THE EFFECTS OF GENDER AND RACE ON SALARY GROWTH: THE ROLE OF OCCUPATIONAL STRUCTURE IN A SERVICE SECTOR FIRM

Jennifer M. Mellor
University of Maryland at College Park

and

Elizabeth A. Paulin
La Salle University

INTRODUCTION

In March of 1994 Labor Secretary Reich ruled that a major US federal contractor "discriminated against women in both hiring and promotions in the mid-1970s" [Swoboda, 1994]. By explicitly recognizing the creation of "women's jobs" with little opportunity for promotion, the Secretary of Labor affirmed that key decision-makers within firms have a choice in structuring internal labor markets. The Secretary thus implicitly acknowledged their latitude in determining the formal and informal systems of rules that govern the hiring, firing, layoff, transfer, training, promotion, and pay of individuals, and the occupations in which they work.

This recent ruling once again raises the specter of gender (and race) bias in the development and evolution of firms' systems of rules. In this paper, we explore one aspect of that system: the relationship between salary growth and occupational segregation.[1] While the negative correlation between average earnings and the proportion of females and/or minorities in an occupation has been well documented [Blau and Beller, 1988; England, Chassie, and McCormack, 1982; Ferber and Lowry, 1976; Sorensen, 1989 and 1990; Terrell, 1992; Treiman and Hartmann, 1981; U.S. Bureau of the Census, 1987] we want to know if the same holds true for salary *growth*. In other words, do key decision-makers structure internal labor markets in ways that systemically restrict the salary growth of individuals employed in occupations with high concentrations of females and/or minorities?

We begin by setting up a framework that describes how gender and race bias can become imbedded in a firm's internal labor markets. From this, three hypotheses are generated — one of which allows for direct empirical examination of the question we have posed. We then describe the two branches of the financial services firm from which we gathered our data, explain how these data were compiled, and specify the OLS models of salary growth used to test our hypotheses.

While we find no overt bias in salary growth decisions, we do find evidence of institutional bias within one of the branches. In that branch the proportion of white females in an occupation is negatively related to salary growth for everyone but white males. Additional analysis of the results supports the contention that rules governing promotion and salary growth differ for white males, white females, and minority workers within this branch. Interestingly, the same analysis of the second branch leads to quite different conclusions.

THEORETICAL FRAMEWORK

Previously, we stated that key decision-makers in a firm have a choice when structuring internal labor markets. According to Osterman [1987], their decisions will reflect, in part, the emphasis placed on the often conflicting goals of cost effectiveness, flexibility, and predictability. Their decisions will also be subject to a set of constraints. Osterman identifies these as the physical technology, the social technology, the nature of the labor force, and the laws, regulations, and enforcement power of government. In order to understand how gender and race might influence these decisions (and hence affect salary growth), it is necessary to focus on the constraints imposed by the social technology.

Simply stated, social technology refers to the organization of society and its rules of behavior which in part govern the relationships between and among demographically distinct groups.[2] While physical technology places an overarching constraint on the production of goods and services (determining, for example, the limits on how information can be transmitted), social technology constrains the firm on another level. Sometimes working with and sometimes against the constraints imposed by the nature of the labor force and the laws and regulations of government, social technology introduces additional parameters which determine exactly how jobs are structured and related, who performs them, and how they are valued.

For example, social technology at the turn of the century was particularly antithetical to the economic advancement of women and minorities. Often codified in laws and regulations, it spawned a system of occupational segregation with female-dominated and minority-dominated jobs at the bottom of the occupational hierarchy and structured in ways that limited advancement. Compensation similarly reflected the extant social system. As stated in one employer's 1939 *Industrial Relations Manual:*

> The occupations or jobs filled by women are point rated on the same basis ... as are the jobs commonly filled by men.... The gradient of the women's wage curve, however is not the same for women as for men because of the more transient character of the service of the former, the relative shortness of their activity in industry, the differences in environment required, ...*and the general sociological factors not requiring discussion herein* (emphasis added). [*Westinghouse Industrial Relations Manual: Wage Administration,* November 1, 1938 and February 1, 1939, cited in Heen, 1984]

While times have changed, this historical ranking of men above women and whites above people of color can still be found in various degrees in the organization of our society and, consequently, in the organization of some firms. The key question is how pervasive it is.

Certainly, women and racial minorities are not always and everywhere relegated to positions which allow for little or no promotion or salary growth. Changes in the laws, regulations, and enforcement power of government can change the rules. So can changes in the nature of the labor force and in production technology. In addition, key decision makers, in striving to achieve their own goals may find the historical *modus operandi* obsolete and counterproductive. Alternatively, workers themselves may work toward change through collective bargaining or informal work groups. Once again the key question is how much the rules have changed. Is there any evidence to suggest that key decision-makers still structure their firm's internal labor markets in such a way that systemically restricts the salary growth of individuals employed in occupations with high concentrations of females and/or minorities?

To answer the latter question and test for the existence of a traditional social technology, we examine three hypotheses. All else equal,

> *Hypothesis 1:* salary growth for white males exceeds that for white females, minority females, and minority males;
>
> *Hypothesis 2:* the return to a promotion, as measured in terms of salary growth, is higher for white males than for the other three gender/race groups; and
>
> *Hypothesis 3:* high concentrations of white females, minority females, and/or minority males in an employee's occupation are negatively related to individual rates of salary growth.

If the social technology continues to be manipulated by historical stereotypes, we would expect some or all of these hypotheses to be validated. The extent of validation will depend upon the degree to which such a "traditional" social technology dominates any countervailing forces imposed by the firm's goals and constraints. Of course, if historical rankings no longer significantly influence social technology, or if the traditional social technology is otherwise no longer binding, each of our hypotheses should be refuted by the empirical evidence.

