SOME EMPIRICAL EVIDENCE ON THE USE OF GENDER SPECIFIC PROMOTION RULES

Robert Kaestner
Rider College

INTRODUCTION

Women's lack of progress in moving up the corporate ladder is often associated with a form of occupational segregation in which female managers of a firm are relegated to the entry level and some middle-management jobs, but are effectively prohibited from obtaining higher paying positions within the firm. The phenomenon has been popularly labeled the "glass ceiling": female managers are close enough to see the next level without being able to reach it. Other popular issues, such as the "mommy track", can also be thought of as a form of occupational or "job" discrimination. In both cases, the firm treats male and female employees differently when deciding on promotions and career tracks.

In a recent article, Lazear and Rosen [1990] develop a "jobs" theory of discrimination which provides an explanation for the "glass ceiling" and is consistent with much of the recent empirical evidence regarding the pay and occupational differences between men and women [Seiling, 1984; Olson and Becker, 1983].[1] In the Lazear and Rosen "jobs" theory of discrimination, men and women receive equal treatment within the same job, but men are given preferential treatment at the time of promotion. Firms prefer to promote men because they expect men to remain with the firm longer than women. Thus, an equally capable man and woman in any particular job will be paid the same, but the man will have a better chance of being promoted to a higher paying position. The result is that lifetime wages of men are greater than those of equally qualified women. Men are able to move up the "job ladder" while women remain at the bottom of the firm hierarchy.

The Lazear and Rosen (L&R) [1990] model is a formal representation of the widely held view that the inferior labor market outcomes of women are due to their discontinuous labor force participation. This view is consistent with the traditional model of firm-specific on-the-job training presented by Becker [1975] and Hashimoto [1981], in which part of the costs of training are paid for by the firm. Under these conditions, the employment relationship must be lasting in order for the firm to recoup its investment. Black and Lowenstein [1989] also present a model with predictions similar to those of L&R, and which is based on differing labor market attachments of men and women.

Eastern Economic Journal, Vol. 20, No. 2, Spring 1994

In this paper, empirical evidence is presented which supports the L&R "jobs" theory of discrimination and the more general notion that an employee's expected tenure is an important determinant of promotion. Using the personnel files of a Fortune 500 company, an analysis of the firm's promotion decision is carried out paying special attention to the role that employee separations play in such a decision. In particular, three of the theoretical predictions of the L&R model are put to an empirical test. First, does the incidence of employee separations from the firm significantly influence the promotion decision? Second, does the difference in promotion rates between men and women diminish with ability? Finally, do differences in promotion rates diminish with the number of previous promotions? The first of the three predictions is quite general and reflects a commonly held belief, while the latter two are more specific to the L&R model.

LAZEAR-ROSEN MODEL

The L&R model is based on a firm's cost-benefit analysis of promotion and in this regard shares common ground with the utility analysis models found in the human resource management literature [Boudreau and Berger, 1985]. The cost of promoting an employee is the lost output resulting from on-the-job training, and the benefit of promotion is the increased productivity, or output, of the newly trained worker. The firm will promote an employee if the benefits are greater than the costs. There is an additional factor that needs to be considered, however, and that is the probability that the trained employee will remain on the job after the promotion. Although there is no direct monetary loss associated with such a separation in the L&R model, by not taking account of this factor the firm would be misallocating its resources.[2] A firm which fully considers the issue of employee separations will be able to produce more output, with a given level of resources, than a similar firm that neglects this issue.

The L&R model considers a firm in which there are two jobs, A and B, and job A is more productive. It is efficient to promote high-ability workers to job A, since "...ability and job productivity are assumed to be complements." [Lazear and Rosen, 1990, S112].[3] Ignoring the non-market production aspects of the L&R model, output in job A, in a three-period model, is

$$q + qa_1 + qa_2F(qa_2)\ ,$$

where q is the level of output associated with ability level z, $a_1 < 1$ is a parameter that denotes the loss of output due to training for job A in period 2, $a_2 > 1$ is a parameter that measures the increase in output in period 3 due to training, and $F(qa_2)$ is the cumulative probability of staying on the job in period 3, given that the employee has ability level z, and output of qa_2. There is a one-to-one mapping of ability into output. The probability of staying on the job, $F()$ is a function of the value of non-market work and the level of employee output. An employee will only remain on the job if the wage exceeds the value of non-market time, and the wage is equal to output in all periods.[4]

