A Second Look at the Process of Occupational Feminization and Pay Reduction in Occupations[a,b]

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Abstract

Using the IPUMS-USA data for the years 1960–2015, this study examines trends in the effect of occupational feminization on occupational pay in the U.S. labor market and explores some of the mechanisms underlying these trends. The findings show that the (negative) association between occupational feminization and occupational pay level has declined, becoming insignificant in 2015. This trend, however, is reversed after education is controlled for at the individual as well as the occupational level. The two opposite trends are discussed in light of the twofold effect of education: (1) the entry of women into occupations requiring high education, and (2) the growing returns to education and to occupations with higher educational requirements. These two processes have concealed the deterioration in occupational pay following feminization. The findings underscore the significance of structural forms of gender inequality in general, and occupational devaluation in particular.

Keywords: Gender inequality, occupational devaluation, gender segregation, occupational mobility, structural discrimination

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Introduction

In recent decades researchers have devoted considerable effort to the study of long-term trends in occupational sex segregation and occupational mobility of women. Their findings underscore a decline in segregation levels, with more women entering high-status and lucrative occupations (Charles and Grusky 2004; Cotter, Hermsen, and Vanneman 2004; England 2006, 2010; Jacobs 1989; Mandel 2012, 2013; Weeden 2004). Curiously, despite the scholarly attention devoted to the decline in sex segregation, the question of how the changing gender composition of occupations affects the relative pay levels of occupations has been largely neglected within a long-term framework. Indeed, the scholarship on long-term trends in gender inequality tends to focus on the relative attainments of individual men and women, while overlooking the structural implications of men and women's changing attainments.

One notable implication of the growing occupational attainments of women in recent decades is evident in the way occupational feminization affects the pay level of occupations. Although extensive empirical researches have pointed to the negative association between the percentage of women in occupations and their rewards,[1] most of these works have focused on the causal mechanisms of the process, and not on its over-time dynamic. Their findings have shown not only that women are selected into occupations with lower average pay, but also that the entry of women into occupations may devalue the status of these occupations and reduce their average pay. Despite new methodology that has offering additional support for the negative effect of feminization on occupational pay (England, Allison, and Wu 2007; Levanon, England, and Allison 2009), we don't yet know whether this devaluation effect is in decline or strengthening over the course of time – nor do we know whether other processes that took place over recent decades affect the devaluation processes, and how.

The changing levels of education among women over-time (DiPrete and Buchmann 2013), their entry into professional occupations (Cotter et al. 2004), and the increase in returns to education and to professional occupations (Morris and Western 1999) during the last decades are all processes that could potentially affect the devaluation process. However, while the growing economic and

1 See the list of empirical studies in Levanon, England, and Allison (2009), and also the book by Reskin and Roos (1990).

occupational attainments of individual women over the past decades have been widely studied, the consequences of these changes for occupational pay have received very little empirical attention from a long-term perspective. In fact, the sweeping changes in the economic status of American women during recent decades, first and foremost their upward occupational mobility, makes this period ideal for examining how gender affects occupational pay, because the changing position of women on the occupational wage ladder is a prior condition for any possible effect of feminization on occupational pay.

In light of this lacuna, my aim in this paper is twofold: (1) to examine trends in the effect of occupational feminization on occupational pay over more than five decades, using multilevel analysis; and (2) to uncover some of the mechanisms underlying these long-term trends, especially the role of education. In order to do so, I integrate data on individuals and occupations from the U.S. Census (1960-2010) and the ACS surveys (2001-2015), and employ a multilevel analysis to control for individual as well as occupational characteristics. The findings show that occupational feminization reduces occupational pay, and that this negative effect has intensified over time. This intensification, however, is revealed only after controlling for education (at both the occupational and individual levels), because the growing educational levels of women, and the growing returns to education, are processes that run counter to and thus conceal this intensification. The findings demonstrate the interrelationship between two opposing gendered processes, and provide concrete evidence that gender stratification operates differently at the individual and structural/occupational levels.

These findings carry significant implications for understanding past and future processes of gender inequality. The imbalance between the empirical evidence of the two processes - given the dearth of long-term analyses of structural gendered processes (such as occupational devaluation), versus the abundance of long-term comparisons of the relative attainments of individual men and women - may result in an underestimation of the significance of gender as a stratifying force in our society today.

Theoretical Background

Devaluation and women occupational mobility within a long-term framework

The advancement of women in the labor market in recent decades has been widely documented by sociologists and economists using a variety of indicators. For example, women have surpassed men in overall rates of college graduation, and have almost reached parity with men in rates of doctoral and professional degrees (Cotter et al. 2004; DiPrete and Buchmann 2013). Occupational sex segregation has declined, and the pay gap between men and women has narrowed as women have gained greater access to previously male-dominated occupations, in particular managerial and high-status professional occupations (Blau and Kahn 2007; Charles and Grusky 2004; Cotter et al. 2004; Jacobs 1992; McCall 2007; Weeden 2004).

These trends, however, do not take account of social processes that contribute to maintaining gender inequality. First, while the advancement of women is evident in all fields within the long-term framework of 50 years, the decline in gender segregation and gender pay gaps has slowed since the mid-1990s (Blau and Kahn 2007; Blau, Brummund and Liu 2013; Cotter et al. 2004; England 2006, 2010; Mandel and Semyonov 2014). Second, the impressive mobility of women has not eliminated deeply rooted beliefs—termed "gender beliefs"—about the fundamental differences between men and women (Ridgeway 2011; Ridgeway and Correll 2004). These biased gender perceptions account for the lower evaluation of female-labeled occupations and consequent reduction in their social status and economic rewards (England 1992; Ridgeway 2011; Steinberg 1990). As Paula England (1992) argues, the entry of women into occupations reduces the value, and consequently the pay, of these occupations, as these occupations become more identified with women's traits and skills, which are devalued compared to men's traits and skills.

In contrast to processes of gender inequality between individual men and women in pay or in occupational attainments, the devaluation processes have received very little scholarly attention within a long-term framework. This is surprising given the extensive attention devoted to the association between the percentage of women and occupational pay, which has provided clear empirical evidence for the negative effect of percentage of women on occupational wages (e.g., Catanzarite 2003; Cohen and Huffman 2003; England, Allison, and Wu 2007; Karlin, England, and Richardson 2002; Levanon, England, and Allison 2009; Semyonov and Lewin-Epstein 1989).

Moreover, many of these studies used longitudinal data to examine the association between gender composition and occupational pay, but they used it to test the causal dynamics of this association, rather than over time changes in the effect of feminization on occupational pay. Specifically, previous studies used longitudinal data (usually two time points) to control for the causal order by regressing male wage in occupations on lagged female percentage, or vice versa. The theoretical motivation was to determine whether the former affects the latter, or vice versa.

The study by Levanon, England and Allison (2009) is an exception in its long-term framework, from 1950 to 2000. In addition to the wide spectrum, the authors used three different occupational classifications, which lead to consistent conclusions, and a method that better deals with the omitted variable bias (fixed effect). In doing so, the authors significantly improved the robustness of their findings and conclusions regarding the effects of devaluation (vs. queuing). Although their work marks an important improvement on past literature, Levanon et al. (2009) were also interested in testing the causal dynamics (devaluation vs. queuing). Their results therefore focus on comparisons between models with opposing causal orders, different statistical methods, and different occupational classifications, using longitudinal data to improve the validity of the results. No attention—theoretical or methodological—is devoted to over-time comparisons. The use of longitudinal data serves to further improve the validity of the results.

The findings of Levanon et al. (2009) provide strong evidence for the superior effect of devaluation over queuing (i.e., the effect of female percentage on occupational wage rather than vice versa), and also some evidence that this effect has intensified over time. Both are most valuable to the present study. First, because the current study does not examine the causal dynamics, the robustness of their findings makes them a strong source to lean on when examining devaluation in general, and the changing effect of devaluation in particular. Second, although are not comparable with the findings of the present study,[2] the evidence that the devaluation effect has intensified over time is valuable for developing theoretical expectations regarding the over-time trend.

[2] Levanon et al. (2009) used fixed-effects at the occupational level, while multilevel models (with data on both individuals and occupations) are used in this study. Also, because the fixed-effects model requires all occupations to appear in all decades, the analysis is based on only 164 selected occupations, relative to about 400 that are used in this study.

The study by Mandel (2013) also examines the effect of feminization on occupational pay over time, and provides evidence for an increase in the (negative) effect, first and foremost in occupations located on the upper rungs of the occupational wage structure. This evidence as well is valuable for developing theoretical expectations.[3] However, the study by Mandel, which focused on a comparison of the devaluation effects between groups of occupations, did not track the causes of this increase; rather, it controlled for all possible mechanisms in advance.

As it turns out, the two studies that examined devaluation effects within a long-term framework did not focus on the mechanisms that caused changes in the devaluation effect over-time. Furthermore, whereas we know very little about trends in the devaluation process, the findings of studies that focused on gender inequality between individuals—rather than occupations—have shown a reduction in gender segregation. This reduction is caused, first and foremost, in white-collar occupations because of an impressive entry of women into highly skilled professional and managerial occupations (Charles and Grusky 2004; Cotter et al. 2004; England 2006), a process that may affect occupational devaluation. Thus, in the next section, I develop my theoretical and empirical expectations based on the relationship between women's upward occupational mobility and the expected effect of this process on the association between gender composition and occupational pay on the one hand, and on the devaluation process on the other.

Theoretical and empirical expectations

The limited empirical evidence prevents me from forming clear expectations regarding the dynamic of the devaluation process over time. Therefore, in the following I will speculate on the relationship between the percentage of women and occupational pay, based on changes that have contributed to the advancement of women in the labor market in recent years. Two significant processes are particularly important, as both have clear implications for the effect of gender composition on occupational pay:

[3] Here again a comparison between the results is not straightforward because the study by Mandel (2013) focuses on a comparison between different groups of occupations, based on pay and feminization levels, so the effect of feminization on occupational pay is analyzed after disaggregating the samples into different groups.

1) *Changes in the gender composition of occupations* (hereafter *Compositional shifts*) between occupations, caused by the rise in women's educational attainments, a process that stimulated their entry into professional occupations in fields traditionally dominated by men (Cotter et al. 2004; DiPrete and Buchmann 2013; Weeden 2004; Mandel 2012, 2013).

2) *Increase in the returns to education*, which promoted the rise in wage inequality between workers and between occupations, especially between educated and uneducated workers and occupations (e.g., Blau and Kahn 1997, 1999; Katz and Autor 1999; Morris and Western 1999).

