structural Change, and Ideological Learning. *Social Science Research* 33:106-33.

Buchmann, Claudia, Thomas A. DiPrete, and Anne McDaniel. 2008. Gender Inequalities in Education. *Annual Review of Sociology* 34:319-37.

Budig, Michelle J., and Paula England. 2001. The Wage Penalty for Motherhood. *American Sociological Review* 66:204-25.

Budig, Michelle J., and Melissa J. Hodges. 2010. Differences in Disadvantage: Variation in the Motherhood Penalty across White Women's Earnings Distribution. *American Sociological Review* 75:705-28.

Chen, Renbao, and S. Phillip Morgan. 1991. Recent Trends in the Timing of First Births in the United States. *Demography* 28:513-33.

Cherlin, Andrew, and Pamela Barnhouse Walters. 1981. Trends in United States Men's and Women's Sex-Role Attitudes: 1972 to 1978. *American Sociological Review* 46:453-60.

Clawson, Dan, and Mary Ann Clawson. 1999. What Has Happened to the US Labor Movement? Union Decline and Renewal. *Annual Review of Sociology* 25:95-119.

Cotter, David A., Joan M. Hermsen, and Reeve Vanneman. 2004. *Gender Inequality at Work*. New York: Russell Sage Foundation.

_____. 2011. The End of the Gender Revolution? Gender Role Attitudes from 1977 to

2008. *American Journal of Sociology* 117:259-89.

England, Paula. 1992. *Comparable Worth: Theories and Evidence*. New York: Aldine de Gruyter.

England, Paula, George Farkas, Barbara Stanek Kilbourne, and Thomas Dou. 1988. Explaining Occupational Sex Segregation and Wages: Findings from a Model with Fixed Effects. *American Sociological Review* 53:544-58.

Ferree, Myra Marx. 1974. A Woman for President? Changing Responses: 1958-1972. *Public Opinion Quarterly* 38:390-99.

Goldin, Claudia and Lawrence F. Katz. 2002. The Power of the Pill: Oral Contraceptives and Women's Career and Marriage Decisions. *Journal of Political Economy* 110:730-70.

Goldstein, Joshua R., and Catherine T. Kenney. 2001. Marriage Delayed or Marriage Forgone? New Cohort Forecasts of First Marriage for US Women. *American Sociological Review* 66:506-19.

Kalleberg, Arne L. 2011. *Good Jobs, Bad Jobs: The Rise of Polarized and Precarious Employment Systems in the United States, 1970s to 2000s*. New York: Russell Sage Foundation.

Kilbourne, Barbara Stanek, Paula England, George Farkas, Kurt Beron, and Dorothea Weir. 1994. Returns to Skill, Compensating Differentials, and Gender Bias: Effects of Occupational Characteristics on the Wages of White Women and Men. *American Journal of Sociology* 100:689-719.

Marini, Margaret Mooney. 1989. Sex Differences in Earnings in the United States. *Annual Review of Sociology* 15:343-80.

Mason, Karen Oppenheim, and Yu-Hsia Lu. 1988. Attitudes toward Women's Familial Roles: Changes in the United States, 197-1985. *Gender & Society* 2:39-57.

O'Neill, June. 2003. The Gender Gap in Wages, circa 2000. *American Economic Review* 94:309-14.

Reskin, Barbara F. 1988. Bringing the Men Back in: Sex Differentiation and the Devaluation of Women's Work. *Gender & Society* 2:58-81.

Thornton, Arland, and Linda Young-Demarco. 2001. Four Decades of Trends in Attitudes Toward Family Values in the United States: The 1960s through the 1990s. *Journal of Marriage and Family* 63: 1009-1037.

Tomaskovic-Devey, Donald, and Sheryl Skaggs. 2002. Sex Segregation, Labor Process Organization and Gender Earnings Inequality. *American Journal of Sociology* 108:102-

28.

Waldfogel, Jane. 1997. Understanding the "Family Gap" in Pay for Women with Children. *Journal of Economic Perspectives* 12:137-56.