If the employee remains in job B, his output would be

$$q + q + qF(q),$$

where everything is defined as before. It is important to note that $F(qa_2)$ is greater than $F(q)$, and therefore the probability of staying on the job is dependent upon whether or not the employee receives a promotion to job A. In a cost-benefit framework, the firm compares the output of the employee in job A and job B. If the output is greater in job A than B, the worker is promoted. This decision can be represented as

$$qa_2F(qa_2) - qF(q) > q(1-a_1)\ . \tag{1}$$

If the left-hand side, the benefits of promotion, is greater than the right-hand side, the cost of promotion, the employee is promoted.

The first point to be gleaned from this brief review of the L&R model is that promotion decisions are based upon two factors: the ability level of the employee and the expected probability that the employee will remain with the firm. Second, it should be noted that causality runs in both directions; separations affect promotions, but promotions also affect separations. An employee who is promoted will be less likely to separate since the absolute difference between the wage and the value of alternative uses of time will increase.

The L&R model leads to several testable hypotheses. First, the probability of being promoted depends on the probability of staying with the firm, and the inclusion of such a variable in a promotions model should have a significant impact on an employee's chance of promotion. This implies that two equally able individuals, say a male and a female employee, will not necessarily have the same promotion chances if their expected probability of staying with the firm differs. Next, the impact of the probability of staying with the firm on the promotion decision should decrease with ability, because at higher levels of ability, the probability of staying with the firm approaches one for all distribution functions (e.g. both male and female). Finally, the model implies that employees with low expected probabilities of staying with the firm, who have been previously promoted, are more able than other promoted employees with higher expected probabilities of staying with the firm. Thus, the difference in promotion rates between employees (e.g. male and female) with different expected probabilities of staying with the firm will decline, conditional on the number of previous promotions. The higher ability level of the employee from the group with the lower probability of staying with the firm, will offset the disadvantage associated with this lower probability.

EMPIRICAL SPECIFICATION

The firm is interested in promoting the most able employee, and thus, an empirical model of promotions is similar to the standard human capital model of earnings. Employee ability is unobserved and assumed to be a function of the employee's accumulated stock of human capital. In addition to ability, the firm

considers whether the employee is expected to remain with the firm long enough to recoup its investment in the employee. Therefore, an empirical model of the promotion decision should include a measure of the employee's probability of staying with the firm. Inclusion of the probability of staying with the firm raises an empirical problem, however, since this probability is dependent on whether or not the employee receives a promotion. Thus, it is necessary to estimate a two-equation model in order to account for their interdependence. In general, the model can be written as follows:

$$P = \mathbf{X}b_1 + \mathbf{Z}b_2 + Sb_3 + e_p , \tag{2}$$

$$S = \mathbf{X}d_1 + \mathbf{Z}d_2 + Pd_3 + e_s , \tag{3}$$

where P is an index equal to one if the employee was promoted, zero otherwise; S is an index equal to one if the employee separates from the firm, zero otherwise; $\mathbf{X}$ is a vector of human capital variables; $\mathbf{Z}$ is a vector of firm specific variables; the b_i and d_i are parameters to be estimated; and the e_i are normally distributed random variables.

The dependent variables are both discrete, binary indicators and thus require the use of appropriate maximum-likelihood estimation procedures. In this paper, equations (1) and (2) will be estimated by probit methods, consistent with the normality assumption regarding e_i. To address the simultaneity problem, the two-step procedure described in Maddala [1983] is used to estimate the model. This estimation strategy has been shown to yield consistent parameter estimates when the dependent variables are discrete [Maddala, 1983].