These two processes are expected to *mitigate* the negative association between gender composition and pay level in occupations over the course of time, for both substantive and measurement reasons. Substantively, because devaluation is anchored in employer's underestimation of traits and skills identified with femininity (England 1992) the high educational levels acquired by women in recent decades, and their entry into professional and managerial occupations, may mitigate the tendency to underestimate women and femininity. In this case, work done by women may suffer less from status devaluation and wage erosion. Also, as Goldin (2002) argued, in professional occupations, where hiring processes are based on credentialing, employers have less reason to suspect that women with verifiable and known credentials will be less productive and are thus less likely to undervalue the work of women.

The second reason relates to over-time shifts in correlation levels between the percentage of women in occupations and their pay levels. Given compositional shifts resulting from the upward occupational mobility of women, the negative correlations between the percentage of women in occupations and their pay are expected to decline over time. Figure 1 displays compositional shifts in the percentage of women across occupations in different pay levels. As can be seen, the percentage of women is highest in low-pay occupations, but the figures remained constant over the years. However, with the entry of women into the labor market, the gender composition of occupations at the mid- and high-pay levels has changed considerably, tripling from around 10% in 1960 to more than a third in 2015. With more women approaching the head of the occupational earnings queue and less women crowding at the bottom, the (negative) association between percent female and pay across occupations is expected to decline over time.

- Figure 1 around here -

On the other hand, based on the power of "gender beliefs" and the logic of devaluation theory mentioned above (England 1992; Ridgeway 2011), the occupational mobility of women may be a trigger for occupational devaluation. If female traits and the skills identified with femininity remain devalued even after their advanced educational and occupational achievements, then gender composition will remain an important determinant of how occupations are rewarded, as devaluation theory suggests. In this case— and since devaluation is expected to occur when women enter high-paid male-dominated occupations (Mandel 2013)—we would expect the negative correlations between the percentage of women in occupations and occupational pay levels to increase over-time. But for the latter process to become manifest, the opposite process of women's upward occupational mobility needs to be neutralized across time points.

To complicate matters, the rise in the premium for higher education may further contribute to concealing shifts in devaluation processes over-time. For example, suppose that a rise in the average earnings of an occupation—due to a rise in its education level, or a rise in the education premium, or both—has occurred simultaneously with feminization, which would inhibit this rise. Because the wage premium for this occupation may be greater than the wage penalty incurred as a result of its feminization, devaluation would most likely be masked. In this case, occupational feminization would not lead to an absolute wage reduction, but rather to a lower wage premium compared to similar occupations. Thus, the effect of devaluation can be revealed only when occupations with similar attributes are compared. Indeed, to ensure this comparability, all studies that measured devaluation controlled for occupational attributes, first and foremost for educational levels. When measuring *over-time trends* in occupational devaluation, the comparability issue is of particular importance. This is because - given the two processes described above - trends in the (net) effect of the percentage of women on occupational pay (i.e. devaluation) should exceed the countervailing effects mentioned above that pull the trend to the opposite direction.

On the basis of the above, two opposite expectations may be formed: on the one hand, compositional shifts in occupations can be expected to lower the association between the percentage of women in occupations and their pay over the period studied, mirroring the upward occupational mobility of women. On the other hand, if the entry of women into valued occupations deteriorates the relative pay of these occupations, as devaluation theory suggests, then the association can be expected to increase after controlling for education. Thus, the analyses that follow will be conducted in stages; with and without the effect of education at both the individual and occupational level, in order to address the conflicting forces, and to empirically track after the scenario described above.

Data and Methods

Data

The empirical analysis is based on U.S. Census data for 1960-2000,[4] and the 2010 and 2015 American Community Survey (ACS) datasets.[5] All data are harmonized and distributed by the Integrated Public Use Microdata Series (IPUMS; Ruggles et al. 2010). A major advantage of the census data is the sample sizes, a critical factor for studies with occupations at center stage. The large samples at the individual level make aggregation to the occupation level possible, even for the three-digit occupational classification.[6] After selection for age and labor market participation, the average number of cases in an occupation varies from more than 2,100 in the smallest sample (1960) to more than 13,500 in the largest (2000). Effective sample sizes of both occupations and individuals appear in Appendix 1.[7]

Variables

The analysis includes variables at individual and occupational level. The dependent variable is at the individual level: pretax wage and salary income for the year prior to the survey, divided by the number of weeks the individual worked in that year, and by the number of hours per week that the

[4] I used the 5% sample censuses of 1980 through 2000 and the 1% censuses of 1960 through 1970.

[5] In the dynamic analysis (where OCC1990 is used) the 2009, 2010 and 2011 ACS data files are combined to enlarge the sample (hereafter 2010). In Appendix 2, all post-2000 years were analyzed to validate the consistency of the trend.

[6] The census data have drawbacks of inconsistency between the earnings variable (measured for the prior year), and the variables of hours and occupations (measured for the current year). This may affect the results because women, more than men, tend to change occupations. However, this potential bias should randomly affect all Census years, so the over-time trend – which is the main focus of this paper – is likely to be preserved.

[7] Occupations with less than 30 workers were selected out.

respondent usually worked.[8] This variable is adjusted for inflation and converted to natural logarithms. When this variable is aggregated to the occupational level, it represents the average logged hourly wage in occupations. Gender is coded 1 for female and 0 for male. When this variable is aggregated to the occupational level, it measures the proportion of females in an occupation. Other independent variables at the individual level—education and potential work experience—are used as controls. Education levels are measured by the highest educational attainment based on three groups: college graduate (at least 4 years of college); some college (1-3 years); and high school (high school diploma or lower), as the omitted category. Potential work experience is calculated by subtracting years of education from an individual's age and then subtracting 6, the school starting age.[9]

Characteristics of the occupations are computed by aggregating relevant variables using the IPUMS variable OCC, which reports an individual's primary occupation. Since the analysis is separated by year, I prefer to use the actual occupational coding scheme in each year (OCC), instead of the standardized coding schemes offered by IPUMS, because doing so minimizes the selection bias of occupations. Indeed, under this classification the samples of occupations are the largest. To rule out the possibility that the results are affected by occupational classifications, I recalculate the analyses based on three other classifications; the first two are the standardized OCC1990 and OCC1950, based on the 1990 and 1950 classifications, respectively, which offer a consistent classification across all decades. In the dynamic models—which require standardized coding for all decades—I use the OCC1990 classification and recalculate the analysis by the OCC1950 classification in order to validate the results. The third is occupation-by-industry categories, computed by the detailed (3 digit) OCC variable with broad (1 digit) industry categories (see also Levanon et al. 2009).

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[8] Given the absence of "usual working time" in the data for 1960 and 1970, I use the total number of hours the respondent worked during the previous week instead. Since the variable is given in intervals, I used the middle of the category.

[9] The measure of "potential work experience" (age-education-6) assumes continuous work experience post education, an assumption that is more problematic for women. To check for a potential bias of this measure, I tested the robustness of this measure using an alternative measure by the variable 'number of years the respondent has worked in his/her current job' from the MORG subsample of the biennial January 'Job Tenure Supplement' (years 2000-2012). Although the correlations between the two measures are stronger among men, differences between the gender groups remain relatively stable across the years, so this gap is not expected to affect the over-time trend.

The percentage of women in an occupation is the key independent variable in the study. To examine the mechanisms described at the outset, the most important control variable is the education level of each occupation, which is calculated according to the percentage of workers who are college graduates; the percentage of workers with some college education; and, lastly, the percentage of workers with a high school diploma or less (the omitted category). The average years of work experience in occupations is also introduced as a control at the occupation level.[10] Appendix 1 presents descriptive statistics for the variables used in the analysis.

Analytical strategy

In order to examine whether female representation is associated with lower pay in occupations, and to trace the mechanisms involved in this process, the average hourly earnings in occupations is regressed on the percentage of women in separate regressions, by decades. In the first stage of the analysis, the raw effects are presented by period in order to document the long-term trends. As elaborated in the theoretical section, I expect that the bivariate association between gender composition and occupational pay will weaken over time, reflecting the occupational mobility of women.

The next stage of the analysis aims to differentiate between the mechanisms that affect the association between gender composition and occupational pay over time. Although this association is at the occupational level, it could also be affected by mechanisms that operate at different levels: on the one hand, women's (individual) upward mobility—that is, women's growing representation in the upper segments of the occupational wage structure—and, on the other hand, women's (collective) effect on occupations—that is, the effect of feminization on pay levels in occupations. As expected, these two mechanisms have conflicting consequences for the association between gender composition and occupational pay and, therefore, each mechanism might conceal the over-time trend of the other. Thus, at the second stage of the analysis, I intend to implement multilevel

[10] I also controlled for "percentage of unemployed in an occupation" as an indicator for demand and supply of workers, which is relevant to both women's odds of being hired in an occupation and occupational pay levels. The coefficients were not significant across all decades, and their inclusion in the regressions did not change the coefficients of percentage of women. Therefore, I did not include this model.

modeling that incorporates individual and occupational attributes (Bryk and Raudenbush 1992; Kreft and Leeuw 1998).

To accomplish this, I first separate the gender effect—women's lower pay relative to men *within occupations*—from the effect of gender composition on occupational pay. Because devaluation is expected to reduce the wage levels of all workers, and in order to estimate the effect of gender composition on occupational wages above and beyond the lower pay of women as individuals, I adopt the method used in most studies and estimate the effect of gender composition on *male* wages in occupations (Catanzarite 2003: p. 19).[11] It should be noted, however, that this model assumes that the devaluation effect is similar for men and women. Therefore, a subsequent analysis tests this assumption by measuring the effect of female percentage on occupational pay, for men and women separately.

Second, in the multilevel analysis, I control for variables at both the individual and occupational levels, first and foremost education. If the effect is aggravated only after, but not before, controlling for individual and occupational attributes this may imply that conflicting mechanisms are indeed operating simultaneously. It is important to note that introducing controls (even at both levels) may only partly —and not sufficiently —eliminate the influence of the conflicting mechanisms described above (i.e. upward occupational mobility, and an increased returns to education), as occupational categories in the data are not always sufficiently detailed (even though I have used the most detailed classification available in these files). Therefore my results may underestimate, rather than overestimate, the opposing trends.

Third, in order to strengthen the results, I also employ a dynamic multilevel analysis that examines the *changes* that occurred between two subsequent decades (see equation 3a below). The use of a dynamic analysis not only allows for validating the results, but also further reduces the risk of omitted variable bias, as described in the following section.