A DESCRIPTION OF THE FINANCIAL SERVICES FIRM

To test our hypotheses, we collected data on individuals employed in two branches of a financial services firm from 1988 through 1990. Using year-end data, we first merged employee records from 1988 and 1989, matching the records by employee number.[3] The matched file was then abridged to include only those full-time employees whose records appeared in both years. Using the data in the matched files, two additional variables were constructed and added to each record: salary growth (*PCTSAL*), the percentage change in salary from 1988 to 1989, and promotion (*DPROMO*), a dummy variable equal to one if the individual's grade level in 1989 exceeded that in 1988 and zero otherwise.[4] The same process was followed for the years 1989 and 1990. The two matched files were then pooled and a binary variable added to indicate from which matched file the observation originated. Finally, the

TABLE 1
Employment, Promotion, Salary, and Salary Growth

	Number Employed	Median Grade Level	Percent Promoted	Median Salary	Average Salary Growth Promoted	Average Salary Growth Not Promoted
Branch A						
All	664	28	37.7%	$18,113	17.8%	7.9%
White Females	419	28	36.4	$18,330	17.9	8.2
Minority Females	107	27	45.6	$15,805	15.9	8.1
White Males	100	30	37.7	$22,566	19.7	6.8
Minority Males	38	25	32.8	$15,975	16.6	6.5
Branch B						
All	374	27	29.5%	$15,418	18.7%	7.4%
White Females	319	27	30.2	$15,474	18.0	7.6
Minority Females	23	25	37.1	$11,271	28.6	7.2
White Males	30	28	15.8	$18,227	15.8	6.3
Minority Males	2	25	50.0	$14,468	28.7	6.4

Number employed refers to the number employed at the end of 1990. Other figures are generated from the combination of the two matched files.

pooled data were divided into two branch offices (which we will refer to as Branch A and Branch B) to permit separate analyses.[5]

Branch A is located in a major metropolitan area and employed over 650 workers in 1990. Branch B, located several hundred miles away in an area dominated by agricultural interests, employed approximately 375 workers in 1990. While both branches are similar in function and composition (both employ large proportions of women, 79 percent and 91 percent respectively), they differ in two critical respects. First, Branch A, as the organization's home office, houses a majority of the organization's top management, most of whom are male. Second, Branch A is located in a racially diverse metropolitan area, whereas Branch B is located in an area with few minorities. These differences can account in part for the larger proportion of males and minorities employed and the higher median salaries and grade levels in Branch A, shown in Table 1.

Table 1 also highlights salary growth differences between the two branches. For promoted employees, salary increases are higher on average in Branch B while salary growth for those who are not promoted is higher in Branch A. Gender and race differences also exist between the two branches. Among promoted employees in Branch A, annual salary growth was highest for white males at 19.7 percent, followed next by white females at 17.9 percent, with minority males and females at 16.6 percent and 15.9 percent respectively. In Branch B, on the other hand, the greatest gains in salary growth upon promotion were for minority males and females. White males in this latter branch received the lowest salary increases of the four gender-race groups in each of the promoted and not-promoted classifications. Even so, median salaries and median grade levels were higher for white males than for the other three gender/race groups in both branches of this firm.

THE MODEL

Using the data in the pooled-matched files, we posit the following model of salary growth:

$$PCTSAL_i = X_i B + T \cdot DPROMO_i + \epsilon_i. \quad (1)$$

$\mathbf{X}_i$ is a row vector of explanatory variables, grouped into three categories. A first set measures the individual's human capital accumulation and use with variables measuring tenure, age, and performance rating. Employees of the firm are evaluated by their supervisor at least once a year and given a performance rating which can theoretically range from a low of 1 to a high of 5. In our data set no employee received a 1 and only five employees received a rating of 2. Consequently, we model job performance using two dummy variables, *D-RATING(4)* and *D-RATING(5)* and consider a performance rating of 3 as our omitted category. These two dummy variables should be positively related to salary growth.

A second set of variables describes the individual's gender-race profile, allowing us to test Hypothesis 1. For Branch A we include three dummy variables *(D-WHFEM, D-MINFEM,* and *D-MINMALE)* which will have a negative effect on salary growth if overt gender and race bias exists. Given the demographic composition in Branch B, we alter the model specification by replacing the three dummy variables with one, *D-WHMALE*, which equals 1 for white males and 0 otherwise.

A third set of variables describes the occupation in which the individual works and allows for a direct test of Hypothesis 3. For Branch A, we include measures of the proportion of white females (*P-WHFEM*), minority females (*P-MINFEM*), and minority males (*P-MINMALE*) in the individual's occupation.[6] Again because of the demographic makeup of Branch B, we replaced *P-WHFEM*, *P-MINFEM*, and *P-MINMALE* with *P-WHMALE*, the proportion of white males, to capture the desired effect. Two other variables in this set are *OCCSIZE,* which controls for the total number of employees in the occupation, and *D-EXEMPT*, which identifies the exempt/nonexempt status of the occupation.[7] Exempt occupations are higher paying and of higher status, and also require more independent thought and responsibility. Given that these positions are generally less structured with respect to job duties, the evaluation and reward of employees in these positions is likely to be more subjective. Consequently, if the firm's key decision makers are influenced by historical stereotypes, we would expect to see a greater degree of bias in salary growth decisions in these upper-level positions. Thus, we include an addendum to Hypothesis 3 which states:

> The negative relationship (between salary growth and the concentrations of white females, minority females, and minority males in an occupation) is more pronounced among employees in exempt positions.

