1996

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Gregory B. Lewis
Georgia State University, glewis@gsu.edu

Recommended Citation

Lewis, Gregory B. Gender Integration of Occupations in the Federal Civil Service: Extent and Effects on Male-Female Earnings. Industrial & Labor Relations Review 49.3 (1996): 472–483.

GENDER INTEGRATION OF OCCUPATIONS IN THE FEDERAL CIVIL SERVICE: EXTENT AND EFFECTS ON MALE-FEMALE EARNINGS

GREGORY B. LEWIS*

Using the U.S. Office of Personnel Management's Central Personnel Data File, the author shows that from 1976 through 1992 gender integration of occupations proceeded more rapidly and steadily in the federal civil service than in the general economy. During that period, increasing numbers of women moved into traditionally male occupations, especially in professional and administrative work. Little of that progress, the author finds, was attributable to changes in women's education or seniority. Although average grades (indicating levels of responsibility) in male-dominated occupations declined as women entered them, gender integration of occupations helped to narrow male-female pay disparities in the federal service more than in the general economy.

Have recent declines in the gender segregation of occupations led to greater male-female earnings equality? Although many studies have suggested the need to desegregate occupations to narrow the gender earnings gap, few have tested the impact of desegregation either on pay in individual occupations or on general patterns of pay inequality.

In this paper, using a one percent sample of federal personnel records for 1976 through 1992, I focus on patterns and effects of gender desegregation in the federal civil service. The sample allows a more detailed tracking of changes for a larger employment sector than has been possible in previous studies. After briefly reviewing previous research on occupational segregation and earnings inequalities, I investigate how extensive the gender integration of federal white-collar occupations has been; whether it slowed in the 1980s (as in the general economy); whether it resulted from women's increasing qualifications

*Gregory B. Lewis is Associate Professor of Public Administration in the School of Public Affairs at American University. This research was sponsored by the U.S. Equal Employment Opportunity Commission, Public Programs Division, using data purchased from the U.S. Office of Personnel Management with funds provided by The American University.

Researchers interested in obtaining copies of the Central Personnel Data File should contact the Office of Workforce Information at the U.S. Office of Personnel Management. Researchers must be sponsored by a federal agency to obtain the data. A copy of the computer programs used to generate the results presented in this paper is available from Gregory B. Lewis, School of Public Affairs, American University, 4400 Massachusetts Avenue NW, Washington, DC 20016.

Industrial and Labor Relations Review, Vol. 49, No. 3 (April 1996).
0019-7939/96/4903 $01.00

rather than from changes in behavior; and whether it was concentrated in the least desirable occupations. I then consider whether women's entry into male-dominated occupations lowered those jobs' grades and whether overall gender integration reduced gender inequality in federal pay.

Gender Segregation and Earnings in the U.S. Economy

Throughout the world and throughout history, men and women have done different work (Charles 1992; Jacobs 1989). Studies indicate that three in five men (or women) would need to change occupations for the two sexes to have equal occupational distributions in the United States (for example, Gross 1968; Jacobs 1989). Job segregation is even more extreme within firms than figures for occupational segregation would suggest (Blau 1977; Bielby and Baron 1984).

Male-dominated occupations offer higher pay and better benefits than female-dominated occupations, even when the analysis includes controls for characteristics of the work and the workers (for example, Jusenius 1977; England et al. 1982; Johnson and Solon 1986; England et al. 1988; Sorensen 1989). Human capital economists attribute both gender segregation and higher pay in male-dominated occupations to gender differences in attachment to the labor market, in investment in education and job training, and in valuation of working conditions, as well as to compensating pay differentials (for example, Polachek 1975; Filer 1983, 1989). The empirical evidence, however, better supports the sociologists' argument that discriminatory hiring and promotion practices, harassment from male coworkers, and socialization that teaches women to avoid "unfeminine" work restrict women's entry into traditionally male occupations (England et al. 1988). Two mechanisms, sociologists argue, lead to lower pay for women's work of comparable worth. First, women are overcrowded into a limited number of occupations, lowering the marginal productivity (and hence wages) in those occupations (Bergmann 1974). Second, bureaucratic practices, customs, and notions of fairness lead to the systematic undervaluation of women's work, especially in less competitive labor markets (Deaux 1985; McArthur 1985; Major et al. 1984; Kim 1989; Bridges and Nelson 1989). Various studies attribute 9% to 38% of earnings differences between men and women to occupational segregation (Jacobs 1989; Sorensen 1989).