Methodology

The analysis is based on a set of multilevel models, in which the dependent variable is an individual's logged hourly wage, and both individual- and occupational-level variables serve as independent

[11] In the multilevel model, this is accomplished by explaining the intercept (male=0) after introducing the gender covariate into the equation. See also in Bryk and Raudenbush (1992).

variables. This setup makes it possible to model the effects of gender composition on occupational pay, net of the effects of both individual- and occupational-level variables. The two-level model is formally defined by the sets of equations below. A separate model is fitted for each time period. The within-occupation equation models wages as a function of individual characteristics:

(1) $Y_{ij}=\beta_{0j}+\beta_{1j}Female_{ij}+\beta_2 X_{2ij}...+\beta_k X_{kij}+r_{ij}$,

where the dependent variable Y_{ij} is the log hourly earnings of person i in occupation j; β_{0j} is the intercept (i.e., the average pay) for occupation j; and β_{1j} (Female) denotes the effect of gender (i.e., the average earnings gap between women and men) in occupation j. X_{2ij} through X_{kij} are the individual-level control variables (education and work experience, respectively), each centered around its grand mean (by year). β_2 through β_k are the corresponding regression coefficients (see the rationale for centering in Bryk and Raudenbush 1992; Kreft and Leeuw 1998). The error term r_{ij} is assumed to be normally distributed with mean zero and variance σ^2.

The individual-level variables can be modeled as having either random or stable effects across occupations. The current model allows both the intercept β_{0j} and the gender coefficient β_{1j} to vary across occupations (random effects), while the effects of the individual-level control variables are constrained to be the same across occupations. Equation (2) below indicates the random effect of gender (β_{1j}) across occupations, but β_{1j} is not at the focus of this analysis.

(2) $\beta_{1j}=\gamma_{10}+u_{1j}$

My aim is to explain the distribution of β_{0j} across occupations by occupational-level variables, as shown in Equations (3) and (3a) below:

(3) $\beta_{0j}=\gamma_{00}+\gamma_{01}(\text{proportion female})_j+\gamma_{02}Z_{2j}....+\gamma_{0p}Z_{pj}+u_{0j}$

In Equation (3), the dependent variable β_{0j} (i.e., the intercept in Equation (1) above) represents the average earnings of males (who are coded 0) in occupation j, when all individual level variables, other than gender, are set to their mean. γ_{01} (proportion of females in an occupation) is the main covariate, and $\gamma_{02}Z_{2j}....+\gamma_{0p}Z_{pj}$ are occupational-level control variables, centered around their grand mean. A negative sign for γ_{01} would indicate that the average earnings of males in an occupation decreases with an increase in female proportion.

Although it controls for both individual and occupational attributes, the model above is limited in its ability to control for unobserved characteristics that may change over time.[12] To reduce the risk of omitted variables I therefore also use dynamic models that estimate the dynamic effect of changes in gender composition on changes in male earnings. As presented in Equation (3a) below, in these models male earnings in occupations are regressed on changes in their gender composition, using the lagged dependent variable as an additional regressor:

(3a) $\beta_{0j}=\gamma_{00}+\gamma_{01}\Delta(\text{female proportion})_j+\gamma_{02}(\text{lagged male-earnings})_j+\gamma_{03}(\text{lagged female proportion})_j+\gamma_{04}\,\Delta(Z)_{j......}+\gamma_{0k}\,\Delta(Z)_j+u_{0j}$

In this equation, Δ(female proportion) refers to the absolute change in the proportion of women between decades. Other occupational-level controls are also computed in terms of the absolute changes between decades. In addition, the model controls for lagged female proportion. Because lagged male earnings is added as an additional control, the dependent variable in this equation is interpreted in terms of changes in the average earnings of males in occupations between T_1 and T_2 (i.e. the average male earnings in an occupation at T_2, while T_1 is held constant). The use of a lagged dependent variable model reduces the risk of omitted variable bias because, in this case, intervening factors should be related to *changes* in both variables. Indeed, this technique has been adopted by most studies (Baron and Newman 1989; Catanzarite 2003; England, Allison, and Wu 2007; Karlin, England, and Richardson 2002; Levanon, England, and Allison 2009; Pfeffer and Davis-Blake 1987; Snyder and Hudis 1976).[13] The advantage of using a multilevel analysis with a lagged dependent variable model, as in this study, is that, in addition to controlling for the unmeasured characteristics of occupations, this method controls for individual-level characteristics.

[12] For example, suppose that returns accrue to particular unobserved skill (e.g., leadership skills such as assertiveness), and that men are overrepresented in occupations that demand such skills. In this case, the increase in the effect of female percentage on occupational pay may be affected by the increased returns to assertiveness.

[13] Recently, England et al. (2007) and Levanon et al. (2009) used a fixed-effects model with a lagged dependent variable model to further control for omitted variables.

Findings

The association between feminization and pay in occupations

Table 1 displays the results of the multilevel regressions. In Model 1 the only covariate at the individual level is gender (β_{1j}), added to separate the gender effect from the intercept. Thus the intercept in this model represents the average wage *of males* (who are coded 0) in occupations (rather than the average pay of all workers). With no other controls at either the individual or occupational levels, the model, in fact, examines the correlation between female percentage and the average pay of males in occupations (γ_{01}). In Figure 2—which provides a visual comparison of the coefficients presented in Table 1—the gray line represents this correlation across decades. The results confirm the findings of previous studies; in all decades, higher proportions of females in occupations are negatively associated with the average earnings of males in occupations.

--Table 1 and Figure 2 about here--

When the association between female proportion and the average earnings of males in occupations is compared across decades, it becomes evident that this association is in decline. As graphically illustrated in Figure 2; from 1960 to 1980, the correlation was relatively stable, but it dropped considerably during the 1980s and 1990s, from -0.30 to -0.10, a two-thirds reduction in only 20 years. The decline continued in the 2000s and by 2010 the correlation became even lower, and for the first time, insignificant (-0.07), and it remained so in 2015. As noted at the outset, it was precisely during this period that American women witnessed a significant improvement in their occupational standing, with more women acquiring high education and entering professional and managerial occupations (Cotter et al. 2004; Jacobs 1992; Mandel 2012, 2013). Furthermore, during those decades not only did women enter professional and managerial occupations (i.e. occupations with a high educational level), but these very occupations enjoyed a large wage premium (Blau and Kahn 2007; Goldin 2002; Katz and Autor 1999; Morris and Western 1999).

To illustrate this empirically, Figure 3 juxtaposes the two processes using the Census and the ACS data, and confirms the findings of previous studies. The four colored lines display the increase in the proportions of women (solid lines) and men (broken lines) in professional and managerial (hereafter PM) occupations, and also in professional and managerial occupations with at least 50% college graduate workers. As shown, the proportion of both men and women in these occupations has risen considerably, mirroring the increase in the relative size of these occupations during the last 50 years. However, this increase has been much larger for women than for men. Whereas in 1960 the proportion of men in PM was slightly higher than that of women (0.16 vs. 0.18, respectively), from 1980 onward the proportion of women in PM occupations has exceeded that of men and the gap has gradually widened until 2015 (0.42 vs. 0.31, respectively). In PM occupations with at least 50% college graduate workers, the proportion among both sexes is smaller, but the trend and the gap between the sexes remains the same.

-- Figure 3 about here--

As for the second process, the bold black line (scale at the right of Figure 3) displays the wage premium for education, by the net coefficients of 'percent college graduates in occupations' from a multilevel wage regression. Again, the figure shows a constant increase in the premium for occupations with a high proportion of college graduates during the entire period, which sharpened during the 2000s. As noted above, I suggest that the two processes displayed in the figure may be responsible for the decline in the (negative) bivariate association between female percentage in occupations and their average pay. I have also suggested that if this is the case then the role of education may conceal the trend in the devaluation process. In the following analysis, I test this assertion by adding education and experience, to the models.

Multilevel analysis: static models

In Models 2 and 3 of Table 1 (also graphically presented in Figure 2), controls at both the individual and occupational levels are added; first for education and second for potential work experience. Model 2 controls for education at the individual level by means of two dummy variables: college graduate (=1) and some years of college (=1) (the omitted category is a high school diploma or lower). At the occupational level, Model 2 controls for the percentage of college-graduate workers and the percentage of workers with some years of college. Model 3 adds potential work experience at both levels: years of work experience and average work experience in an occupation.

Model 2 shows, as expected, that occupations with a high percentage of college-graduate workers or partially college-educated workers are better rewarded, above and beyond the education premium enjoyed by individuals working in those occupations. Also, occupational rewards for college graduation have risen consistently since 1980, findings that are already shown in Figure 3 and are consistent with others' research (e.g., Blau and Kahn 1997, 1999; Katz and Autor 1999). As with education, occupations with higher levels of work experience are better rewarded, above and beyond the premium for individual work experience (model 3), but the effect is quite stable from 1990.

More importantly, controlling for the levels of education and experience of both individuals and occupations reverses the over-time trend observed in Model 1 above, as indicated by the divergent directions of the trends in Model 1 versus Models 2 and 3 (see also Figure 2). When education and experience are controlled for, the negative effect of female percentage on the average wage of males in occupations is reduced during the 1960s, but resurges during the 1970s. During the 1980s and 1990s, the effect remains relatively stable, counterbalancing the noticeable reduction in the gross effect. From 2000 to 2010, the negative effect of female percentage on the male wage in an occupation intensifies greatly, from -0.35 log wage to -0.45 in only one decade, further intensifying until 2015 (-0.49).

Because the increase in the magnitude of the effect during the 2000s is so pronounced, and in order to verify that the trend in not affected by the data,[14] I collected the separate files of the ACS from 2000 until 2015 and recalculated Model 1 and Model 3 by year. The findings, presented in Appendix 2, validate the trend—that is, the increase in the magnitude of the effect is evident over the years. Similarly, the decline in the association (Model 1) has also gradually continued post 2000. In order to further confirm the robustness of the results, and to rule out the possibility that they are affected by occupational selection or occupational coding, I also calculated the analysis in Table 1 using three different occupational classifications: the two standardized occupational coding schemes, OCC1950 and OCC1990 (see variable descriptions above), and the occupation-by-industry categories. The results are quite similar under all three classifications. Appendix 3 displays the over-time trend in the effect of female percentage on occupational pay presented in Table 1 and Figure 2 using the alternative classifications.

[14] The ACS and the Census data are not perfectly comparable; in the latter earnings refers to the earnings of the previous calendar year, while in the former earnings refers to the past 12 months.

Disaggregation by gender

The multilevel models test the devaluation effect on the average pay of men (coded 0) because the average pay of all workers in occupations may be affected not solely by devaluation but also by the lower pay of women (as individuals) within occupations (which is neutralized in the model by adding the gender coefficient β_{1j}). Also, as a structural theory, devaluation emphasizes the consequences of compositional effects (i.e. changes in the gender composition of occupations) for occupational rewards, regardless of an incumbent's specific characteristics. Although this theory does not deal with the different consequences for different groups explicitly, it is reasonable to assume that the devaluation effect would also affect the average pay of women in occupations, although not necessarily as much. As Mandel (2013) showed, the devaluation effect is most significant in highly paid occupations, especially in highly paid male-dominated occupations. Following this, I expect the effect of feminization on the average pay of females in occupations to be less pronounced than the effect shown above (on the average pay of males in occupations).