To these explanatory variables we add the dummy variable *DPROMO*, which allows us to test Hypothesis 2. A complication arises, however, from the fact that the unmeasured characteristics and activities affecting salary growth (e.g., ambition, networking, and similarity-attraction factors)[8] are likely to be the very same unmeasured characteristics and activities that affect promotion. Consequently, individuals will be sorted in a non-random manner into the promoted group and non-promoted groups. Thus, our coefficient on promotion will be overestimated unless we can take this non-random sorting into account.[9]

We correct for the presence of this bias with a two-step procedure similar to that developed by Heckman [1979]. In the first step, we estimate a probit model of promotion and use the maximum likelihood results to construct the inverse Mill's ratio for individuals within the promoted and non-promoted groups. In the second step, we add the inverse Mill's ratio (*LAMBDA*) to our salary growth model.[10] The OLS model we ultimately estimate is:

$$PCTSAL_i = X_i B + T \cdot DPROMO_i + \rho \cdot LAMBDA_i + \epsilon_i, \tag{2}$$

where

$$LAMBDA_i = DPROMO[\phi(Z_i\hat{\gamma})/\Phi(Z_i\hat{\gamma})] - (1 - DPROMO)\{\phi(Z\hat{\gamma})/[1 - \Phi(Z_i\hat{\gamma}]\}. \tag{3}$$

In Equation (3), ϕ is the standard normal probability density function, and Φ is the standard normal cumulative distribution function estimated from the probit model of promotion. The coefficient on *LAMBDA*, ρ, is equivalent to the covariance of the error terms in the salary growth and promotion models.

RESULTS

The results of the first step in the two-step procedure to correct for selectivity bias (maximum likelihood estimation of a probit model of promotion) are presented in Tables 2A and 2B.[11] These tables report the marginal effects and associated standard errors for the covariates for various samples of Branch A and Branch B employees.[12]

For each probit model we calculate the proportion of correctly predicted promotion outcomes. The proportion correct ranges from 0.66 for white males in Branch A to 0.88 for exempt employees in Branch B. Based on the results of likelihood ratio tests, each model is significant at the 5 percent level.

In general, the results of the probit model meet our expectations. For example, the dummy variables for performance rating, *D-RATING(4)* and *D-RATING(5)* are positive and significant in the majority of cases. The variables serving as proxies for the degree of competition for promotion are negative and significant as is the dummy variable for exempt/nonexempt status.

Several results stand out concerning the existence of a traditional social technology. First, the gender and race of an individual do not significantly affect the probability of promotion in either branch. The one exception is minority males in the Branch A full sample. On the other hand, the gender and racial makeup of the occu-

TABLE 2A
Marginal Effects on the Probability of Promotion: Branch A

	All (1)	White Females (2)	White Males (3)	Minority Females and Males (4)	Exempt (5)	Non-Exempt (6)
Individual Human Capital Characteristics						
TENURE	-0.0029	-0.0084	0.0149	0.0109	-0.0025	-0.0024
	(0.0108)	(0.0141)	(0.0301)	(0.0213)	(0.0105)	(0.0126)
TENURE^2	-0.0001	0.00004	-0.0006	-0.0003	0.000002	-0.0001
	(0.0004)	(0.0006)	(0.0013)	(0.0008)	(0.0004)	(0.0005)
AGE	0.0033	0.0030	-0.0180	0.0198	-0.0127	0.0043
	(0.0109)	(0.0139)	(0.0321)	(0.0241)	(0.0141)	(0.0119)
AGE^2	-0.0001	-0.0001	0.0001	-0.0003	0.0001	-0.0002
	(0.0001)	(0.0002)	(0.0004)	(0.0003)	(0.0002)	(0.0002)
D-RATING(4)	0.1074[a]	0.0895[a]	0.0076	0.3424[a]	0.0097	0.1282[a]
	(0.0351)	(0.0439)	(0.0946)	(0.1014)	(0.0456)	(0.0388)
D-RATING(5)	0.1763[a]	0.1735[b]	0.1506	0.3518	0.1021[c]	0.1275
	(0.0661)	(0.0780)	(0.1596)	(0.3212)	(0.0618)	(0.0921)
Competition for Promotion						
COMPETE(1)	-0.0697[a]	-0.0746[a]	-0.0233	-0.1025[b]	-0.0611[b]	-0.0590[a]
	(0.0123)	(0.0147)	(0.0356)	(0.0413)	(0.0250)	(0.0135)
COMPETE(2)	-0.0230[b]	-0.0304[b]	0.0195	-0.0310	0.0161	-0.0379[a]
	(0.0114)	(0.0146)	(0.0285)	(0.0305)	(0.0137)	(0.0130)
Structural Variables						
P-WHFEM	-0.2788[b]	-0.8313[a]	0.1642	-0.4522[c]	-0.2322[d]	-0.2935[b]
	(0.1224)	(0.2341)	(0.2390)	(0.2625)	(0.1454)	(0.1511)
P-MINFEM	-0.1861	-0.7738[a]	0.1560	-0.3240	-0.4639[c]	-0.0870
	(0.1804)	(0.2960)	(0.5228)	(0.3781)	(0.2497)	(0.2179)
P-MINMALE	-0.3319[c]	-0.6592[d]	-0.0695	-0.5634[c]	0.0670	-0.4418[b]
	(0.1892)	(0.4376)	(0.5500)	(0.2930)	(0.2217)	(0.2196)
D-EXEMPT	-0.2867[a]	-0.4026[a]	-0.2427[b]	-0.3478[c]		
	(0.0529)	(0.0740)	(0.1398)	(0.1804)		
OCCSIZE	-0.0024[b]	-0.0032[b]	-0.0011	0.0000	-0.0010	-0.0025[b]
	(0.0010)	(0.0012)	(0.0037)	(0.0022)	(0.0019)	(0.0011)
Individual Gender/Race Characteristics						
D-WHFEM	-0.0364				-0.0462	-0.0054
	(0.0569)				(0.0406)	(0.0754)
D-MINFEM	-0.0555			0.1495	0.1089	-0.0465
	(0.0699)			(0.1163)	(0.0934)	(0.0838)
D-MINMALE	-0.1712[c]				-0.2239	-0.1266
	(0.0987)				(0.1779)	(0.1100)
Matched-file Dummy Variable						
D-YEAR	-0.0630[c]	-0.0205	-0.1285[d]	-0.1856[b]	-0.0811[b]	-0.0425
	(0.0327)	(0.0419)	(0.0849)	(0.0719)	(0.0292)	(0.0376)