Although segregation levels remained remarkably stable over most of this century (Gross 1968), they declined steadily after 1960, though faster in the 1970s than in the 1980s (Blau and Hendricks 1979; Bianchi and Rytina 1986; Beller 1985; Jacobs 1989; Reskin 1993). This decline should affect men's and women's pay. Women's entry into male-dominated occupations should lower occupational pay, either by lowering the marginal productivity of labor in men's occupations and raising it in women's, or by devaluing work by showing that it is done or can be done by women. Alternatively, women's entry may signal that an occupation has already been deskilled or devalued, so that men no longer find it desirable. Several studies document a connection between feminization and declining pay in occupations. Women's share of bank teller jobs rose from 0% to 91% while the status and relative pay of bank tellers fell (Strober and Arnold 1987). Pay for both male and female college administrators fell as women's share of administrative positions in the college rose (Pfeffer and Davis-Blake 1987). In the California civil service, relative starting pay declined as the percentage of the job's workers who were female or black (or both) rose (Baron and Newman 1989).

If gender segregation of occupations is a major cause of women's lower earnings, desegregation across the occupational structure should reduce gender pay inequality. Surprisingly, most evidence suggests that gender integration has had a minimal impact on male-female relative earnings. Reskin (1988) noted that the index of segregation dropped by 10% in the 1970s but

the male-female wage gap fell by only 2%. England (1992) added that desegregation was faster in the 1970s than in the 1980s but that the white female-to-male ratio of median weekly earnings did not begin rising until the 1980s. Reskin and Roos (1993) concluded from a series of case studies of rapidly integrating occupations that most had experienced ghettoization or resegregation rather than real integration, and that gender integration had not resulted in great economic improvement for women. Blau and Beller (1988:526) found clear declines in both male-female earnings differentials and occupational segregation, but concluded "that the *total* effect of occupational changes over the decade was to widen the gender differential in the log of annual earnings.... The increased entry of women into male (and integrated) occupations did narrow the differential slightly, but . . . [t]he return to being in a male or integrated occupation increased."

Segregation and Earnings in the Public Service

Public employers face less pressure than private firms to maximize profits and minimize costs, allowing them to differ from the market in their treatment of various groups (Wharton 1989). In recent decades, gender pay disparities have been lower in the public than the private sector (Smith 1976; Asher and Popkin 1984; Sorensen 1989). In addition, gender segregation declined faster and more steadily in the public than in the private sector between 1950 and 1980 (Wharton 1989). Baron and Mittman (1991) found gender segregation to be lower in state agencies than in private firms in California, despite Bielby and Baron's (1984) conclusion that segregation was strongly positively related to size, location within the core economy, specialization, and bureaucratic rules—all characteristics of California state government.

Still, all studies have found public pay-setting practices to be subject to internal and external political pressures, and those pressures often hurt women. The state government of California explicitly took the gender composition of an occupation into account in setting pay rates in the 1930s, and those rates have a continuing impact today (Kim 1989). Federal and state tribunals in Australia set minimum wage rates for occupations in both the public and private sectors; until 1975, they explicitly considered the sex of an occupation's workers in their decisions, traditionally setting minimum wages high enough to support a family in male occupations and to support a single woman in female occupations (Gregory and Duncan 1981). Bridges and Nelson (1989) found unexplained pay gaps between male- and female-dominated occupations in Washington State government to be smallest in "benchmark" jobs (those whose salaries were most directly set by the market) and largest in jobs least tied to external labor markets; bureaucratic politics affected salary determination most where market links were weakest, and those politics generally operated in favor of men's work. Perhaps we should not be surprised by Sorensen's (1989) finding that, although gender pay disparities were smaller in the public than the private sector, the gender composition of occupations affected salaries more in government work.