To that end, I disaggregated the sample by gender and reconstructed the analyses shown in Table 1 for men and women separately. The results are shown in Table 2 and presented graphically in Figure 4. In general, the findings exhibit a pattern similar to the one observed before: in both samples, the association between gender composition and occupational pay declines over time without controls, and increases over time when controls are added. The magnitude of the effects, however, differs between the samples. Starting with Model 1, a sharp decline in the negative association between the percentage of women and occupational pay is evident in both samples, but it is less pronounced in the male than in the female sample until 1980, and it is more pronounced in the male sample from 1980 onward. This finding supports the findings cited above regarding the upward occupational mobility of women. Because women have increased their numbers in highly paid male-dominated occupations, and because this trend intensified after 1980, this change is more pronounced in the male than in the female sample from 1980. Models 2-3 show that the magnitude of the devaluation effect, as well as its change over time, is somewhat more pronounced in the male sample, although this may vary by decade. For example, while the change during the 2000s is large in both samples, it is greater in the male sample. This again could be an indication that devaluation is more costly for higher paid positions, where the representation of men is higher.

--Table 2 and Figure 4 about here--

To sum up the findings so far, the continuous *decline* in the association between gender composition and occupational pay from 1980 to 2010, when individual and occupational attributes are *not* controlled for, is reversed when those attributes *are* controlled for. This devaluation effect is evident on male as well as female average wage in occupations, and the trends are similar for both groups. As suggested at the outset, the divergent trends imply that the process of devaluation has intensified over time, a structural process that indicates an increasing gender inequality. This process opposed other processes that occurred during the same period, and indicates a decline in gender inequality. Education is the most important control covariate, and its effect is twofold; it controls for the growing educational levels of women as individuals (DiPrete and Buchmann 2013), as well as their entry into occupations with high educational levels (such as professionals and managers) (Cotter et al. 2004; Mandel 2012; 2013; Weeden 2004).

In order to examine the process of devaluation further and more explicitly, the next analysis tests the process dynamically. Whereas the method used in Table 1 compares cross-sectional effects at different points in time (controlling for education and experience alone), the following analysis uses a lagged dependent variable model which largely reduces the risk of unobserved omitted variable bias (e.g., Finkel 1995; Keele and Kelly 2006). Also, and no less importantly, the dynamic analysis, which tests the effect of *change* in gender composition on *change* in male wages, explicitly tracks the implications of devaluation as a dynamic process whereby occupational pay is reduced *as a result of* women's entry.

Multilevel analysis: dynamic models

The dynamic models that follow distinguish between two mechanisms that may explain the gender effect: the effect of the previous proportion of women, and the effect of changes in the proportion of women. The latter could indicate that the wage penalty is the result of women's entry into occupations, as devaluation implies. As explained in the methods section, the dependent variable in the new models—the change in the average hourly wage of males in occupations—is constructed by adding the lagged average hourly male wage in occupations as an additional regressor at the second level.

Table 3 displays the results of the dynamic regressions, while Figure 5 provides a visual comparison of the effect of change in female percentage across decades. Model 1 examines the effects of change in female percentage and lagged female percentage (the female percentage in the previous decade) on change in the average pay of males in occupations, with individual-level controls. Because dynamic models control for omitted variables by nature (Finkel 1995; Keele and Kelly 2006), Model 1 (with no controls) is very similar to Models 2 and 3 (with controls). Models 2 and 3 add the following controls for both education and work experience at the occupational level: changes in the percentage of college graduates; changes in the percentage of workers with some years of college; and changes in the average years of work experience.

--Table 3 and Figure 5 about here--

The findings, again, show a consistent increase in the (negative) magnitude of the effect of change in female percentage on change in the average earnings of males in occupations. That is, the wage penalty associated with occupational feminization intensified over the period studied. These findings are even stronger than the findings in the static models: the negative effect of feminization is consistently aggravated, from no effect during the 1960s to -0.71 (Model 2) and -0.70 (Model 3) between 2010 and 2015. Except in 2000, the coefficients of female proportion are hardly affected by whether or not occupational-level characteristics are controlled for, which supports the effectiveness of the lagged dependent variable model for reducing the risk of spurious association via omitted variable bias (Finkel 1995; Keele and Kelly 2006). Also, omitting the lagged female percentage from the model has very little impact on the effect of feminization (results not shown).

Discussion and Conclusions

Is the significance of gender in decline? In this paper, I attend to this question by focusing on long-term trends in the association between the percentage of women in occupations and their pay. My findings indicate that there are opposite answers to this question, depending on the way we conceptualize, and consequently examine, gender inequality in the labor market.

As previous studies have shown, when the educational, occupational, and earnings attainments of men and women are compared over time, gender inequality, according to almost every economic criterion, is indeed shrinking. In recent decades, and especially from 1980 onward, a growing number of American women have approached the head of the occupational earnings queue (Cotter et al. 2004; Mandel 2012; 2013; Weeden 2004). This shift has been fueled by women's growing educational attainments (DiPrete and Buchmann 2013) and, together with the rising returns to education, has greatly contributed to the decline in gender wage gaps (Blau and Kahn 1999; Katz and Autor 1999; Morris and Western 1999).

Based on these changes, as the findings Indeed show, the negative association between female percentage in occupations and their pay levels declines over time. This decline is most apparent from 1980 onward (see Figure 3), a period in which American women witnessed a significant improvement in their occupational standing (Cotter et al. 2004; Mandel 2012; 2013; Weeden 2004), and also period when occupations requiring higher education enjoyed a large wage premium (Blau and Kahn 2007; Goldin 2002; Katz and Autor 1999; Morris and Western 1999; see Figure 3).

However, when intervening variables are controlled for, the trend is reversed; the negative net effect of female percentage on occupational pay intensifies over time. This is true in the static analysis, when levels of education and work experience are controlled for at the individual and occupational levels, and also in the dynamic analysis, which uses a lagged dependent variable model to further reduce the risk of omitted variable bias. These two opposite processes reflect the upward occupational mobility of women, on the one hand, and its gendered consequences, on the other hand.

Education plays a major and twofold role in explaining the divergent trends. Both the entry of women into occupations requiring higher education, and the growing return to education and to occupations with higher educational requirements (Figure 3) may cover the trend in the devaluation effects as they both contribute to weakening the correlation between the percentage of women and pay across occupations over the course of time. In other words, the increase in the magnitude of the devaluation effect took place simultaneously with two processes that "pull" the correlation in the opposite direction. Thus, for tracking shifts in occupational devaluation over-time, one should bear in mind that feminization would not necessarily cause a reduction in the average pay of an occupation, but a smaller wage premium relative to comparable occupations.

The split between the individual and occupational forms of gender in/equality and the divergent trend of each are crucial for gender inequality in theory as well as in practice. This is because structural mechanisms are not directed at any specific individual and thus are more ambiguous and more difficult to track empirically (Peterson and Saporta 2004). The danger in occupational devaluation is therefore that the importance of gender as a determinant of economic inequality in the labor market will be less visible, less amenable to empirical assessment, and not sufficiently acknowledged.

The findings also have significant implications for theories of devaluation, as they highlight the interrelationship between gendered processes at the individual and occupational levels. While women's entry into professional and managerial occupations in recent decades is an explicit sign of a decline in gender inequality at the individual level, the consequences of this entry are likely to be reflected at the structural level by occupational devaluation. Feminists would claim that this is because the wage hierarchies of occupations, like the wage hierarchies of jobs in organizations, are gendered; i.e., they both affect and are affected by gender composition (Acker 1988, 1990; Andes 1992; Crompton 1989, 2001; England 1992; Mann 1986; Ridgeway 1997). Thus, as long as females and femininity remain undervalued in society, female jobs and activities will also be undervalued and thus under-rewarded in the labor market. Although feminists repeatedly highlight the existence of gender beliefs and their discriminative consequences, their insights have not fully penetrated into comparative empirical research.

The findings of this paper paint a less optimistic picture of the extent to which American women have succeeded in overcoming discrimination and approaching wage parity with men, casting a different light on the assessment of the declining significance of gender. The findings also raise several questions that should be on the scholarly agenda: Why is devaluation increasing? Is the rising discrimination against occupations following women's entry a reaction to the opposite trend of declining discrimination against women as individual workers? What specific factors account for this trend? These questions cannot be answered using only six points in time. In order to follow devaluation processes more closely, possible changes over time—such as changes in the nature of occupations, in their skills and demands, as well as the relation of these changes to occupational feminization—should be further examined and specified. By having payed heed to this process and uncovered some of the mechanisms that affect it, this paper will hopefully encourage others to further examine this trend and develop explanations for it.

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Table 1: Hierarchical Linear Regression on Logged Hourly Wage