TABLE 2A (Cont.)
Marginal Effects on the Probability of Promotion: Branch A

	All (1)	White Females (2)	White Males (3)	Minority Females and Males (4)	Exempt (5)	Non-Exempt (6)
n	1001	674	131	196	221	780
ln(L)	-587.64	-379.01	-78.33	-110.22	-103.64	-474.05
c-ratio	152.81	123.21	21.57	45.35	31.50	113.41
PC	0.71	0.73	0.66	0.69	0.77	0.69

Marginal effects are calculated for a reference individual with the mean characteristics of each sample. Standard errors of marginal effects are in parentheses.
a. Significant at the 1 percent level (two-tail test). b. Significant at the 5 percent level (two-tail test).
c. Significant at the 10 percent level (two-tail test). d. Significant at the 10 percent level (one-tail test).
ln(L): the natural log of the value of the maximum likelihood function.
c-ratio: the likelihood ratio statistic computed as -2·ln(L0/L1), where L0 is the value of the likelihood function if all coefficients except the intercept term equal zero, and L1 is the value of the likelihood function for the full model [Aldrich and Nelson, 1984]. All c-ratios are significant at the 5 percent level.
PC: the proportion of correct predictions. If the estimated probability was greater than or equal to 0.5, we predicted that the individual would be promoted. If the probability was less than 0.5, we predicted that the individual would not be promoted.

pation does affect the probability of promotion in both branches, but in opposite ways. More specifically, an increase in the proportion of white females in a Branch A occupation negatively affects the likelihood of promotion for all subgroups but white males. Yet in Branch B an increase in the proportion of white males in an occupation negatively affects promotion (for all but exempt employees). Second, with one exception, the variables affecting the likelihood of promotion for white females and minorities in Branch A do not affect promotion for white males, suggesting that this latter subgroup of employees is subject to a different system of rules.

In Tables 3A and 3B we report results obtained from OLS models of salary growth which include *LAMBDA* as a regressor. The individual human capital characteristics generally perform as expected. Tenure decreases salary growth for white females in Branch A and for all samples in Branch B. In nearly all samples salary growth decreases with age. The dummy variables for rating categories 4 and 5 are consistently of the expected sign, and statistically significant in more than half of the cases.

In both branches of this firm the coefficients for the individual's gender and race are all insignificant, thus refuting Hypothesis 1, which posits larger salary growth for white males. This result holds even when workers are separated by exempt/nonexempt status.

The second hypothesis, which posits a greater return to promotion for white males, is tested through examination of the coefficient on *DPROMO*. In the models estimated *without* the selectivity correction factor, promotion does have a positive and significant effect on salary growth in all samples. In addition, the return to a promotion is higher for white males.[13] Inclusion of the selectivity correction factor, how-

TABLE 2B
Marginal Effects on the Probability of Promotion: Branch B

	All (1)	White Females (2)	Exempt (3)	Non-Exempt (4)
Individual Human Capital Characteristics				
TENURE	-0.0119	-0.0086	0.0001	-0.0060
	(0.0162)	(0.0178)	(0.0031)	(0.0206)
TENURE2	-0.0001	-0.0003	0.000009	-0.0005
	(0.0010)	(0.0010)	(0.0001)	(0.0013)
AGE	0.0116	0.0038	0.0058	0.0124
	(0.0165)	(0.0169)	(0.0117)	(0.0187)
AGE²	-0.0003	-0.0002	-0.0001	-0.0003
	(0.0002)	(0.0002)	(0.0002)	(0.0003)
D-RATING(4)	0.0387	0.0562	-0.0115	0.0569
	(0.0399)	(0.0445)	(0.0174)	(0.0466)
D-RATING(5)	0.2445ᵃ	0.2542ᵃ	0.0115	0.2104ᵃ
	(0.0639)	(0.0679)	(0.0202)	(0.0804)
Competition for Promotion				
COMPETE(1)	-0.0292ᵃ	-0.0320ᵇ	-0.0050	-0.0129
	(0.0111)	(0.0125)	(0.0074)	(0.0151)
COMPETE(2)	-0.0352ᵃ	-0.0320ᵇ	-0.0016	-0.0625ᵃ
	(0.0124)	(0.0134)	(0.0026)	(0.0181)
Structural Variables				
P-WHMALE	-0.7202ᵃ	-0.8403ᵇ	-0.0406	-0.7283ᵃ
	(0.2145)	(0.3221)	(0.0727)	(0.2612)
D-EXEMPT	0.0342	0.0752		
	(0.0642)	(0.0726)		
OCCSIZE	-0.0006	-0.0006	-0.0004	-0.0005
	(0.0007)	(0.0008)	(0.0006)	(0.0009)
Individual Gender/Race Characteristics				
D-WHMALE	-0.0044		0.0114	0.0154
	(0.0813)		(0.0169)	(0.1052)
Matched-file Dummy Variable				
D-YEAR	-0.0430	-0.0377	-0.0123	-0.0288
	(0.0342)	(0.0374)	(0.0179)	(0.0418)
n	631	548	100	531
ln(L)	-332.21	-279.27	-26.14	-294.60
c-ratio	90.08	71.10	42.00	64.06
PC	0.73	0.73	0.88	0.72

For notes see Table 2A.