DATA

The data for the analysis was drawn from the personnel file of a large U.S. manufacturing firm, which is a member of the Fortune 500. The file was originally assembled for a sample of management employees with at least a bachelors degree at the time of hire. For this analysis, it was further restricted to employees who were white, had fewer than twenty-five years of service with the firm, and were active in the firm in 1979, 1980 or 1981. The sample was restricted to white employees in order to avoid confounding the results regarding gender discrimination with those of race discrimination. Long-tenured employees were omitted from the analysis in accord with the spirit of the L&R model. Separating from the firm due to retirement is qualitatively different from other types of separations. An employee with long tenure who retires is assumed to have met the terms of the implicit contract. The available data does not identify the reason for separation, and thus, the above rule of twenty-five years of service is used as a proxy for retirement.[5]

The firm under study is a high-wage industry leader that relies heavily on highly trained scientific and engineering personnel.[6] The use of this type of data is in some ways perfectly suited for examining the validity of the L&R model, since this

TABLE 1
Distribution of Employees' Salary Grade at Time of Hire By Current Salary Grade in 1981

CURRENT SALARY GRADE	SALARY GRADE AT HIRE	MALES TOTAL EMPLOYEES	MALES FREQ(%)	FEMALES TOTAL EMPLOYEES	FEMALES FREQ(%)
1-3	1	1642	388(24)	586	250(43)
	2	(17%)	889(54)	(59%)	259(44)
	3+		365(22)		77(13)
4-6	1-3	3633	2547(70)	329	250(76)
	4	(37%)	242(7)	(33%)	14(4)
	5		662(18)		54(16)
	6+		182(5)		11(3)
7-9	1-3	4126	2357(57)	76	42(55)
	4-6	(42%)	1581(38)	(8%)	28(37)
	7		122(3)		3(4)
	8+		66(2)		3(4)
10-11	1-3	537	296(55)	4	0(0)
	4-6	(5%)	184(34)	(0%)	1(25)
	7-9		38(7)		2(50)
	10-11		19(4)		1(25)
ALL	1-3	9938	6802(68)	995	878(88)
	4-6		2882(30)		107(11)
	7-9		234(2)		9(1)
	10-11		20(0)		1(0)

Approximately one percent of sample received a demotion so the current grade can be below the starting grade. Due to rounding all numbers may not add to 100 percent.

firm has many of the characteristics that make the "jobs" concept relevant. The firm has a clearly defined internal labor market, where employees begin their careers in starting (low) salary grade levels, and later receive promotions to higher salary grades (see Table 1). The salary grade levels distinguish employees by level of responsibility as well as pay. Individuals in the upper salary grades are more likely to be in supervisory roles and have a broader set of responsibilities. For example. regional and area managers are not found until salary grade 8. The wage changes associated with promotions (i.e. a change in salary grade) are much greater than those associated with tenure, or another year in the same salary grade.[7] The general idea is that wages are a function of not only personal attributes, but also location of an employee in the firm hierarchy [Wise, 1975; Lazear and Rosen, 1990]. Wages are attached to jobs as well as people [Williamson et al., 1976; Lazear, 1990].

The data does have a few drawbacks. One is the relatively small proportion (7.5 percent) of females in the firm. The low female representation means that the usual qualifications, regarding the generality of the findings, are particularly germane to the current research. An analysis of the types of jobs that male and female employees hold in the firm, however, reveals that women hold similar job titles as compared to men. This is not surprising given the fact that both male and female employees have about the same levels of education, and the sample under study includes only management-level (exempt) employees. A second limitation is that the employee separation rates are relatively low. Given the low rates of separation, the two most recent years of data were not used in the analysis. Although the data continue in time through 1983, the period of analysis covers 1979-81 so that ample time was available to observe employee separations. Even with this restriction, separation rates were only about 10 percent over the observed period. Furthermore, the term "separations" refers to all exits from the firm, both voluntary and involuntary.[8]

The dependent variables used in the promotion analyses are the following: a dummy variable indicating whether a promotion to a higher salary grade occurred within a one calendar-year period, and the starting salary grade level of the employee. If the initial placement of the employee determines a career, or "jobs" track, then it is also important to examine this decision. The initial placement can be thought of as the first promotion, and if there are costs associated with this decision, then the arguments used above with regard to promotions can be applied.

The explanatory variables used in the promotion equation (2) include a set of human capital variables and a set of firm-specific indicators of ability. The human-capital variables include several measures of work experience, education level, and major field of study. The firm-specific indicators are the supervisor performance ratings, and when examining promotions within a one calendar-year period, the current salary grade level.