Western, Bruce, and Jake Rosenfeld. 2011. Unions, Norms, and the Rise in US Wage Inequality. *American Sociological Review* 76:513-37.

Wright, Erik Olin, and Rachel E. Dwyer. 2003. The Patterns of Job Expansions in the USA: A Comparison of the 1960s and 1990s. *Socio-Economic Review* 1:289-325.

Appendix

Table A1: OLS Models of Log Hourly Wages

	Model 1		Model 2		Model 3		Model 4		Model 5	
Variables	coef	se	coef	se	coef	se	coef	se	coef	se
Female	-0.526***	(0.009)	-0.516***	(0.009)	-0.503***	(0.008)	-0.412***	(0.008)	-0.362***	(0.008)
Age 25-29	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
Age 30-34	0.124***	(0.003)	0.111***	(0.003)	0.099***	(0.003)	0.084***	(0.003)	0.080***	(0.003)
Age 35-39	0.201***	(0.004)	0.191***	(0.004)	0.171***	(0.004)	0.150***	(0.004)	0.145***	(0.004)
Age 40-44	0.227***	(0.006)	0.223***	(0.006)	0.195***	(0.005)	0.171***	(0.005)	0.166***	(0.005)
Age 45-49	0.232***	(0.007)	0.230***	(0.007)	0.200***	(0.007)	0.180***	(0.006)	0.176***	(0.006)
Age 50-54	0.211***	(0.009)	0.208***	(0.009)	0.176***	(0.008)	0.161***	(0.008)	0.162***	(0.008)
Age 55-59	0.162***	(0.011)	0.157***	(0.011)	0.124***	(0.010)	0.124***	(0.010)	0.131***	(0.009)
Age 60-64	0.101***	(0.013)	0.093***	(0.013)	0.049***	(0.012)	0.074***	(0.012)	0.090***	(0.011)
Period 1975-79	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
Period 1980-84	-0.079***	(0.004)	-0.071***	(0.004)	-0.084***	(0.004)	-0.086***	(0.003)	-0.090***	(0.003)
Period 1985-89	-0.051***	(0.005)	-0.036***	(0.005)	-0.057***	(0.004)	-0.059***	(0.004)	-0.064***	(0.004)
Period 1990-94	-0.097***	(0.006)	-0.080***	(0.006)	-0.113***	(0.005)	-0.109***	(0.005)	-0.109***	(0.005)
Period 1995-99	-0.045***	(0.008)	-0.026***	(0.007)	-0.070***	(0.007)	-0.069***	(0.007)	-0.070***	(0.006)
Period 2000-04	0.040***	(0.009)	0.061***	(0.009)	0.003	(0.008)	0.005	(0.008)	0.005	(0.008)
Period 2005-09	0.057***	(0.011)	0.077***	(0.010)	0.011	(0.010)	0.015	(0.009)	0.014	(0.009)
Cohort 1935-39	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
Cohort 1940-44	0.012**	(0.005)	0.010**	(0.004)	-0.020***	(0.004)	-0.012***	(0.004)	-0.013***	(0.004)
Cohort 1945-49	0.008	(0.005)	0.008	(0.005)	-0.062***	(0.005)	-0.044***	(0.004)	-0.042***	(0.004)
Cohort 1950-54	-0.053***	(0.006)	-0.046***	(0.006)	-0.115***	(0.006)	-0.085***	(0.005)	-0.080***	(0.005)
Cohort 1955-59	-0.104***	(0.008)	-0.089***	(0.008)	-0.135***	(0.007)	-0.101***	(0.007)	-0.095***	(0.007)
Cohort 1960-64	-0.149***	(0.009)	-0.124***	(0.009)	-0.163***	(0.009)	-0.123***	(0.008)	-0.115***	(0.008)
Cohort 1965-69	-0.166***	(0.011)	-0.129***	(0.011)	-0.183***	(0.010)	-0.137***	(0.010)	-0.128***	(0.009)
Cohort 1970-74	-0.189***	(0.013)	-0.141***	(0.012)	-0.201***	(0.012)	-0.151***	(0.011)	-0.143***	(0.011)
Cohort 1975-79	-0.243***	(0.014)	-0.179***	(0.014)	-0.231***	(0.013)	-0.182***	(0.013)	-0.171***	(0.012)
Cohort 1980-84	-0.297***	(0.016)	-0.216***	(0.016)	-0.271***	(0.015)	-0.213***	(0.014)	-0.196***	(0.014)
Female X 1975-79 Period	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
Female X 1980-84 Period	0.021***	(0.006)	0.017***	(0.006)	0.012**	(0.006)	0.008	(0.005)	0.007	(0.005)
Female X 1985-89 Period	0.055***	(0.007)	0.046***	(0.007)	0.040***	(0.007)	0.029***	(0.006)	0.028***	(0.006)
Female X 1990-94 Period	0.114***	(0.009)	0.104***	(0.009)	0.094***	(0.008)	0.078***	(0.008)	0.073***	(0.008)
Female X 1995-99 Period	0.096***	(0.011)	0.090***	(0.011)	0.078***	(0.010)	0.058***	(0.010)	0.054***	(0.009)
Female X 2000-04 Period	0.094***	(0.013)	0.091***	(0.013)	0.080***	(0.012)	0.061***	(0.011)	0.054***	(0.011)