TABLE 3A
OLS Model of Salary Growth With Selectivity Correction: Branch A

	All (1)	White Females (2)	White Males (3)	Minority Females and Males (4)	Non-Exempt (5)	Exempt (6)
Individual Human Capital Characteristics						
TENURE	-0.0394	-0.1205[c]	0.0485	0.0567	-0.0904	-0.0342
	(0.0552)	(0.0628)	(0.2148)	(0.1365)	(0.0822)	(0.0684)
AGE	-0.2044[a]	-0.1792[a]	-0.3429[a]	-0.1949[a]	-0.1664[a]	-0.2175[a]
	(0.0270)	(0.0302)	(0.1120)	(0.0575)	(0.0445)	(0.0304)
D-RATING(4)	1.6218[a]	1.3416[c]	2.9900[d]	3.2039[b]	2.4109[b]	1.6180[b]
	(0.6115)	(0.6907)	(2.0239)	(1.5515)	(0.9745)	(0.7350)
D-RATING(5)	0.8308	0.4761	2.7388[d]	-0.2502	1.5146[d]	0.5038
	(0.8380)	(1.0210)	(2.0222)	(2.3812)	(1.1364)	(1.2102)
Structural Variables						
P-WHFEM	-2.8419	-9.2210[b]	2.1436	-10.5345[c]	-4.1088[d]	-3.1018
	(2.2663)	(4.2125)	(3.6566)	(5.6315)	(2.6450)	(3.2579)
P-MINFEM	2.1114	-1.3302	5.9016	-12.1696[c]	2.7159	2.9174
	(3.2615)	(4.9139)	(9.4339)	(6.7266)	(3.8290)	(4.5491)
P-MINMALE	-1.7866	3.8742	-6.3855	-11.0621[c]	-1.5197	-2.2253
	(3.3213)	(7.2708)	(7.7932)	(5.8550)	(3.8059)	(4.3644)
D-EXEMPT	-0.4967	-1.3820	-0.7069	-3.1392[c]		
	(0.7624)	(1.1042)	(1.9892)	(1.8393)		
OCCSIZE	-0.0136	-0.0263[d]	0.0990	-0.0121	0.1175[a]	-0.0269[d]
	(0.0167)	(0.0192)	(0.1044)	(0.0261)	(0.0432)	(0.0186)
Individual Gender/Race Characteristics						
D-WHFEM	0.6896				0.6977	1.0987
	(1.2579)				(1.1065)	(2.0394)
D-MINFEM	-0.7786			0.8866	0.4074	0.2065
	(1.4484)			(1.5690)	(2.2010)	(2.5446)
D-MINMALE	-0.1667				0.4308	-0.5680
	(1.9679)				(2.5098)	(2.1054)
Treatment Effect and Selectivity Correction						
DPROMO	3.5896[d]	3.4995[d]	-1.5684	-1.5191	10.3927[a]	0.1239
	(2.2264)	(2.5936)	(7.5771)	(3.0115)	(2.4365)	(2.9853)
LAMBDA	3.5081[b]	3.2043[c]	8.4405[c]	6.1836[a]	-1.1546	5.6379[a]
	(1.4442)	(1.6964)	(4.8868)	(1.9324)	(1.6213)	(1.8779)
Matched-file Dummy Variable						
D-YEAR	0.6249	0.9514[d]	-1.9115	0.1518	0.9883	0.7085
	(0.5645)	(0.6414)	(2.1055)	(1.1406)	(0.9287)	(0.6584)
Constant	19.1542[a]	24.9582[a]	22.6055[a]	24.4288[a]	11.5682[a]	21.7692[a]
	(3.0738)	(5.4453)	(7.1847)	(7.2761)	(3.2568)	(3.8866)
n	1001	674	131	196	221	780
R^2	0.2864	0.3059	0.3624	0.3265	0.3722	0.2799
Adjusted R^2	0.2755	0.2933	0.2976	0.2784	0.3295	0.2667
F-Statistic	26.36	24.28	5.59	6.79	8.72	21.24

The dependent variable, salary growth, is calculated as a percentage change. White's [1980] standard errors are in parentheses. a. Significant at the 1 percent level (two-tail test). b. Significant at the 5 percent level (two-tail test). c. Significant at the 10 percent level (two-tail test). d. Significant at the 10 percent level (one-tail test).