Male-female disparities in the federal civil service reflect those in the general economy in many respects. Occupations are highly segregated by sex; comparable employees earn much more in male- than in female-dominated occupations; and segregation has declined steadily since 1967 (Lewis and Emmert 1986). Men earn substantially more than comparable women (Taylor 1979; Grandjean 1981; DiPrete 1989), but unexplained pay differentials have also been declining (Lewis 1988). This study documents both trends, then examines the connections between them.

Data

I analyzed data for full-time, permanent, white-collar employees in the General Schedule (GS) and equivalent pay systems. The U.S. Office of Personnel Management (OPM) categorizes the 1.6 million white-

collar positions covered by these pay systems in several ways. OPM classifies all positions as professional, administrative, technical, clerical, or other "based on the subject matter of the work, the level of difficulty or responsibility involved, and the educational requirements of each occupation" (OPM 1985:193). Following the *Handbook of Occupational Groups and Series of Classes,* OPM assigns each white-collar position to one of 22 occupational groups (for example, legal and kindred, engineering and architecture, or business and industry) and approximately 445 occupational series (for example, general attorney, civil engineer, or internal revenue officer). Employees in an occupational series perform similar work but at different levels of responsibility. Positions are further classified into 15 grades (plus the Senior Executive Service, here coded as grade 16), which indicate the level of responsibility. One's grade (level in the hierarchy) and step (largely a measure of time in the grade) almost entirely determine one's salary. Because definitions of the levels of responsibility change slowly over time, grade levels provide more stable measures of status over time than do salaries.

Data came from the Central Personnel Data File (CPDF), which OPM maintains as the government's central personnel files. Trends in gender segregation from 1967 through 1993 were found in OPM publications covering all full-time white-collar workers, generally based on October records for odd-numbered years (*Occupations of Federal White-Collar and Blue-Collar Workers*). I used a one percent sample of the CPDF for the individual-level analysis, restricting the sample to nonminority, full-time, permanent, white-collar employees in the GS and equivalent pay systems working inside the United States. The sample uses March personnel records and covers the years 1976 to 1992; thus, occupational gender composition measures (based on population data for odd-numbered years) are not perfect matches for the sample data. Although I included minorities in initial analyses, I report results for a sample limited to white non-Hispanics to simplify presentation. This does not change the patterns reported.

The Extent of Occupational Gender Integration

Trends. Although gender segregation remained quite high in 1993, it had diminished markedly over the previous 20 years (Table 1). In 1967, 42% of the women and 49% of the men held positions in occupational series in which at least 95% of their co-workers were of their same sex. By 1993, those percentages had dropped to 12 and 3, respectively. Over those 26 years, the percentage of the work force in highly segregated occupations (at least 95% of the same sex) fell by five-sixths (from 47% to 8%). Employment in moderately integrated occupations (25–75% male) rose by two-thirds (from 29% to 49%). In 1967, only 25% of the average woman's occupational co-workers were men, compared to 81% of the average man's occupational co-workers—a difference of 56%. By 1993, that gap had dropped to 33% (35% versus 68%).

The index of dissimilarity indicates what percentage of men (or women) would need to change occupational series for men to comprise the same percentage of every occupation's workers.[1] That index declined steadily between 1967 and 1993, falling from 68 to 50. In contrast to the general economy (Reskin 1993), in the civil service gender desegregation proceeded somewhat faster in the 1980s than in the 1970s, with the index dropping an average of .81 per year between 1979 and 1993, compared to only .55 per year from 1967 to 1979. Still, in 1993 fully 50% of the women or men would have had to change occupations for the two sexes to have had identical occupational distributions. Only 26% of 1967 segregation, as reflected by this index, was eliminated over this 26-year period.

[1]The index is calculated across all occupational series as

$$S = 1/2 \sum |m_i - f_i|,$$

where m_i = the percentage of the male work force employed in occupation i and f_i = the percentage of the female work force employed in occupation i.