Female X 2005-09 Period	0.089***	(0.015)	0.086***	(0.015)	0.070***	(0.014)	0.053***	(0.013)	0.046***	(0.013)
Female X 1935-39 Cohort	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
Female X 1940-44 Cohort	0.039***	(0.007)	0.039***	(0.007)	0.038***	(0.006)	0.028***	(0.006)	0.026***	(0.006)
Female X 1945-49 Cohort	0.097***	(0.008)	0.096***	(0.007)	0.100***	(0.007)	0.076***	(0.007)	0.070***	(0.006)
Female X 1950-54 Cohort	0.173***	(0.009)	0.167***	(0.009)	0.154***	(0.008)	0.120***	(0.008)	0.107***	(0.008)
Female X 1955-59 Cohort	0.216***	(0.011)	0.205***	(0.011)	0.175***	(0.010)	0.142***	(0.010)	0.123***	(0.010)
Female X 1960-64 Cohort	0.246***	(0.013)	0.231***	(0.013)	0.193***	(0.012)	0.159***	(0.012)	0.138***	(0.011)
Female X 1965-69 Cohort	0.267***	(0.016)	0.247***	(0.016)	0.208***	(0.015)	0.170***	(0.014)	0.148***	(0.013)
Female X 1970-74 Cohort	0.306***	(0.018)	0.283***	(0.018)	0.231***	(0.017)	0.194***	(0.016)	0.172***	(0.015)
Female X 1975-79 Cohort	0.338***	(0.021)	0.308***	(0.020)	0.243***	(0.019)	0.211***	(0.018)	0.188***	(0.018)
Female X 1980-84 Cohort	0.340***	(0.024)	0.303***	(0.023)	0.245***	(0.022)	0.211***	(0.021)	0.186***	(0.020)
Female X 25-29 Age	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
Female X 30-34 Age	-0.062***	(0.004)	-0.049***	(0.004)	-0.041***	(0.004)	-0.031***	(0.004)	-0.029***	(0.004)
Female X 35-39 Age	-0.108***	(0.006)	-0.091***	(0.006)	-0.076***	(0.006)	-0.062***	(0.005)	-0.056***	(0.005)
Female X 40-44 Age	-0.110***	(0.008)	-0.094***	(0.008)	-0.079***	(0.008)	-0.062***	(0.007)	-0.055***	(0.007)
Female X 45-49 Age	-0.098***	(0.011)	-0.084***	(0.010)	-0.069***	(0.010)	-0.056***	(0.009)	-0.047***	(0.009)
Female X 50-54 Age	-0.061***	(0.013)	-0.047***	(0.013)	-0.032***	(0.012)	-0.020*	(0.011)	-0.013	(0.011)
Female X 55-59 Age	-0.021	(0.016)	-0.006	(0.015)	0.011	(0.014)	0.018	(0.014)	0.020	(0.013)
Female X 60-64 Age	0.009	(0.019)	0.030	(0.019)	0.058***	(0.018)	0.052***	(0.017)	0.049***	(0.016)
Bachelor's Plus					0.496***	(0.001)	0.327***	(0.002)	0.298***	(0.002)
Some College					0.169***	(0.001)	0.103***	(0.001)	0.078***	(0.001)
Less than High School					-0.263***	(0.002)	-0.181***	(0.002)	-0.147***	(0.002)
Asian, Pacific Islander			0.022***	(0.004)	-0.044***	(0.003)	-0.006**	(0.003)	-0.013***	(0.003)
Black			-0.189***	(0.002)	-0.109***	(0.002)	-0.074***	(0.002)	-0.058***	(0.002)
Latino			-0.328***	(0.002)	-0.135***	(0.002)	-0.087***	(0.002)	-0.063***	(0.002)
Native American			-0.170***	(0.006)	-0.099***	(0.005)	-0.086***	(0.005)	-0.071***	(0.005)
Other Race			-0.045***	(0.007)	-0.097***	(0.007)	-0.057***	(0.007)	-0.057***	(0.007)
Children Under 5			0.071***	(0.002)	0.041***	(0.002)	0.041***	(0.001)	0.038***	(0.001)
Widow			-0.112***	(0.002)	-0.070***	(0.002)	-0.051***	(0.001)	-0.050***	(0.001)
Single			-0.111***	(0.002)	-0.140***	(0.002)	-0.102***	(0.002)	-0.092***	(0.002)
Professional							0.137***	(0.003)		
Farmer							-0.468***	(0.011)		
Manager							0.179***	(0.003)		
Clerical							-0.104***	(0.003)		
Craftsmen							-0.024***	(0.003)		
Operative							-0.205***	(0.003)		
Service							-0.241***	(0.003)		
Laborer							-0.267***	(0.004)		
Retail							-0.339***	(0.002)		
ind_aff							-0.262***	(0.007)		