Model 1							
Year	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Intercept (γ00)	2.68**	2.92**	2.91**	2.81**	2.79**	2.76**	2.73**
Female (β1)	-0.26**	-0.31**	-0.33**	-0.25**	-0.18**	-0.15**	-0.14**
Occupation Level							
Proportion female (γ01)	-0.35**	-0.26**	-0.30**	-0.20**	-0.10**	-0.07	-0.08
Variance Components							
Level 1 variance (σe^2)	0.29	0.30	0.31	0.27	0.29	0.29	0.31
Intercept ($\sigma u0^2$)	0.10	0.08	0.05	0.07	0.08	0.13	0.14
Female slope variance ($\sigma u1^2$)	0.03	0.02	0.01	0.01	0.01	0.01	0.01
Model 2							
Year	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Intercept (γ00)	2.64**	2.88**	2.93**	2.88**	2.91**	2.97**	2.95**
Female (β1)	-0.25**	-0.30**	-0.32**	-0.23**	-0.17**	-0.15**	-0.14**
Some college	0.08**	0.07**	0.05**	0.09**	0.09**	0.08**	0.06**
College graduate	0.20**	0.24**	0.19**	0.29**	0.28**	0.28**	0.28**
Occupation Level							
Proportion female (γ01)	-0.37**	-0.29**	-0.37**	-0.38**	-0.38**	-0.49**	-0.54**
Proportion some college	0.67**	0.75**	0.46**	0.52**	0.69**	0.81**	0.80**
Proportion College graduate	0.29**	0.38**	0.34**	0.50**	0.61**	0.90**	0.98**
Variance Components							
Level 1 variance (σe^2)	0.28	0.29	0.31	0.27	0.28	0.28	0.30
Intercept ($\sigma u0^2$)	0.07	0.04	0.03	0.03	0.02	0.03	0.04
Female slope variance ($\sigma u1^2$)	0.03	0.02	0.01	0.01	0.01	0.01	0.01
Model 3							
Year	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Intercept (γ00)	2.65**	2.87**	2.96**	2.91**	2.92**	2.97**	2.95**
Female (β1)	-0.26**	-0.3**	-0.31**	-0.23**	-0.17**	-0.15**	-0.15**
Some college	0.09**	0.09**	0.09**	0.13**	0.11**	0.11**	0.10**
College graduate	0.21**	0.26**	0.25**	0.35**	0.33**	0.35**	0.36**
Potential work experience	0.002**	0.003**	0.01**	0.01**	0.01**	0.01**	0.01**
Occupation Level							
Proportion female (γ01)	-0.37**	-0.29**	-0.36**	-0.37**	-0.35**	-0.45**	-0.49**
Proportion some college	0.73**	0.71**	0.6**	0.63**	0.71**	0.86**	0.86**
Proportion College graduate	0.30**	0.36**	0.39**	0.50**	0.61**	0.92**	1.01**
Mean potential work experience	0.001	-0.003	0.01**	0.02**	0.02**	0.02**	0.02**
Variance Components							
Level 1 variance (σe^2)	0.28	0.29	0.31	0.26	0.27	0.27	0.29
Intercept ($\sigma u0^2$)	0.07	0.04	0.03	0.02	0.02	0.03	0.03
Female slope variance ($\sigma u1^2$)	0.03	0.02	0.01	0.01	0.01	0.01	0.01

*All variable (except gender and proportion female) were centered around their grand mean. ** p<0.01

Table 2: Hierarchical Linear Regression on Logged Hourly Wage by Gender

	Female							Male						
	Model 1													
Year	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Intercept (γ00)	2.45**	2.61**	2.56**	2.57**	2.61**	2.62**	2.58**	2.67**	2.92**	2.91**	2.81**	2.79**	2.76**	2.73**
Occupation Level														
Proportion female (γ01)	-0.41**	-0.27**	-0.23**	-0.22**	-0.12**	-0.10	-0.07	-0.33**	-0.27**	-0.31**	-0.20**	-0.11**	-0.07	-0.09
Variance Components														
Level 1 variance (σe2)	0.34	0.35	0.3	0.27	0.28	0.28	0.30	0.26	0.27	0.32	0.28	0.3	0.30	0.32
Intercept (σu02)	0.11	0.11	0.06	0.08	0.09	0.14	0.15	0.1	0.08	0.05	0.07	0.08	0.13	0.14
	Model 2													
Intercept (γ00)	2.36**	2.57**	2.57**	2.64**	2.72**	2.80**	2.78**	2.64**	2.88**	2.93**	2.88**	2.91**	2.97**	2.96**
Some college	0.06**	0.07**	0.07**	0.09**	0.08**	0.06**	0.05**	0.09**	0.08**	0.04**	0.09**	0.09**	0.09**	0.08**
College graduate	0.23**	0.27**	0.21**	0.32**	0.30**	0.28**	0.27**	0.18**	0.23**	0.17**	0.26**	0.26**	0.28**	0.28**
Occupation Level														
Proportion female (γ01)	-0.35**	-0.27**	-0.28**	-0.35**	-0.34**	-0.45**	-0.47**	-0.35**	-0.29**	-0.38**	-0.37**	-0.38**	-0.50**	-0.55**
Proportion some college	0.79**	0.88**	0.63**	0.66**	0.80**	0.97**	0.94**	0.60**	0.71**	0.46**	0.52**	0.67**	0.78**	0.77**
Proportion full college	0.50**	0.53**	0.45**	0.56**	0.68**	0.99**	1.09**	0.29**	0.38**	0.34**	0.52**	0.63**	0.89**	0.96**
Variance Components														
Level 1 variance (σe2)	0.34	0.34	0.3	0.26	0.27	0.27	0.29	0.25	0.26	0.32	0.27	0.29	0.29	0.31
Intercept (σu02)	0.06	0.04	0.02	0.02	0.02	0.03	0.03	0.07	0.04	0.03	0.03	0.03	0.04	0.04
	Model 3													
Intercept (γ00)	2.35**	2.55**	2.59**	2.67**	2.74**	2.80**	2.78**	2.65**	2.88**	2.96**	2.91**	2.92**	2.97**	2.95**
Some college	0.07**	0.08**	0.09**	0.12**	0.10**	0.09**	0.09**	0.11**	0.10**	0.10**	0.13**	0.11**	0.12**	0.12**
College graduate	0.24**	0.28**	0.25**	0.36**	0.34**	0.34**	0.35**	0.21**	0.26**	0.26**	0.33**	0.31**	0.34**	0.36**
Potential work experience	0.001**	0.001**	0.003**	0.005**	0.01**	0.01**	0.01**	0.002**	0.003**	0.01**	0.01**	0.01**	0.01**	0.01**
Occupation Level														
Proportion female (γ01)	-0.36**	-0.29**	-0.28**	-0.35**	-0.34**	-0.42**	-0.45**	-0.35**	-0.3	-0.36**	-0.36**	-0.35**	-0.44**	-0.50**
Proportion some college	0.58**	0.70**	0.72**	0.75**	0.83**	1.03**	1.00**	0.69**	0.68**	0.58**	0.62**	0.70**	0.83**	0.83**
Proportion full college	0.43**	0.46**	0.48**	0.59**	0.70**	1.04**	1.14**	0.31**	0.36**	0.38**	0.52**	0.63**	0.92**	1.00**
Mean potential work experience	-0.01**	-0.01**	0.01**	0.01**	0.01**	0.02**	0.02**	0.003	-0.003	0.01**	0.02**	0.01**	0.02**	0.02**
Variance Components														
Level 1 variance (σe2)	0.34	0.34	0.3	0.25	0.27	0.26	0.28	0.25	0.26	0.31	0.26	0.28	0.28	0.29
Intercept (σu02)	0.06	0.04	0.02	0.02	0.02	0.03	0.03	0.07	0.04	0.03	0.02	0.02	0.03	0.03

*All variable (except gender and proportion female) were centered around their grand mean. **$p<0.01$

Table 3: Hierarchical Linear Regression of Change in the Gender Composition and Controls on Logged Wage

	Model 1						Model 2						Model 3					
Change between Years	**1960-1970**	**1970-1980**	**1980-1990**	**1990-2000**	**2000-2010**	**2010-2015**	**1960-1970**	**1970-1980**	**1980-1990**	**1990-2000**	**2000-2010**	**2010-2015**	**1960-1970**	**1970-1980**	**1980-1990**	**1990-2000**	**2000-2010**	**2010-2015**
Intercept	0.74**	1.05**	0.14*	0.44**	-0.17**	0.09*	0.71**	0.84**	0.008	0.47**	-0.31**	0.03	0.73**	0.95**	0.04	0.46**	-0.34**	0.02
Female	-0.29**	-0.31**	-0.23**	-0.18**	-0.16**	-0.15**	-0.29**	-0.31**	-0.23**	-0.18**	-0.16**	-0.15**	-0.29**	-0.31**	-0.23**	-0.18**	-0.16**	-0.15**
Some college	0.10**	0.09**	0.13**	0.11**	0.11**	0.11**	0.10**	0.09**	0.13**	0.11**	0.11**	0.11**	0.10**	0.09**	0.13**	0.11**	0.11**	0.11**
College graduate	0.27**	0.25**	0.36**	0.34**	0.37**	0.38**	0.27**	0.25**	0.36**	0.34**	0.37**	0.38**	0.27**	0.25**	0.36**	0.34**	0.37**	0.38**
work experience	0.003**	0.01**	0.01**	0.01**	0.01**	0.01**	0.003**	0.01**	0.01**	0.01**	0.01**	0.01**	0.003**	0.01**	0.01**	0.01**	0.01**	0.01**
Occupation-Level																		
L. Male wage	0.73**	0.55**	0.80**	0.71**	0.90**	0.79**	0.74**	0.60**	0.83**	0.70**	0.93**	0.81**	0.73**	0.57**	0.81**	0.69**	0.93**	0.81**
L. female proportion	-0.10**	-0.24**	-0.10**	-0.08**	-0.16**	-0.14**	-0.10**	-0.23**	-0.11**	-0.10**	-0.17**	-0.15**	-0.09**	-0.24**	-0.12**	-0.10**	-0.17**	-0.15**
Δ Female proportion	0.02	-0.11	-0.30**	-0.37**	-0.67**	-0.73**	0.02	-0.14	-0.27**	-0.33**	-0.63**	-0.71**	0.06	-0.13	-0.26**	-0.30**	-0.47**	-0.70**
Δ P. College							0.24	0.42**	0.30**	0.42**	0.74**	0.93**	0.32*	0.48**	0.36**	0.45**	0.86**	0.94**
Δ P. Some college							0.21	0.80**	0.65**	0.002	0.83**	0.84**	0.35	0.87**	0.70**	0.04	0.96**	0.81**
Δ mean work exp.													0.01*	0.01*	0.01*	0.02**	0.01**	0.01**
Variance																		
Level 1 variance	0.29	0.31	0.26	0.28	0.28	0.29	0.29	0.31	0.26	0.28	0.28	0.29	0.29	0.31	0.26	0.28	0.28	0.29
Intercept	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.00
Female slope variance	0.021	0.014	0.010	0.006	0.006	0.006	0.021	0.014	0.010	0.006	0.006	0.006	0.022	0.014	0.010	0.006	0.006	0.006