Table 1. Trends in Occupational Gender Segregation in the Federal Civil Service, 1967–1993.

	Year											
Description	*1967*	*1972*	*1976*	*1977*	*1979*	*1981*	*1983*	*1985*	*1987*	*1989*	*1991*	*1993*
Percentage of Work Force in Occupations												
0–5% Male	18.5	15.1	9.2	7.1	7.4	7.6	7.5	7.4	7.3	6.7	6.4	5.9
5–25% Male	8.8	8.5	12.6	15.5	16.0	19.0	16.6	16.8	18.8	19.4	17.7	18.2
25–75% Male	29.1	32.1	36.7	36.1	36.3	35.0	40.9	43.4	43.2	44.8	48.2	48.8
75–95% Male	15.3	16.6	19.7	20.9	23.9	24.0	23.3	23.6	26.7	25.8	24.6	25.3
95–100% Male	28.2	27.6	21.8	20.4	16.3	14.3	11.6	8.8	4.0	3.4	3.2	1.8
Percentage Male in Occupation of Average:												
Woman	25.2	28.6	29.4	29.1	30.1	30.0	30.3	30.8	31.5	32.3	33.1	34.5
Man	81.2	80.9	78.3	77.9	76.6	74.8	74.0	72.3	70.8	69.7	68.2	67.7
Index of Dissimilarity	68.1	65.8	63.2	63.1	61.5	59.2	58.4	56.7	55.2	53.6	51.8	50.2

Source: U.S. Office of Personnel Management, *Occupations of Federal White-Collar and Blue-Collar Workers,* various years.

Impact of changing characteristics of workers. One reason men tend to be in higher-paying occupations than women in the federal service is that the men are, on average, older, more experienced, better educated, and more likely to be educated in higher-paying fields. Thus, any decline in gender segregation might be due to a rise in the relative qualifications of female employees rather than to changes in the process that matched employees to jobs.

I tested this possibility using multiple regression analysis on the one percent samples of federal personnel records for 1976 and 1992. The dependent variable was the percentage of the occupation's workers who were men in October 1976 or 1993, respectively. The model included measures of age, education, and experience (all measured in years and years-squared), measures of disability and veteran status, and 24 dummy variables indicating college graduates' major fields of study.

Those variables by themselves explained about 30% of the variation in the gender composition of workers' occupations in 1992 (Table 2). In general, employment in highly male-dominated occupations was most likely for older, more experienced, and more educated employees with degrees in agriculture, architecture, engineering, or business administration. Adding a dummy variable for sex to the model raised the explanatory power of the model by 13 points (to 43%) and showed that a white non-Hispanic woman was likely to be in an occupation that had 26 percentage points fewer men than the occupation held by a white non-Hispanic man of the same age, experience, and level and type of education. As the average white woman's occupation had 37 percentage points fewer men than the average white man's occupation in this sample, controlling for education and experience explained less than one-third (11 points) of that 37-point gap.

Sex had a clearer direct effect on occupation in 1976. Adding the sex dummy raised the explanatory power of the model by 20 points (from 36% to 56%) and indicated women's occupations had 44% fewer men than the occupations of comparable men. Differences in education and experience explained only 8 points of the 52-point gap between the average white man's and woman's occupations in the sample. The overall gap fell by 15 points between 1976 and 1992 (from 52 to 37), while the unexplained gap fell 18 points (from 44 to 26). Changing characteristics of white male and female employees added about 20% to the trend.[2]

[2]Restricting the sample to employees with less than 16 years of federal experience (to ensure that no

Table 2. Impact of Employees' Gender and Minority Status on the Percentage Male in Their Occupation in the Federal Civil Service, 1976 and 1992.