Mining							0.147***	(0.005)		
Construction							-0.068***	(0.003)		
Transportation							0.003	(0.003)		
Telecom and Utilities							0.136***	(0.003)		
Wholesale							-0.075***	(0.003)		
FIRE							-0.017***	(0.002)		
Business Service							-0.127***	(0.003)		
Personal Service							-0.330***	(0.004)		
Recreational Service							-0.194***	(0.005)		
Prof Service							-0.176***	(0.002)		
Public Admin							0.048***	(0.002)		
Constant	2.202***	(0.006)	2.251***	(0.006)	2.184***	(0.006)	2.322***	(0.006)	2.125***	(0.010)
Observations	1,821,708		1,821,708		1,821,708		1,821,708		1,821,708	

*** p<0.01, ** p<0.05, * p<0.1

[1] Coefficients for detailed occupational and industry categories not shown for model 5

Table A2. Tests of statistical significance for the effects of the gender wage gap for log hourly wages between sequential Age, Period, and Cohort groups.

Coefficient Pair	F
Female cohort 1980-84 – female cohort 1975-79	.03
Female cohort 1975-79 – female cohort 1970-74	17.46***
Female cohort 1970-74 – female cohort 1965-69	39.75***
Female cohort 1965-69 – female cohort 1960-64	13.63***
Female cohort 1960-64 – female cohort 1955-59	34.85***
Female cohort 1955-59 – female cohort 1950-54	78.9***
Female cohort 1950-54 – female cohort 1945-49	246.05***
Female cohort 1945-49 – female cohort 1940-44	105.77***
Female cohort 1940-44 – female cohort 1935-39	See Table A1
Female Period 1975-79 – female Period 1980-84	See Table A1
Female Period 1980-84 – female Period 1985-89	36.45***
Female Period 1985-89 – female Period 1990-94	140.03***
Female Period 1990-94 – female Period 1995-99	12.98***
Female Period 1995-99 – female Period 2000-04	0.09
Female Period 2000-04 – female Period 2000-09	1.51
Female age 25-29 – female age 30-34	See Table A1
Female age 30-34 – female age 35-39	94.72***
Female age 35-39 – female age 40-44	0.13
Female age 40-44 – female age 45-49	5.26
Female age 45-49 – female age 50-54	38.86***
Female age 50-54 – female age 55-59	28.95***
Female age 55-59 – female age 60-64	7.71***

*** p<0.01, ** p<0.05, * p<0.1

Figure 1. Average Wage and Wage Gap by Period, and Cohort.