TABLE 3B
OLS Model of Salary Growth With Selectivity Correction: Branch B

	All (1)	White Females (2)	Exempt (3)	Non-Exempt (4)
Individual Human Capital Characteristics				
TENURE	-0.6064[a]	-0.6210[a]	-0.2164[c]	-0.6802[a]
	(0.1024)	(0.1143)	(0.1147)	(0.1171)
AGE	-0.0764[b]	-0.0908[b]	-0.0125	-0.0532[d]
	(0.0385)	(0.0391)	(0.0545)	(0.0395)
D-RATING(4)	0.4547	1.2708[b]	0.2945	0.8085
	(0.6036)	(0.5880)	(1.4452)	(0.6752)
D-RATING(5)	1.8437	2.4388[c]	4.3794[b]	1.4465
	(1.4423)	(1.4239)	(1.9665)	(1.8256)
Structural Variables				
P-WHMALE	-7.9779[b]	-8.0592[d]	-5.4895[b]	-7.8729[c]
	(3.6264)	(5.0664)	(2.7780)	(4.2396)
D-EXEMPT	-2.9201[a]	-2.3917[a]		
	(0.7844)	(0.9253)		
OCCSIZE	-0.0317[b]	-0.0258[b]	-0.0773[b]	-0.0340[a]
	(0.0125)	(0.0128)	(0.0387)	(0.0131)
Individual Gender/Race Characteristics				
D-WHMALE	-1.4279		-1.1549	-0.2930
	(1.2807)		(0.9944)	(1.6497)
Treatment Effect and Selectivity Correction				
DPROMO	1.3640	-1.0868	1.3041	3.0400
	(2.3789)	(2.4714)	(2.1621)	(2.6912)
LAMBDA	5.4848[a]	6.5915[a]	3.0580[b]	4.4764[b]
	(1.6463)	(1.7663)	(1.4295)	(1.8510)
Matched-file Dummy Variable				
D-YEAR	7.6770[a]	7.7652[a]	-2.4459[b]	9.4410[a]
	(0.6135)	(0.6347)	(0.9838)	(0.6692)
Constant	17.2300[a]	17.9858[a]	12.4029[a]	14.9799[a]
	(2.9136)	(3.0427)	(3.6691)	(3.1033)
n	631	548	100	531
R^2	0.4332	0.4318	0.4454	0.4606
Adjusted R^2	0.4231	0.4212	0.3831	0.4502
F-Statistic	43.00	40.81	7.15	44.40

The dependent variable, salary growth, is calculated as a percentage change. White's [1980] standard errors are in parentheses. a. Significant at the 1 percent level (two-tail test). b. Significant at the 5 percent level (two-tail test). c. Significant at the 10 percent level (two-tail test). d. Significant at the 10 percent level (one-tail test).

ever, reduces both the size and significance of these coefficients and dramatically changes our results.[14] In 7 of the 10 models displayed in Tables 3A and 3B, promotion has no significant effect on salary growth. Only among the full, white female, and exempt samples in Branch A is the promotion coefficient positive and significant. Thus, our second hypothesis is also refuted by the evidence.

Hypothesis 3, which posits a negative relationship between salary growth and the concentration of white females, minority females, and/or minority males in an occupation, is partially supported by the Branch A results. In samples of white females and minorities, increases in the proportion of white females significantly reduce salary growth. In the minority subgroup we also find that high concentrations of minority females and minority males significantly decrease the percentage change in salary. White males provide the exception: their salary growth is not significantly affected by the concentration of white females, minority females, or minority males in their occupation.

Also as expected we find that the proportion of white females negatively affects salary growth for those in exempt positions but not for those in nonexempt positions. While the proportion of minority females and the proportion of minority males in an occupation does not affect salary growth in either group, we must note that only 5 percent of exempt employees in Branch A are minority females and only 3.2 percent are minority males.

Although the results from Branch A generally confirm our hypothesis regarding salary growth and occupational structure, the results from Branch B refute it. The first two columns of Table 3B report that an increase in the proportion of white males leads to a decrease in salary growth, not the increase expected. And while the effect on salary growth is greater in the exempt positions, the negative effect is again related to the proportion of white males in the occupation.

DISCUSSION

This study was driven by one principal question: do key decision makers within a firm structure internal labor markets in a way that systemically restricts the salary growth of individuals employed in occupations with high concentrations of females and/or minorities? Based on our results from one branch of this firm (Branch B) the answer is definitely no. Contrary to expectations, salary growth in that branch is negatively affected by the proportion of *white males* in an occupation. Based on our results from another branch (Branch A), however, the answer is a qualified yes. There, salary growth for white females is negatively affected by their concentration in an occupation while salary growth for minorities is negatively affected by both the proportion of white females and minorities. Here, we provide a plausible interpretation of the results from Branch A in terms of the social technology and explore some possible reasons why the results from the two branches differ so radically.

Evidence of a Traditional Social Technology

Earlier in this paper we argued that a negative correlation between salary growth and the concentration of females and/or minorities in an occupation suggests the existence of a "traditional" social technology. According to our definition, a traditional social technology ranks men above women and whites above people of color. To the extent that such a social technology influences a firm's decision-makers we may observe behavior ranging from overt bias against women and minorities to more subtle forms of bias such as gender-based differences in the determination of acceptable conduct. We may also observe the construction of gender and race-based occupations that do not threaten the "natural order." And we may observe different systems of rules applied to these occupations and to individuals within them.

The results from Branch A disavow any suggestions of overt bias against women and minorities in the salary growth process. However, there is evidence of gender and race-based occupations with different systems of rules. Furthermore, the rules appear to be applied unevenly across individuals. Consider that neither salary growth nor promotion of white males in this branch are negatively affected by the concentration of white females or minorities in their occupations. Yet, these same occupational descriptors adversely affect the promotion and salary growth of individual white females and minorities.

A more detailed and technical analysis of the impact of promotion on salary growth provides further evidence of a traditional social technology. As mentioned in the previous section, our OLS models estimated *without* the selectivity correction factor show that promotions significantly increase salary growth. The promotion effect ranges from 7.6 percentage points for minorities to 11.5 percentage points for white males. At first glance it appears as though white males in Branch A experience a greater return to promotions than any other gender/race group.