Independent Variables	*1976*	*1992*	*1976*	*1992*
All Occupations				
Female (1–0)	—	—	−44.0***	−25.9***
Education (years)	2.39***	2.53***	.95***	1.38***
Federal Experience (years)	1.04***	.39***	.58***	.46***
Federal Experience (years2)	−.010**	.004	−.008*	−.003
Age (years)	1.42***	−.13	1.20***	−.32
Age (years^2)	−.020***	.00	−.014***	−.003
Adjusted R^2	.36	.30	.56	.43
Professionals and Administrators Only				
Female (1–0)	—	—	−19.9***	−12.3***
Education (years)	.60***	1.00***	.23	.60**
Federal Experience (years)	.52***	−.15***	.42**	−.09
Federal Experience (years^2)	−.010**	.005*	−.008*	−.002
Age (years)	−1.01***	−.72***	−.79**	.96***
Age (years^2)	.008**	.005*	.006*	−.008***
Adjusted R^2	.24	.32	.32	.38

Note: Model includes 27 dummy variables indicating major field of study for college graduates, disability status, and veterans' preference.

Source: Computed from one percent samples of U.S. Office of Personnel Management, *Central Personnel Data File,* April 1976 and 1992.

*Statistically significant at the .05 level; **at the .01 level; ***at the .0001 level (two-tailed tests).

Since, even in 1993, 88% of clerical workers and only 36% of professionals and administrators were women, these broad categories account for much of the segregation. Even among workers who attained professional or administrative positions, however, women in 1992 held occupations with 12 percentage points fewer men than did men with the same level of experience and education and with the same field of study in college (down from 20 points fewer in 1976).[3]

The percentage of white women holding professional and administrative positions nearly tripled between the 1976 and 1992 samples (from 18 to 45), while the percentage of white men in that category grew only from 66 to 73. (Over the same period, the percentage of white women and men filling clerical jobs dropped from 62 to 30 and from 7 to 4, respectively.) OLS regression suggests that white women were 24 percentage points less likely than comparable men to hold professional and administrative positions in 1976, but that their disadvantage had fallen to 9 points by 1992.[4]

employee was included in both the 1976 and 1992 samples) had only a trivial impact on the Female coefficient for the all occupations model. (The coefficient fell from −43.6 in 1976 to −25.1 in 1992, compared to −44.0 and −25.9, respectively.) Among professionals and administrators, the impact of being female dropped more rapidly among less experienced employees (from −21.3 to −10.6) than among employees generally (from −19.9 to −12.3).

[3]This analysis was repeated using separate regressions for men and women. When male (female) means were multiplied by female (male) coefficients to generate expected percentage male, the two estimated amounts of difference due to coefficients bracketed the estimates shown in the text. The difference due to coefficients for all employees in 1992 was 19.0 (male means) and 29.9 (female means); for professionals and administrators in 1992, 10.0 and 14.6; for all employees in 1976, 31.8 and 45.8; and for professionals and administrators, 20.3 and 20.2.

[4]The OLS regression used a dummy variable coded 1 for professionals and administrators as the dependent variable, a technique some authorities consider

Table 3. Changes in Occupational Gender Composition and Average Grade in the Federal Civil Service, 1977–1993.

	Dependent Variable		
Independent Variable	*Change in Percentage Male, 1977–93*	*Mean Grade for Men, 1993*	*Mean Grade for Women, 1993*
Percentage Male in Occupation, 1977	−.056** (.019)	.007*** (.001)	.022*** (.001)
Mean Grade for Men, 1977	−1.84*** (.21)	.977*** (.015)	— —
Mean Grade for Women, 1977	— —	— —	.89*** (.019)
Change in Percentage Male, 1977–93	— —	.014*** (.003)	.020*** (.004)
Intercept	9.34	.36	.89
Adjusted R^2	.38	.96	.93

Source: U.S. Office of Personnel Management, *Occupations of Federal White-Collar and Blue-Collar Workers,* various years.

*Statistically significant at the .05 level; **at the .01 level; ***at the .0001 level (two-tailed tests).