The dependent variable for the separations equation (3) is a dummy variable indicating whether an employee separates from the firm in the current year or any year following the period studied. For example, if the dependent variable is the probability of promotion in 1979, the separations dummy will equal one for any employee who separates from the firm in the period 1979-83. The independent variables used in this equation are the same as those used in the promotion equation, plus the number of children of various ages, and a dummy variable indicating whether the employee was married as of 1983.[9] Only the reduced form of this equation will be estimated. The primary focus of this paper is to examine the effects of turnover on promotions, and the data are not rich enough to identify both models. The variables that identify the promotion model are marital status and the number of children of various ages. These variables were chosen for two reasons. First, they are the only variables available in the data that could possibly be excluded from the promotions model. Second, they represent good candidates for exclusion, even though these variables are often found in similar (e.g. wage) models based on human-capital accumulation, especially for women. The primary reason

these family variables are included in wage models, however, is to control for the heterogeneity in the sample regarding unobserved human capital investments. In the present model, however, a direct measure of performance on the job is available, which should be a good proxy for (past) human-capital investments. Thus, the exclusion of the family variables from the model are more valid in the current case. The family variables will measure the value of non-market time and should impact on an employee's decision to leave the labor market.

The separations model will be estimated on a combined sample of male and female employees, which represents a break with much of the past research in this area. Past studies by Viscusi [1980], Blau and Kahn [1981], Meitzen [1986] and Light and Ureta [1992] have found significant differences between men and women with regard to the effect of several variables (e.g. tenure, education, marriage) on the probability of quitting.[10] In light of these past findings, several additional specifications of a reduced form quit model were estimated, including separate gender models, and the stability of the parameter estimates was tested using likelihood-ratio tests. After some experimentation, it was found that if a female dummy variable was interacted with salary grade, marital status, and the children variables, the null hypothesis of no difference in the remaining parameter estimates could not be rejected. This result is not that unexpected when one considers the nature of the data. The current sample of employees is much more homogeneous than that found in publicly available survey data. The appendix contains the descriptive statistics for the variables used in the analysis.

RESULTS

The critical role that employee separation rates play in the L&R model makes a comparison of separation rates by gender particularly interesting. Table 2 contains simple cross tabulations of gender and separations for the three years of data. The assumption that women are more likely to leave the firm is clearly supported by the results of Table 2. The Chi-square statistics listed in Table 2 indicate that men and women in this firm have significantly different unconditional probabilities of leaving the firm. In another analysis, not shown, which held constant the years of tenure of the employee, women were about twice as likely to leave the firm as compared to men at all levels of tenure.

Table 3 contains the first set of multivariate results. Two-stage procedures similar to those described in Maddala [1983, Ch 8] were used to estimate the model.[11] Columns labeled 1 in Table 3 list the results of the basic model. The results indicate that women in the lowest grade levels (1-3), are significantly less likely to be promoted than similar men, and that women in the highest grade levels (7-11), are significantly more likely to be promoted, although there are relatively few (8 percent of all women) women at this level. Women in salary grade levels 4-6 are also less likely than men to be promoted. The coefficients in columns 1 of Table 3 imply that being female decreases the probability of being promoted by between 4-10 percentage points for women in the lowest salary grades.[12] The mean promotion rate for this

TABLE 2
Chi Square Test of Homogeneity of Male and Female Employees With Respect to Separating from the Firm

Year	Males Total	Males Leavers	Females Total	Females Leavers	Chi-Square Statistic
1979	8383	1057	638	199	219.0
1980	9597	874	777	198	208.0
1981	9938	733	995	200	187.6

TABLE 3
Probit Estimates of the Probability of Current Promotion (standard errors in parentheses)

	1979			1980			1981		
VARIABLE	COL (1)	COL (2)	COL (3)	COL (1)	COL (2)	COL (3)	COL (1)	COL (2)	COL (3)
FEMALE	-.121 (.077)	-.173 (.080)	-.042 (.140)	-.248 (.071)	-.309 (.072)	-.251 (.100)	-.111 (.063)	-.125 (.063)	-.001 (.150)
FEMALE SG 4-6	.025 (.126)	.112 (.131)	.071 (.211)	.096 (.114)	.143 (.116)	.123 (.142)	.175 (.101)	.164 (.101)	.128 (.226)
FEMALE SG 7-11	.688 (.203)	.942 (.214)	.893 (.345)	.825 (.183)	.989 (.186)	.971 (.232)	.541 (.170)	.648 (.171)	.559 (.368)
SEPARATION (PREDICTED)			-1.095 (.352)			-.589 (.400)			-1.615 (.526)
PERFORMANCE RATINGS		YES	YES		YES	YES		YES	YES
N =	10078			10374			10933		