However, after correcting for selectivity bias the return to promotion is reduced, confirming that the return is overstated in the models without *LAMBDA*. As expected the same unobserved characteristics and activities that positively affect the probability of promotion also positively influence salary growth. The size of the drop in the promotion coefficient and the corresponding size of the coefficient on *LAMBDA* are both linked to the size of the covariance between the unobservables in the promotion model and the unobservables in the salary growth model. For white males, where the promotion coefficient drops the most, unobservables such as ambition, networking, and similarity-attraction factors are more closely tied to both promotion and salary growth decisions than for other groups.

For white females these same factors are positively related to both decisions, but they are not as closely linked. For example, ambition may be viewed as a very desirable characteristic for a female employee applying for a promotion, but not as desirable when considered for a salary increase in her current position. The differences in how these factors are rewarded by key decision-makers suggests a different system of rules for white females and white males.

The comparison of white males with minorities in Branch A is obfuscated by "institutional noise." Interviews with a personnel administrator revealed that some of the clerical positions, staffed largely by minority females, had been subject to a formal reevaluation just prior to the period under study. As a result of this reevaluation these jobs were assigned a higher grade level to reflect the more advanced skills and knowledge required. Consequently, those employed in these jobs (primarily minority females) received a promotion and a salary increase during the period studied. This "unobserved" phenomenon, linked to both promotion and salary growth, might very well be the prime explanation for the large drop in the *DPROMO* coefficient and the high magnitude of the *LAMBDA* coefficient.

Clearly, this latter action by key decision-makers in Branch A represents an attempt to correct internal inequities. One might argue that even standard economic theory predicts an increase in real wages resulting from an increase in the marginal product of labor, which is certainly what we see here. However, the length of time it took for the increased marginal productivity to translate into higher real wages can be explained only by considering the constraints facing decision-makers. Possibly the timing of the reevaluation and consequent increase in status and pay coincided with a partial breakdown in the traditional social technology.

The Breakdown of Traditional Technology and Rural-City Differences

What can account for the differences between the branches?[15] One possible explanation might lie in the existence of an optimal "rural-city" salary differential that has yet to be achieved.[16] Suppose the firm has an optimal "rural-city" salary differential for each grade level, d_g, where g is grade level. This differential implies that rural (Branch B) salaries will equal some percentage (e.g., 90 percent) of the city (Branch A) salaries:

$$s(B)_g/s(A)_g = d_g < 1.$$

Suppose also that the actual ratio is less than the optimal in those grades containing a disproportionate share of occupations with high concentrations of white females and minorities, f:

$$s(B)_{gf}/s(A)_{gf} < d_g.$$

And, finally, suppose that the actual ratio is larger than the optimal for grade levels containing a disproportionate share of occupations with higher concentrations of white males, m:

$$s(B)_{gm}/s(A)_{gm} > d_g.$$

If these suppositions are true, then it is feasible that the firm would limit salary growth in those Branch A grades containing occupations with high proportions of females and minorities and in those Branch B grades containing occupations with high proportions of males.

We tested this hypothesis using 1990 data, calculating the average salary by grade level for Branch A (city) and Branch B (rural). We found that the ratio of Branch B to Branch A salaries was quite small for the nonexempt grades with the Branch A employees experiencing a rather large salary advantage. If this ratio is smaller than what the firm deems optimal, the firm will attempt to reign in Branch A salaries by limiting salary increases. Given that those occupations with high concentrations of white females and minorities are generally found in the nonexempt grades, it follows that the proportion of white females and minorities in an occupation will be negatively correlated with salary growth for Branch A employees but not for Branch B, consistent with our results.

Furthermore, the 1990 data also show very little difference in average salaries in the exempt grades. Indeed, in some grades the average Branch B salary exceeds the average Branch A salary. If this ratio of Branch B to Branch A salaries is larger than what the firm deems optimal, the firm will attempt to limit the salary increases in the Branch B exempt grades. Given that those occupations with higher concentrations of white males are generally found in the exempt grades, it follows that the proportion of white males in an occupation will be negatively correlated with salary growth for Branch B employees but not for Branch A, again consistent with our results.

One weakness of this explanation is that it does not correspond to the changes that have occurred over time. If an optimal differential exists and if the firm's salary growth decisions were based upon the achievement of such an optimal differential, we would expect to see the salary advantage of Branch A employees in the nonexempt grades getting smaller over time while the salary advantage of Branch A employees in the exempt grades gets larger. When we compare 1988 data with 1990 data no such pattern emerges. Between 1988 and 1990 the salary advantage of Branch A employees *increased* in six of the ten nonexempt grades and *decreased* in four of the six exempt grades, contrary to expectations.

Possibly it is not a "rural-city" salary differential but rather another kind of "rural-city" differential that is at the root of this enigma. As mentioned in the second section, the structure of a firm's internal labor markets reflects the decision-makers' goals and the constraints they face: the physical technology, the social technology, the nature of the labor force, and the laws, regulations, and enforcement power of government. In all likelihood, the goals and the constraints imposed by the physical technology and government are very similar across the two branches. What is likely to differ, however, is the social technology, the nature of the labor force, or both.

Suppose that key decision-makers in both branches were at one time severely constrained by a traditional social technology, which would account for the higher median grade level and earnings of white males in both branches. Suppose also that the traditional social technology is breaking down, but at different rates in each of the branches.

As a traditional social technology begins to break down, we would first expect to see the elimination of overt bias in hiring, promotion, salary determination, etc., since overt bias is easier to detect and easier to eliminate. With the exception of minority males in Branch A, results from both branches indicate an absence of overt bias in promotion and salary growth. We could interpret this as a breakdown in the traditional social technology.