The occupations integrated. The apparent gender desegregation could mean less if it occurred only in moderately integrated or lower-paying male-dominated occupational series. To test this possibility, I regressed the change in the male percentage between 1977 and 1993 on the percentage male in the occupation in 1977 and the mean grade of men in that occupation in 1977. The unit of analysis was the occupation, but the regression weighted the occupations by the number of employees in each occupation in 1993.[5] The male share of an occupation's workers fell faster in occupations that were more male-dominated and had high mean grades for men (Table 3), where integration should have the greatest impact. The pace was not a great deal faster—all else equal, men's share fell by about 3 percentage points more in occupations that were 90% male than in occupations that were 40% male (50 * .056). Still, there was little evidence that the movement of women was slowest in the "best" jobs. Occupational growth and decline had no noticeable impact on gender integration.[6]

The Impact of Integration on Pay Inequality

Integration and pay in individual occupations. I performed two tests of the expectation that as women entered strongly male-identified jobs, grades and salaries in those jobs fell. First, using occupational data for all employees, I regressed the mean grades of men and women in each occupation in 1993 on the occupation's change in its percentage male between 1977 and 1993, controlling for its mean grade and percentage male in 1977 (Table 3).[7] As an occupation's percentage male fell, mean grades fell for both men and women, holding constant the previous mean grade and gender composition. With those variables held constant, an occupation that increased its dependence on men by 10 percentage points was expected to raise the mean grade of men by .14 grade and that of women by .20 grade, relative to an occupation with no change in its gender composition. In a fixed-effects model regressing changes in mean grades on changes in occupational sex composition, bivariate regression showed that a ten percentage point increase in percentage male raised the overall mean grade by .21 and men's mean grade by .07,

legitimate if the mean of the dependent variable is between .2 and .8 (Neter and Wasserman 1974:328). In the logit analysis replication, the full model did not reach convergence. A simplified model, however, which excluded the 24 dummy variables for major, confirmed the OLS findings. The Female coefficient declined by two-thirds between 1976 and 1992, from −1.53 to −.60.

[5]All occupation-level analyses were also run on unweighted data, with no substantial changes in results.

[6]Coefficients on a variable measuring the percentage change in the number of employees in each occupational series were substantively trivial and statistically insignificant.

[7]All regressions in Table 3 use occupational series as the unit of analysis and are weighted by the number of employees in each occupation in 1993. Unweighted regressions yielded very similar results.

but had a statistically insignificant impact on women's mean grade. Both approaches show that as women increased their presence in occupations, not only did the entering women receive lower grades than the men they replaced, but the men's grades also fell.[8]

These results were consistent with expectations, but mean grades could have fallen because of changing qualifications of workers, rather than declining expected grades of comparable workers. To test this possibility, I regressed grade and the natural logarithm of salary in 1992 on a reasonably standard set of independent variables, plus the percentage male in employees' occupations in 1977, plus the change in that percentage between 1977 and 1993. The models controlled for sex, education in years, 24 major fields of study, federal work experience and age (in years and years squared), veterans' preference, and disability status. A set of interaction terms between sex and all other control variables allowed for different returns on characteristics for men and women. Some observations were dropped because of changes in occupation codes over this period.

As expected, male-dominated occupations paid better than female-dominated occupations, even after controlling for many worker characteristics (Table 4). Expected grade rose .4 and the natural logarithm of salary rose .04 with each rise of ten percentage points male for occupations generally. Part of that rise occurred because the higher-graded professional and administrative occupations were predominantly male, while the lower-graded clerical occupations were predominantly female. Even when the sample is restricted to professional and administrative occupations, however, men's occupations paid better than women's, even for comparable workers, though the effects were only about half as strong as for occupations generally.

Table 4. The Impact of Gender Composition of Occupation on Grades and Salaries in the Federal Civil Service, 1992.

1992 Data	*Grade*	*Logarithm of Salary*
All Employees		
Percentage Male in Occupation, 1977 (Standard Error)	.040*** (.001)	.0040*** (.0001)
Change in Percentage Male, 1977–93 (Standard Error)	−.020*** (.002)	−.0014*** (.0003)
Adjusted R^2	.62	.66
N	9377	9377
Professionals and Administrators Only		
Percentage Male in Occupation, 1977 (Standard Error)	.017*** (.001)	.0022*** (.0002)
Change in Percentage Male, 1977–93 (Standard Error)	.010*** (.002)	.0020*** (.0003)
Adjusted R^2	.36	.49
N	6033	6033

Note: Regression models include age, length of federal service, level of education, major field of study in college, region of employment, eligibility for veterans' preference, and handicap status.