SG refers to salary grade, so SG 4-6 means a female employee in salary grades 4 through 6. The model in columns labeled 1 contains the following additional variables. There are three different measures of experience: prior to the firm, with the firm but prior to current job, and in current job. Each experience term is entered as a quadratic and a full set of interaction terms is also included. There are two education dummy variables indicating masters and doctoral level degrees. Bachelors degree is reference group. There are ten dummy variables for salary grades 1-10. Level 11 is the reference group, and employees in the highest grade (12) are omitted. The models in columns 2 and 3 include supervisory performance ratings which are entered as a series of three dummy variables. The reference group is employees in the lowest two rating categories. The standard errors reported in columns labeled 3 are the corrected standard errors taking account of the predicted variable (*SEPARATION*).

group is approximately 45 percent. For women in the top salary grades, the coefficients in columns 1 indicate that being female increases the probability of being promoted by between 7-11 percentage points, and the mean promotion rate for this group of employees is approximately 13 percent. These findings are consistent with the L&R hypothesis that the differences in promotion rates between men and women become smaller as the level of ability increases. The assumption underlying the empirical analysis is that employees in the higher salary grade levels are in fact more able [Rosen, 1982]. The results are consistent across all three years.

When the supervisory performance ratings (PERF) are added to the model, as in columns labeled 2, the coefficient on the reference-group gender dummy becomes even more negative. This result also accords with the L&R model. Holding constant an additional measure of ability, women will be even less likely to receive a promotion since they are held to higher standard due to their higher propensity to separate. It is assumed that the performance ratings are a good measure of ability, and it should be noted that the results imply that women in salary grades 1-3 have higher performance ratings than men on average.[13] The coefficients of the performance ratings were all positive and highly significant.

The next task is to add the probability of separating to the model. The expectation is that the coefficient on the gender variable will become more positive (less negative). The estimates of the gender effect, when the probability of separating is included in the promotions model, are listed in columns 3 of Table 3.[14] The results lend support to the argument that women are not promoted as frequently as men due to their lower probability of remaining with the firm. In each year examined, the coefficient on the reference group gender dummy variable became more positive as compared to that in columns 2. The changes are quite dramatic in 1979 and 1981. The parameter estimate associated with the probability of separating from the firm is also negative and usually significant. Those more likely to leave the firm are less likely to be promoted, which implies substantial costs to promotion.[15] The coefficients associated with the separation variable imply that a 10 percent increase in the probability of separating from the firm will reduce the probability of being promoted by anywhere from 2-5 percentage points. These results are strong evidence in support of the L&R predictions, and are consistent with the widely held belief that women suffer losses due to their discontinuous labor force participation.[16]

An additional analysis related to current promotions and concerned with the possibility that the effect of the separation probability on promotions might differ by the level of employee service or tenure was carried out. High separation probabilities are likely to be expected for employees with either very low or very high levels of tenure, but the effect of this variable on the employee's chance of promotion could differ by tenure. For example, a high separation probability for an employee with a low level of tenure might be expected to have a greater negative impact on their chance for promotion than for an employee with twenty years service with the firm. One reason for this possibility is there might be very little learning on the job, and therefore lower costs for the firm, for senior employees who know the way the company works and the tasks of the new position. Thus, the models of Table 3 were

TABLE 4
Probit Estimates of the Probability of Current Promotion By Years of Tenure (standard errors in parentheses)