*p<0.05; ** p<0.01

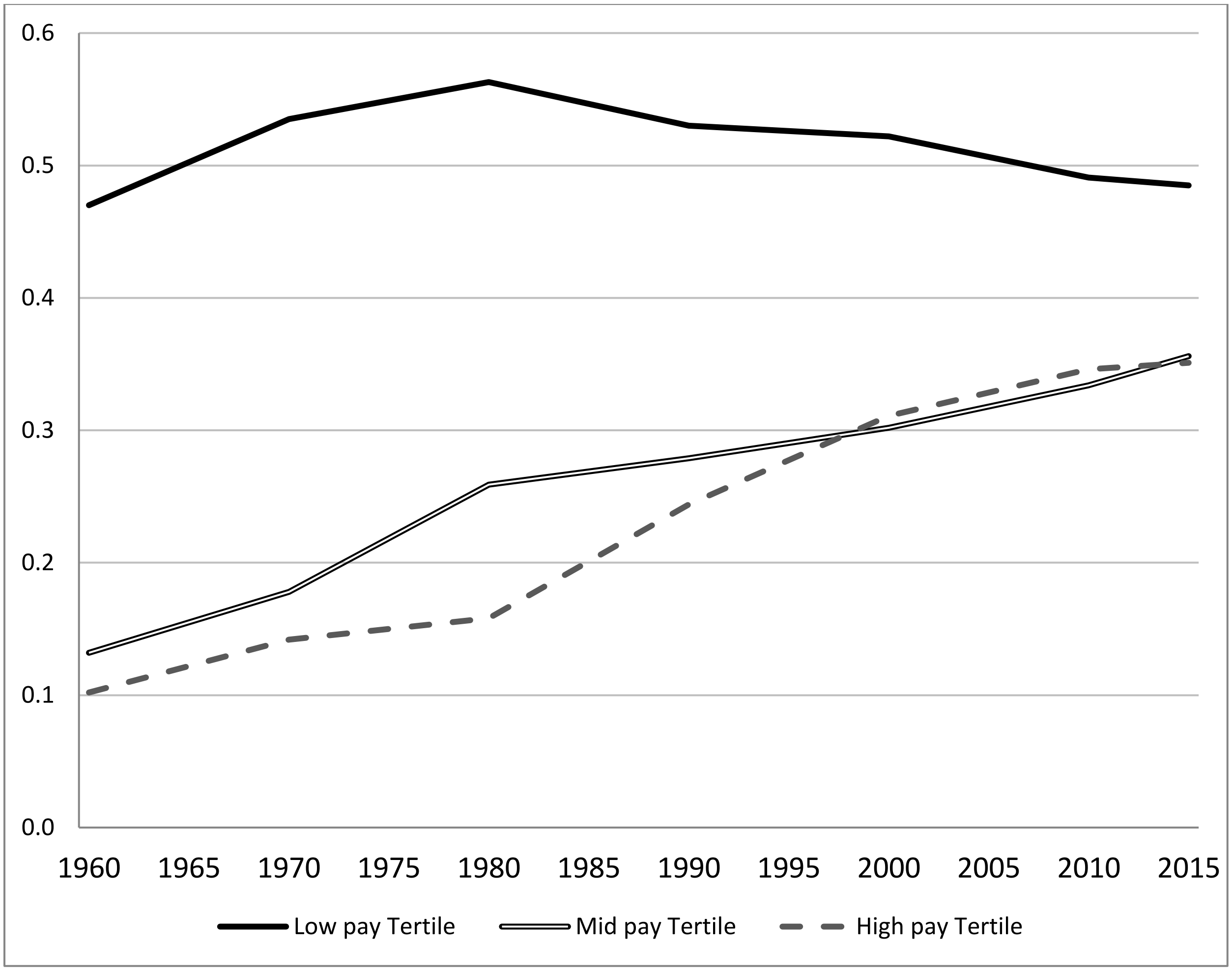


Figure 1: Mean proportion female in occupation by tertiles of average weekly wage of occupations

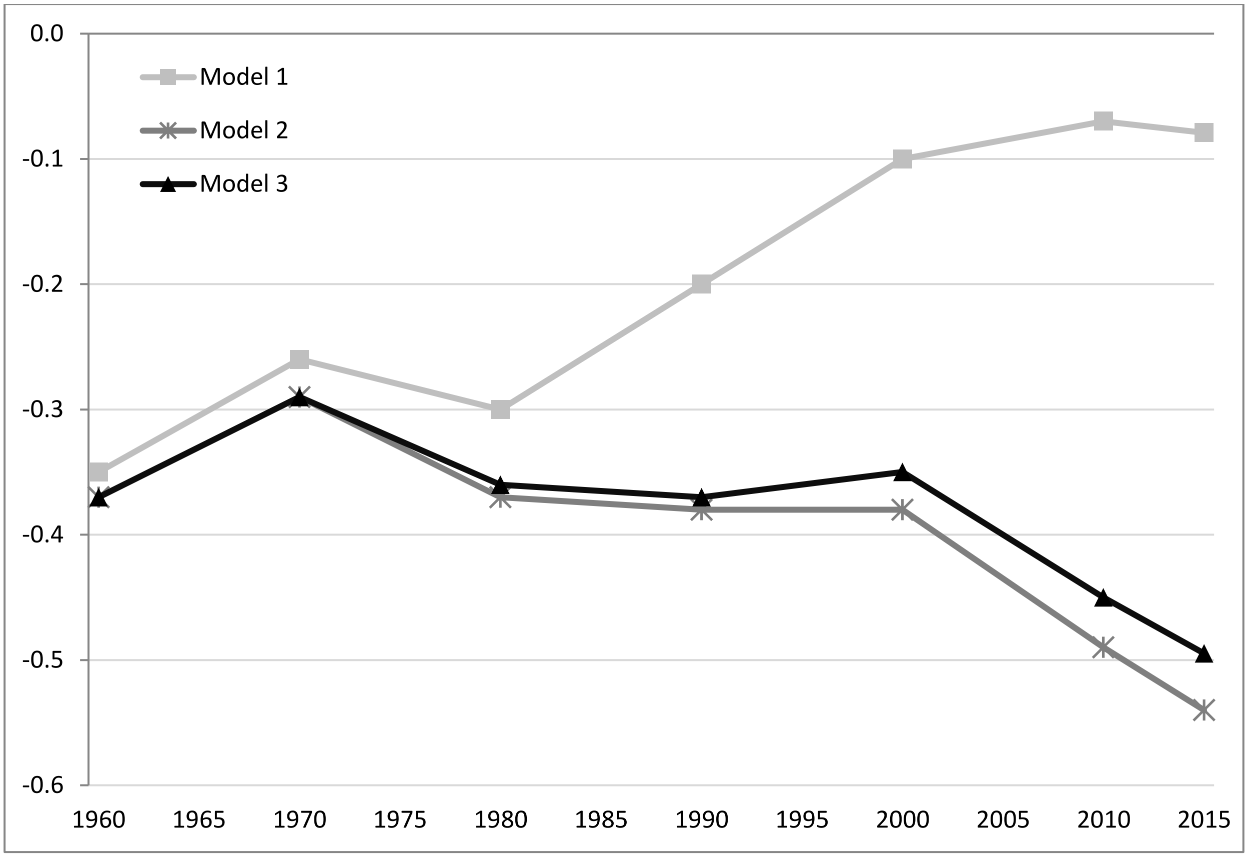


Figure 2: Trends in Effect of percent female on occupational pay, without (Model 1) and with (Models 2 & 3) controls

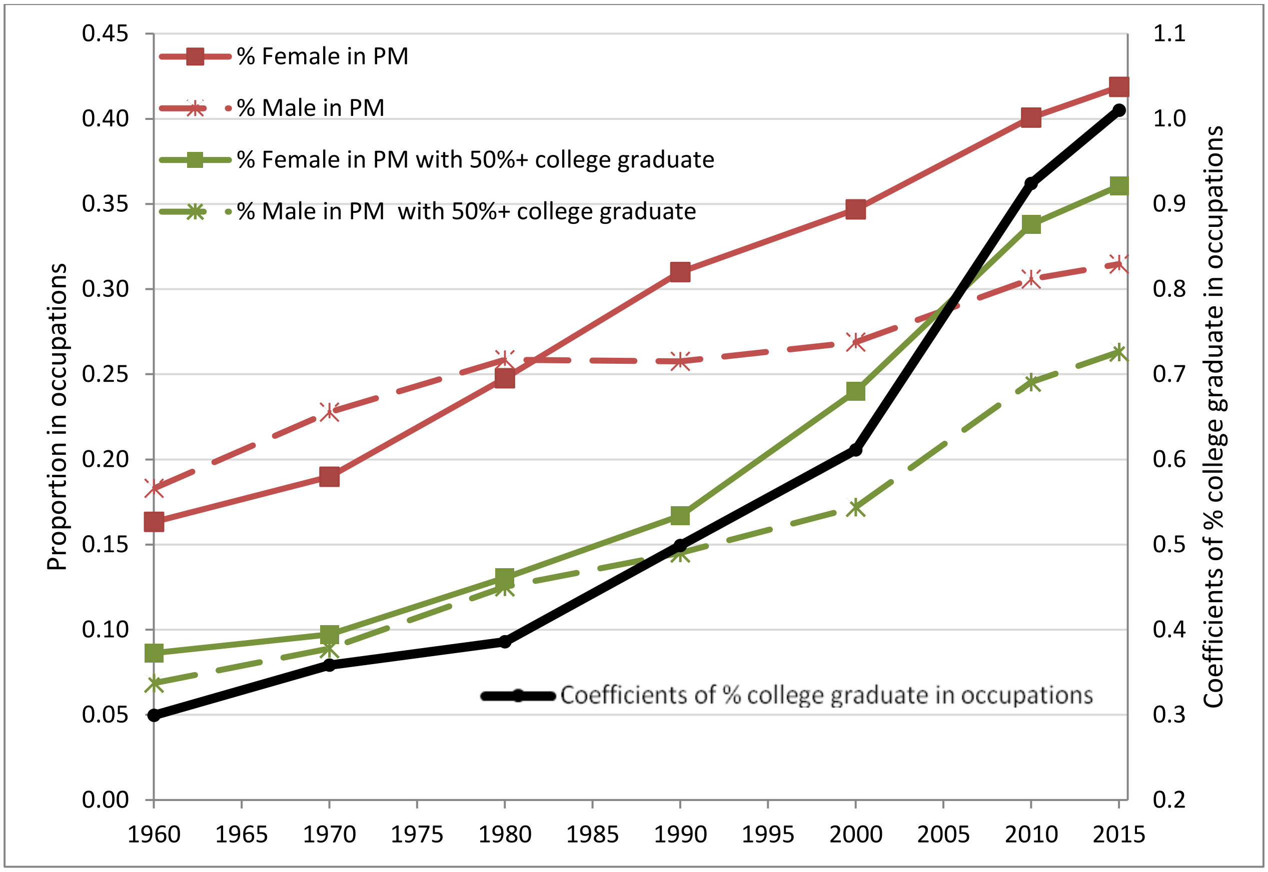


Figure 3: Trends in proportions of fe/male in occupations with high educational requirements, and in the premium for working in such occupations