Source: Computed from U.S. Office of Personnel Management, *Central Personnel Data File*, one percent sample, April 1992.

*Statistically significant at the .05 level; **at the .01 level; ***at the .0001 level (two-tailed tests).

Surprisingly, expected grades and salaries were higher in occupations in which women's share of employment rose faster. Each ten percentage point increase in men's share of an occupation *lowered* expected grades by .20 and the natural logarithm of salary by .014. This result contradicts expectations and earlier findings (Pfeffer and Davis-Blake 1987; Baron and Newman 1989). However, this pattern seems to reflect the fact that grade growth was most rapid in male-dominated professional and administrative occupations. When four dummy variables were added to the model to indicate whether the occupation was professional, administrative, technical, clerical, or other, each ten-point increase in percentage male since 1977 *raised* expected grade and salary (by .18 and .025,

[8]In regressions not shown, men's and overall mean grades also rose somewhat faster in more rapidly growing occupations, but women's mean grades did not.

Table 5. The Impact of Sex and Gender Composition on Grade and Salary in the Federal Civil Service, 1976–1992.

	Grade			*Natural Logarithm of Salary*		
	(1)	*(2)*		*(1)*	*(2)*	
Year	*Sex Only*	*Sex*	*Percent Male*	*Sex Only*	*Sex*	*Percent Male*
All Employees						
1976	−2.60	−1.05	.035	−.273	−.123	.0034
1977	−2.56	−.95	.039	−.279	−.120	.0038
1981	−2.30	−.71	.040	−.256	−.100	.0039
1983	−2.27	−.69	.042	−.257	−.102	.0041
1985	−1.94	−.51	.042	−.223	−.082	.0042
1987	−1.82	−.46	.044	−.203	−.076	.0041
1989	−1.67	−.37	.044	−.195	−.068	.0043
1991	−1.51	−.26	.046	−.180	−.055	.0045
1992	−1.46	−.26	.047	−.175	−.055	.0047
Professionals and Administrators Only						
1976	−1.49	−1.33	.008	−.200	−.179	.0011
1977	−1.35	−1.12	.012	−.191	−.164	.0014
1981	−1.17	−.94	.013	−.173	−.144	.0016
1983	−1.13	−.85	.018	−.174	−.137	.0023
1985	−.95	−.74	.015	−.150	−.120	.0022
1987	−.84	−.61	.018	−.129	−.103	.0020
1989	−.69	−.50	.016	−.122	−.095	.0022
1991	−.61	−.41	.016	−.111	−.082	.0023
1992	−.60	−.39	.017	−.109	−.080	.0024

Note: Regression models include age, length of federal service, level of education, major field of study in college, region of employment, eligibility for veterans' preference, and handicap status.

Source: U.S. Office of Personnel Management, *Occupations of Federal White-Collar and Blue-Collar Workers,* various years.

All coefficients are significant at the .0001 level (two-tailed tests).

respectively, nearly as much as in 1977 [.25 and .026]). Regression on professional and administrative occupations alone also demonstrated the expected effect: as women increased their share of an occupation, expected grade and salary declined. Thus, both occupation-level and individual-level analyses confirmed that increasing representation of women was associated with declining occupational grades and salaries.

Integration and pay inequality. If occupational segregation is a major cause of pay disparities between men and women, then desegregation of the occupational structure should lead to greater male-female pay equality. Table 5 shows the effects on grade and salary of gender and occupational composition for several years, with controls for experience, age, education, major field of study, veterans' preference, and disability status. As seen in the first column of each set, unexplained grade and salary differentials between white, non-Hispanic men and women narrowed steadily between 1976 and 1992. For occupations generally, the grade gap shrank from 2.60 to 1.46 and the salary differential narrowed from .273 to .175. Progress was nearly as impressive in professional and administrative occupations, with the grade gap narrowing from 1.49 to .60 and the salary differential from .179 to .080.