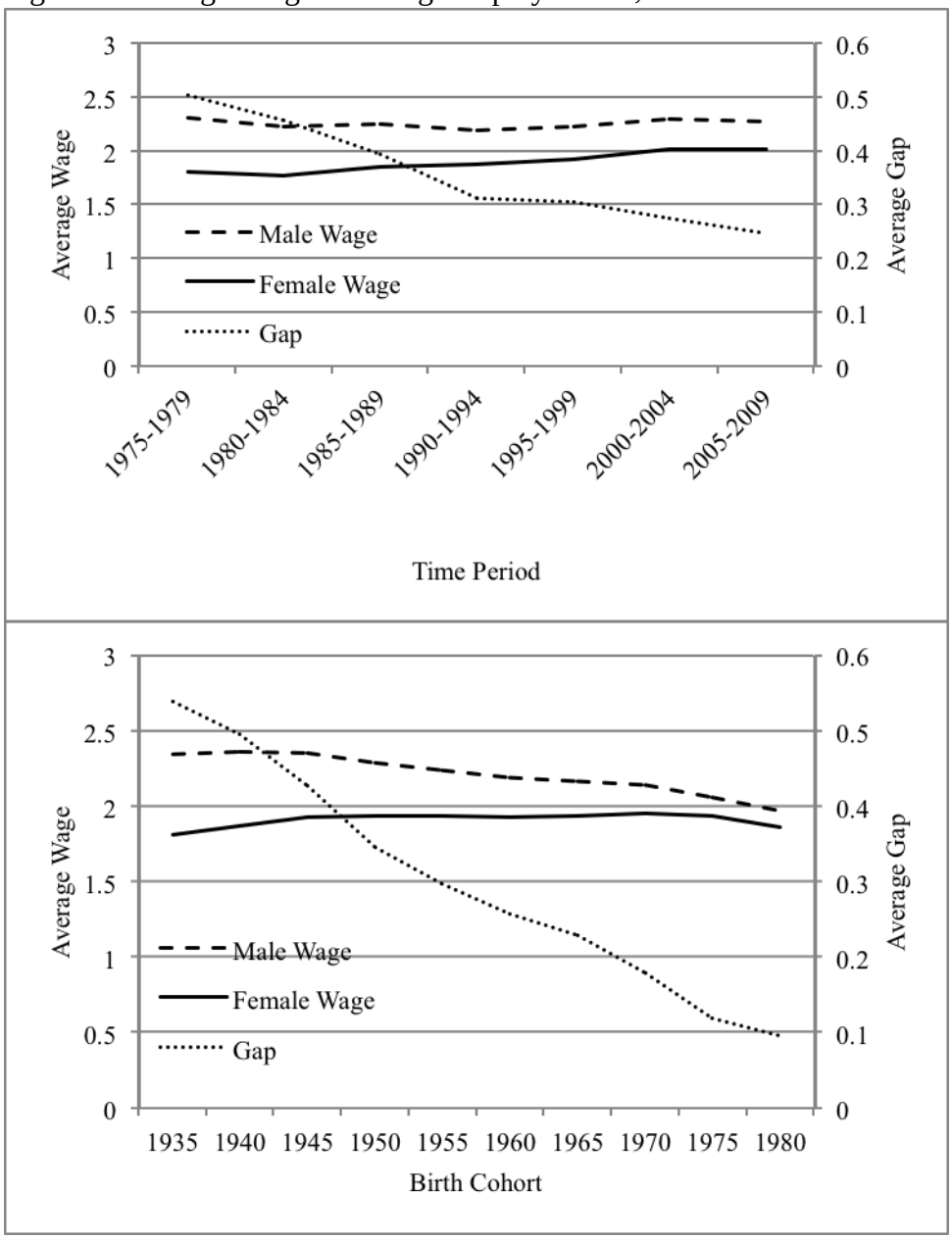

Figure 2. Estimated Gender Wage Gap in Log Hourly Wages by Time Period.