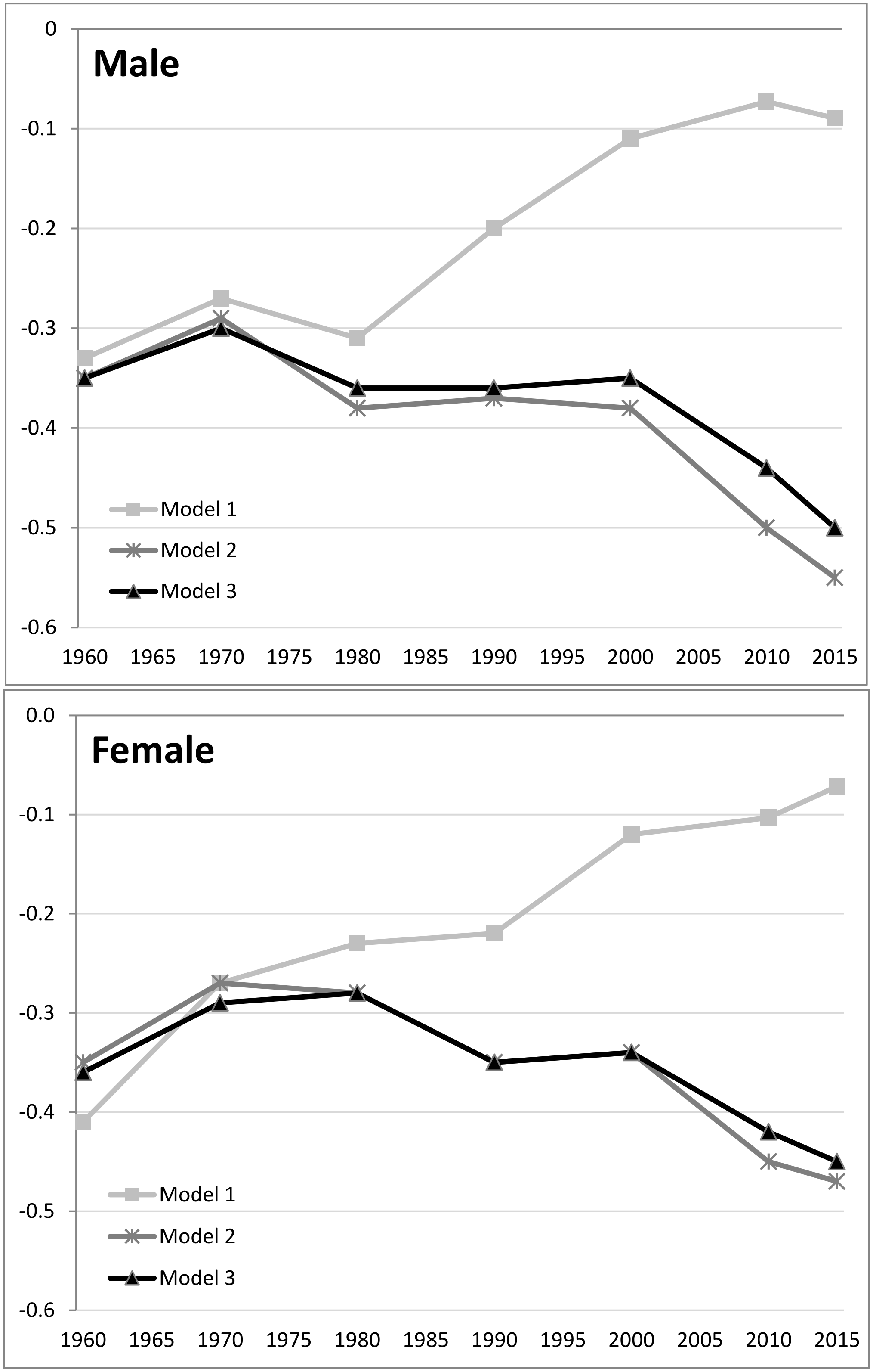


Figure 4: Trends in the effect of percent female on occupational pay, without (Model 1) and with controls (Models 2 & 3), by gender

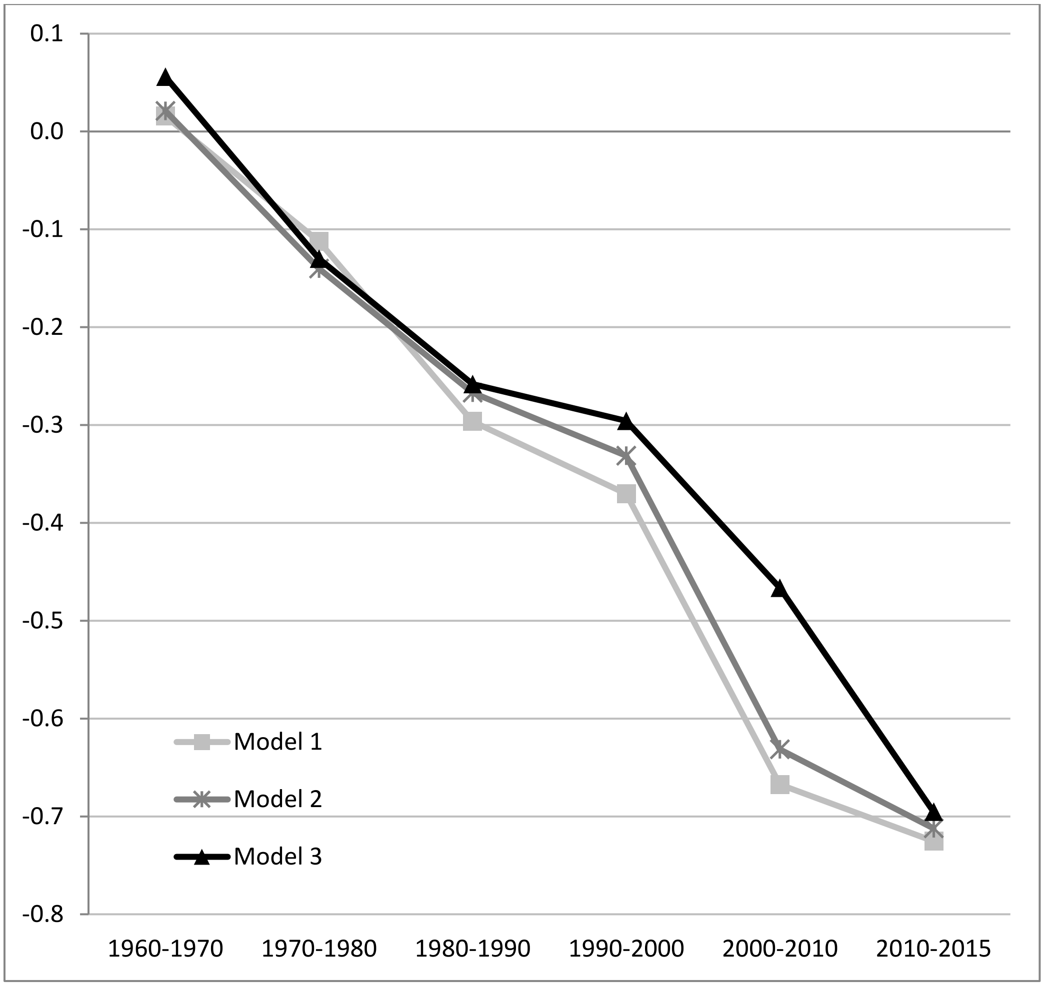


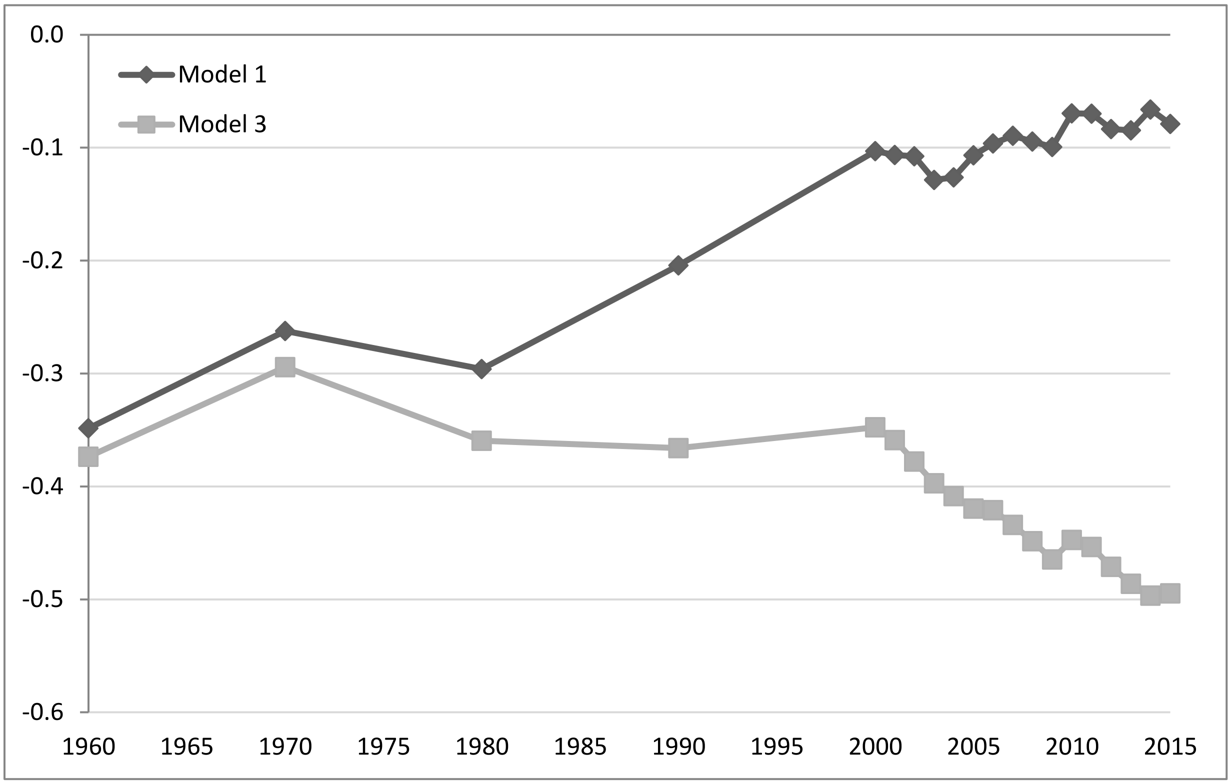
Figure 5: Trends in the effects of change in percent female on change in occupational pay