The gender composition of occupations appears to explain much of the grade and salary gap left unexplained by individual characteristics. In the estimation for 1976, adding the percentage male in one's occupation to the grade model increases R^2 by .05 and lowers the coefficient on Female by 1.55 (from −2.60 to −1.05), a decrease of nearly 60% in the unexplained grade gap.

In the estimation for 1992, adding percentage male to the grade equation increases R^2 by .09 and lowers the Female coefficient by 1.20 (from −1.46 to −.26), a decrease of more than 80%. The impact is nearly as large for the natural logarithm of salary.

The fact that most professional and administrative occupations were male-dominated explains most of this pattern. When I restricted the analysis to those occupations, the impact of gender composition was much smaller (partly because the segregation was less extreme). In the 1976 grade equation, adding percentage male to the grade equation shrank the Female coefficient by .16 (from −1.49 to −1.33), a decline of 11%. For 1992, the coefficient shrank by .21, about 35%. Effects were nearly as large for salary.

The decline in occupational segregation appears to have played a more limited role in equalizing pay than these figures would suggest. The coefficients on percentage male rise steadily over time, counteracting the effect of shrinking segregation to some extent. Among occupations generally, the gender composition of occupations explains a 1.55 male-female grade gap in 1976 and a 1.20 grade gap in 1992. Thus, the grade gap associated with sex segregation declined .35, accounting for 31% of the 1.14-grade narrowing of the unexplained male-female grade gap. Declining segregation also explains .030 of the .098 shrinkage in the salary differential (31%).

In professional and administrative occupations, on the other hand, the rising coefficients on percentage male completely overwhelm the shrinkage of segregation. Controlling for gender composition lowers the Female coefficient more in the analysis of 1993 data than in the analysis of 1976 data (and the fluctuation seems quite random since 1977). Gender segregation affected professional and administrative women's earnings as much in the early 1990s as in the 1970s.

Conclusion

Gender integration of occupations has proceeded more rapidly and steadily in the federal civil service than in the general economy. Real, if slow, gender integration of federal white-collar occupations proceeded steadily between 1967 and 1993, with some acceleration after 1979 (contrasted with some deceleration in the general economy after 1979). The integration resulted partly from changing qualifications of female workers, but an equally large role was played by changes in occupational choices by individuals and changes in hiring and promotion decisions by federal supervisors. Women's occupational shares increased most in highly male-dominated, highly paid occupations, with substantial progress in professional and administrative positions.

The analysis yields somewhat mixed evidence on the impact of integration on grades in individual occupations. Occupation-level analysis shows that an increase in women's representation in an occupation lowered not merely the average grade in the occupation but also the average grades for both men and women. Individual-level analysis, however, suggests that grades and salaries for comparable workers were higher in integrating occupations than in non-integrating occupations. This unpredicted pattern disappears when type of occupation is controlled: professional and administrative occupations were integrating fairly rapidly but still increasing in relative grades and salaries. Within those occupations, however, the more rapidly integrating occupations experienced relative declines in grades and salaries. The bulk of the analysis supports earlier conclusions by Pfeffer and Davis-Blake (1987) and Baron and Newman (1989).

Although the gender composition of occupations seems to explain 80% of the otherwise unexplained grade gap between men and women in 1992, substantial declines in occupational segregation seem to explain only one-third of the drops in unexplained male-female grade and salary differentials. Most of women's gains came within occupations rather than from mobility across them. Integration of occupations, especially women's entry into professional and administrative occupations, is

decreasing gender inequality in federal pay, but not as much as cross-sectional analysis would predict. The reason seems to be the pattern noted by Blau and Beller (1988:526) for the general economy: "The return to being in a male or integrated occupation increased." Neither the overcrowding hypothesis nor the systematic-undervaluation-of-women's-work hypothesis clearly predicts such a pattern. This finding thus presents a puzzle requiring further development of theory. The practical implications suggest the necessity of combining comparable worth strategies with occupational desegregation as a means for reducing gender pay inequality.

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