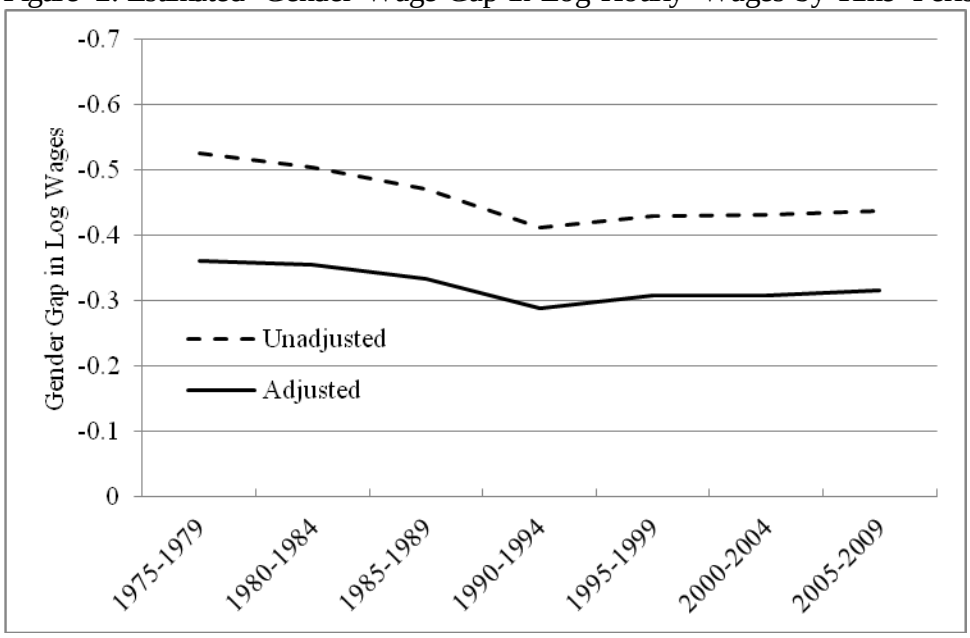

Figure 3. Estimated Gender Wage Gap in Log Hourly Wages by Cohort.