Appendices

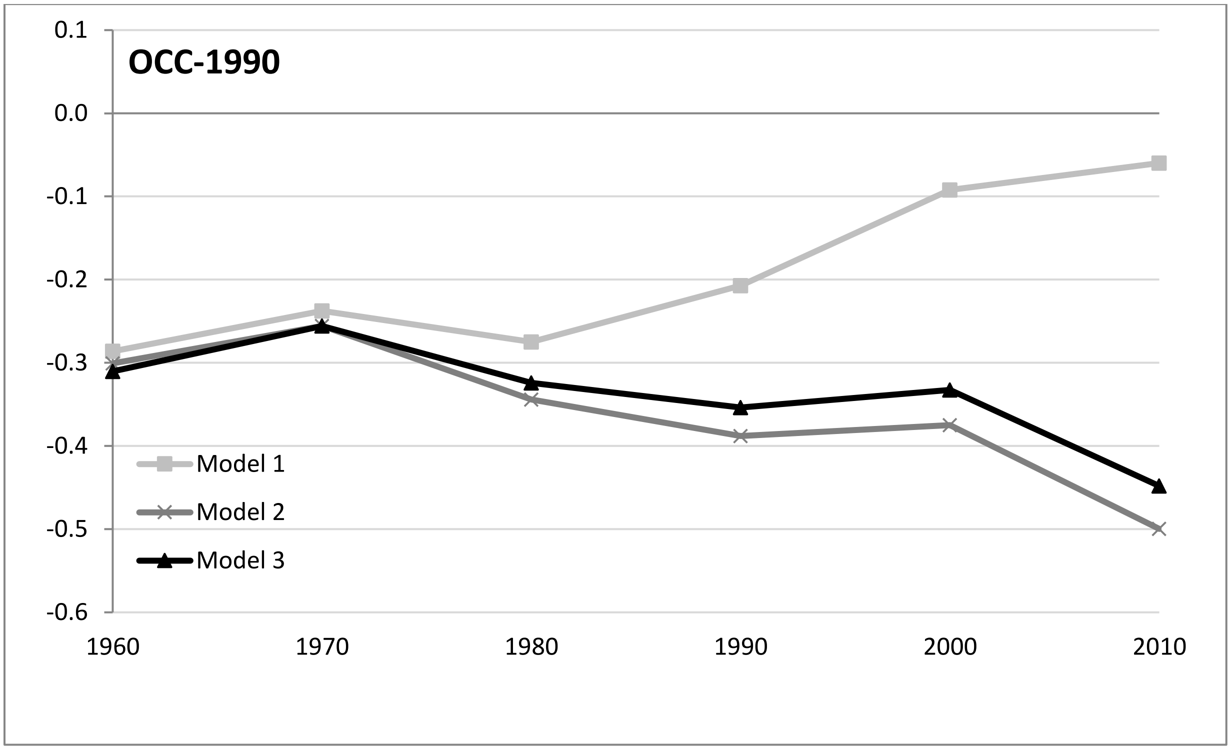
Appendix 1: Descriptive Statistics for Variables in the Analysis

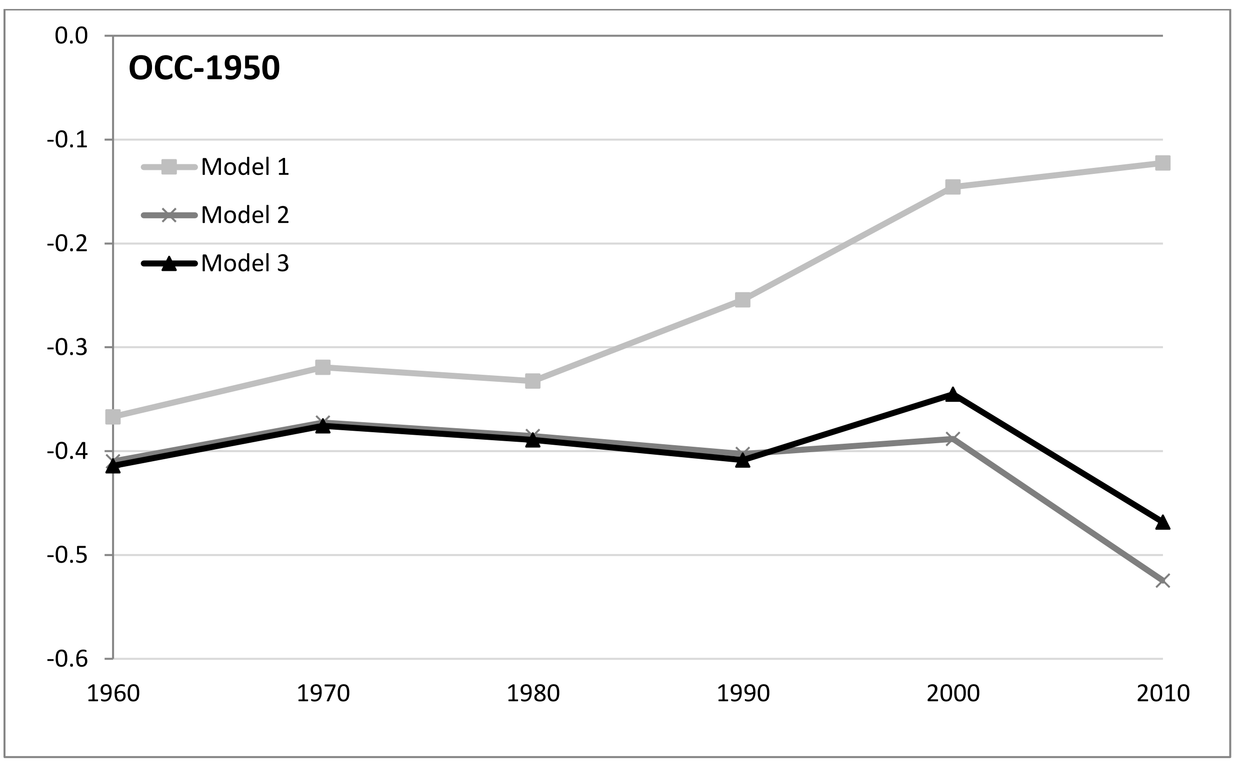
	1960		1970		1980		1990		2000		2010		2015	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
N of individuals	363,729		901,509		2,984,285		3,783,068		4,294,730		913,199		924,068	
Hourly wage (logged)	2.45	0.64	2.69	0.64	2.67	0.64	2.63	0.61	2.66	0.62	2.66	0.66	2.63	0.68
Gender (female=1)	0.33	0.47	0.37	0.48	0.43	0.50	0.47	0.50	0.48	0.50	0.50	0.50	0.49	0.50
Some college (=1)	0.10	0.30	0.12	0.33	0.19	0.40	0.30	0.46	0.24	0.43	0.25	0.43	0.25	0.43
College completed (=1)	0.11	0.31	0.14	0.35	0.22	0.41	0.25	0.44	0.29	0.45	0.36	0.48	0.39	0.49
Years of work experience	24.14	10.71	23.51	11.02	20.36	11.09	19.87	9.80	21.40	9.59	22.70	10.27	22.47	10.62
N of Occupations	284		427		503		498		474		491		478	
Proportion female	0.24	0.31	0.29	0.31	0.33	0.29	0.35	0.28	0.38	0.28	0.39	0.28	0.40	0.28
Proportion some college	0.11	0.09	0.14	0.10	0.19	0.10	0.28	0.13	0.24	0.11	0.25	0.12	0.26	0.12
Proportion college completed	0.18	0.30	0.20	0.30	0.23	0.29	0.24	0.29	0.27	0.29	0.32	0.30	0.34	0.30
Mean years of work experience	21.93	5.97	20.36	5.38	17.81	3.99	18.36	3.45	19.83	3.19	22.26	3.72	22.00	3.83

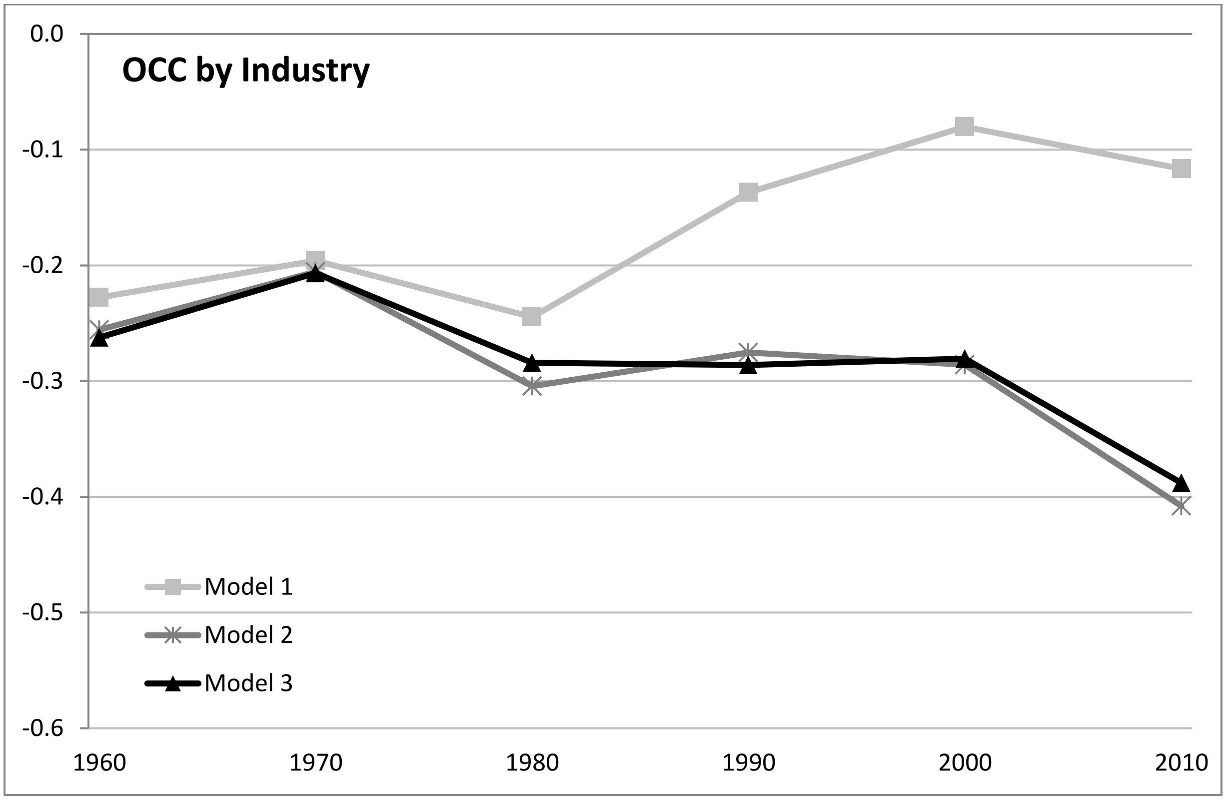
Appendix 2: Post 2000 trends in Effect of percent female on occupational pay



Appendix 3: Trends in Effect of percent female on occupational pay under alternative occupational classifications






0.0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
OCC by Industry
Model 1
Model 2
Model 3
1960
1970
1980
1990
2000
2010