Institutional bias takes much longer to eliminate and is harder to detect since there is no "smoking gun." In addition, occupational structures and job ladders take longer to restructure due to the resources involved in such an undertaking. Nonetheless, as traditional social technologies give way to more modern forms of social organization we would expect criteria for judging internal equity to change. As occurred with some of the minority female occupations in Branch A, we would expect an upgrading of female-dominated and minority-dominated occupations in terms of status and pay.

If the rate of change in the social technology is larger in Branch B or if the transformation began earlier, we would expect to observe systems of rules which differ markedly from those in Branch A. It may be that this is exactly what the patterns of salary growth are telling us. Possibly, the traditional social technology in Branch B has been replaced, and new rules have been imposed on the evaluation of internal equity. If this is the case, previous gender and race-based inequities that were once judged legitimate might now be considered unacceptable. Consequently what we might be seeing currently is the attempt to partially rectify the inequities through the restriction of salary increases for those in occupations with larger proportions of white males.

Without a detailed ethnographic study of the two areas, we can only speculate about the differences in the social technologies embodied in the internal labor markets of the two branches. Our conclusion then is a modest one. While we readily admit that our interpretation of the results needs closer scrutiny, we are nonetheless convinced that economists need to reach beyond the limits of traditional theory in order to fully understand the operation of internal labor markets.

NOTES

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1. The impact of gender and race on promotions is investigated by the authors in "Gender, Race and Promotions within a Private Sector Firm," *Industrial Relations,* forthcoming.
2. Our focus in this paper is on gender and race, thus explaining our emphasis on demographically distinct groups. We recognize, of course, that social distinctions are based not only on gender and race, but also on class, religion, age, and ethnicity.
3. According to the records, there was very little turnover in the two branches of this firm during the period under study.
4. According to the company's employees' manual, a promotion is defined by "(a) movement from one job to another job with greater responsibility as reflected by a higher job grade. A move between jobs of the same grade is a lateral move — not a promotion." Employees who worked solely on commission are excluded from our analysis as are employees in the two highest grade levels (36 and 37). Pertinent information on these latter individuals (vice-presidents and executive vice-presidents) is missing.
5. This technique is similar to that followed by Hartmann [1987].
6. The original data set contained over 400 different job titles. With the aid of a personnel officer at the home office, we were able to consolidate these job titles into 44 "occupations," based loosely upon the definitions contained in the *Dictionary of Occupational Titles*. The largest occupation employs 72 individuals while the smallest employs 1.
7. Within this firm, nonexempt employees are in grade levels 20 through 29. Exempt employees are in grade levels 30 through 37.

8. For a discussion of the impact of similarity-attraction factors on labor market outcomes see Beehr and Juntunen [1990], Byrne [1971], and Tsue and O'Reilly [1989].
9. The coefficient on promotion will be unbiased if (1) the covariates in **X** are perfectly correlated with the unmeasured characteristics and activities; (2) promotion is purely random; or (3) the covariates in **X** are perfectly correlated with the factors that determine promotion [Barnow, Cain and Goldberger, 1980]. Each of the three conditions for unbiasedness is highly improbable.
10. To model promotion so that its outcome is orthogonal to the salary growth outcome we include two instrumental variables, *COMPETE(1)* and *COMPETE(2)*, which measure the possible competition for promotions one and two grade levels above one's current position. Each is a ratio of the number of possible openings at that higher grade level to the number of individuals one and two grade levels below. (In Branch A, 54.6 percent of promotions involved a promotion of one grade level while 30.3 percent involved a promotion of two grade levels. The comparable figures for Branch B are 50.0 percent and 26.1 percent.) We expect that an individual's probability of promotion will be negatively affected by the intensity of the competition, yet that salary growth will be unaffected by these variables. See Greene [1993], Barnow, Cain and Goldberger [1980], and Heckman [1979] for a more detailed discussion of selectivity bias and "treatment effects."
11. We were not able to estimate separate models for minority females and minority males in Branch A because the number of minority males (56) was too small to generate maximum likelihood estimates that were unbiased, efficient, and normally distributed. Similarly, in Branch B the numbers of white males (51), minority females (28), and minority males (4), were also too small to estimate separate models.
12. Marginal effects for quantitative variable, $\mathbf{X}_k$, were calculated as $dP(Y=1)/d\mathbf{X}_k = \phi(\mathbf{z}\hat{\alpha})\hat{\beta}_k$ where **z** is a vector of explanatory variables evaluated at their means, and $\hat{\alpha}$ is the vector of estimated coefficients. Marginal effects for qualitative variables, $\mathbf{X}_j$, were calculated as $dP(Y=1)/d\mathbf{X}_j = P(Y=1 \mid \mathbf{X}, \mathbf{X}_j = 1) - P(Y=1 \mid \mathbf{X}, \mathbf{X}_j = 0)$. In the case of tenure and age, which are squared in our models, a "net" marginal effect would account for the quadratic relationship with promotion. Tables showing the maximum likelihood estimates are available upon request.
13. This result is only indirectly seen for Branch B employees where the promotion coefficient for white females is smaller than for all employees. Tables are available upon request.
14. The one exception is for exempt employees in Branch A. In this sample the promotion coefficient increases in both size and significance.
15. Results obtained from prior studies of the impact of the concentration of females and/or minorities in an occupation on salary growth are as mixed as our own. For example, Kelley [1982], focusing on the gender/race composition of seniority units in a large manufacturing concern, found that those seniority units with a high percentage of females and/or minorities received smaller wage increases than those with high percentages of white males. Yet in a different empirical study focusing on the concentration of females (and minorities) in the managerial, professional, and technical occupations of a large insurance firm, Hartmann [1987] found evidence of a posititve relationship.
16. Our thanks to Steve Pressman for suggesting this avenue of inquiry.

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