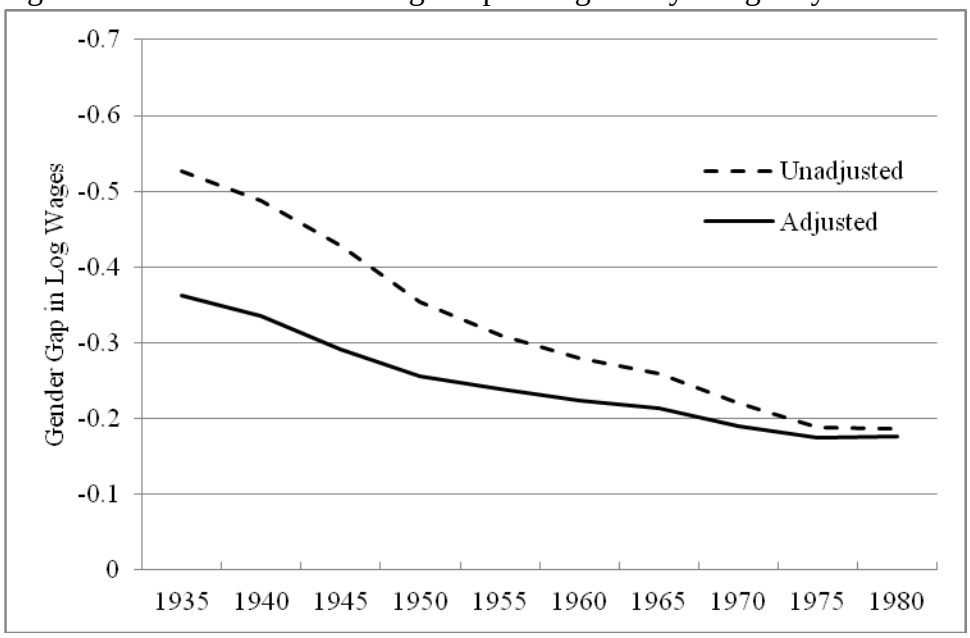

Figure 4. Gender Wage Gap and Male Wages by Period.

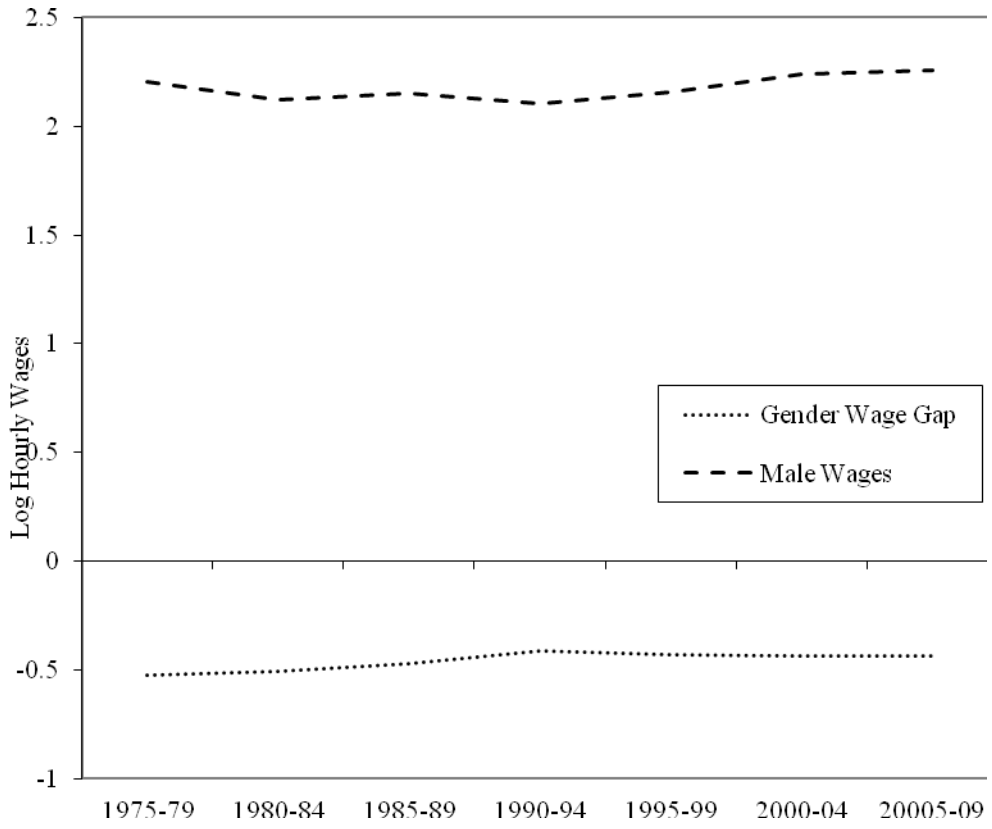

Figure 5. Gender Wage Gap and Male Wages by Cohort.