YEARS OF TENURE	VARIABLE	1979 COL (1)	1979 COL (2)	1980 COL (1)	1980 COL (2)	1981 COL (1)	1981 COL (2)
0-5	FEMALE	-.221 (.087)	-.114 (.100)	-.387 (.078)	-.319 (.088)	-.163 (.067)	-.050 (.076)
	FEMALE SG 4-6	.247 (.170)	.225 (.170)	.268 (.161)	.231 (.162)	.218 (.127)	.197 (.127)
	FEMALE SG 7-11	.751 (.452)	.706 (.453)	.836 (.391)	.792 (.392)	.222 (.356)	.062 (.359)
	SEPARATION (PREDICTED)		-.871 (.403)		-.656 (.394)		-1.560 (.508)
	N	2727		2510		3449	
6-12	FEMALE	.335 (.268)	.481 (.289)	-.036 (.236)	.046 (.247)	.367 (.275)	.715 (.313)
	FEMALE SG 4-6	-.445 (.322)	-.484 (.323)	-.121 (.274)	-.107 (.274)	-.277 (.306)	-.407 (.312)
	FEMALE SG 7-11	.678 (.376)	.556 (.387)	.538 (.344)	.516 (.345)	.343 (.356)	.020 (.382)
	SEPARATION (PREDICTED)		-.885 (.655)		-.861 (.775)		-2.859 (1.22)
	N	2988		3524		3212	
12+	FEMALE	.616 (.491)	.613 (.498)	.265 (.575)	.335 (.586)	-.793 (.602)	-.815 (.608)
	FEMALE SG 4-6	-.714 (.569)	-.713 (.569)	-.261 (.632)	-.308 (.639)	.602 (.656)	.610 (.659)
	FEMALE SG 7-11	-.730 (.776)	-.721 (.817)	.486 (.660)	.313 (.701)	1.032 (.686)	1.102 (.705)
	SEPARATION (PREDICTED)		-.039 (1.06)		.830 (1.05)		-.579 (1.20)
	N	4363		4340		4272	

See notes to Table 2 for a list of variables included in the model. All models contain supervisory performance ratings. The standard errors reported in columns labeled 2 are *not* the correct standard errors. They are derived from the second stage probit without taking account of the predicted variable (*QUIT*).

re-estimated by three tenure groups: fewer than 6 years of tenure with the firm, 6 to 12 years of tenure with the firm, and more than 12 years of tenure with the firm. The results of this analysis are contained in Table 4.

For employees with fewer than 6 years of tenure (73 percent of the women), and 6 to 12 years of tenure (20 percent of the women), the inferences drawn from Table 4 are the same as those of Table 3. The separation probability is always negative, and the coefficient on the gender variable becomes more positive for the reference group which contains the majority of women. The addition of the separation probability plays an important role in identifying the true gender effect in a promotions model. The results are stronger for the group of employees with fewer than 6 years of tenure. For employees with more than 12 years of tenure with the firm, the addition of the separation probability leaves the parameter estimates relatively unchanged.[17] Finally, it is interesting to note that the gender coefficient is large and positive for women in salary grades 7-11 who have fewer than 12 years of tenure.

The L&R model should be equally applicable to an analysis of an employee's starting salary grade. As was argued above, if there are costs associated with the initial placement of the employee, or what could be considered the first promotion, then the firm would have an incentive to identify and use information related to the probability that the employee will separate. To test this hypothesis, a model of starting salary grade level was specified, which has the starting salary grade level, as defined above, dependent upon prior firm experience, education level at the time of hire, major field of study, and the probability of separating. The model was estimated only for employees with less than 1 year of firm experience, since the separation probability that is relevant is that at the time of hire and not at some later point in time.[18] The results of the starting salary grade model are reported in Table 5. The results indicate that part of the apparent adverse treatment of women within firms is due to the firm's consideration of future events, specifically the probability that the employee will remain with the firm. The gender coefficient in the starting salary grade model becomes significantly more positive when the probability of separating is added to the equation, and the probability of separation is negatively related to starting salary grade level.

The final hypothesis to be tested is whether the differences in promotion rates among employees, who differ in regard to their separation probabilities, become smaller conditional on the number of previous promotions received. Those women who have been previously promoted would be expected to be of high ability, since they are being held to a higher standard than men due to their higher separation probability. To test this hypothesis, a model of current promotion was estimated by four groups defined by the number of previous promotions the employee received. For example, an analysis of the probability of being promoted in 1979 was estimated separately for employees who had not received a promotion by 1979, for employees who had received 1 previous promotion, for employees who had received 2-3 previous promotions, and for employees who had received 4 or more previous promotions. Given the evidence presented in this paper, it is not unreasonable to think of women as the group more likely to separate, and thus, the gap in promotion rates between

men and women should narrow with the number of promotions. The L&R model has very different implications than the "glass ceiling" hypothesis. In the L&R model the differences in promotion rates should narrow as argued above, while the "glass ceiling" argument would predict that promotion differentials should grow as women reach their ceiling. Table 6 contains the results of this analysis. For the most part, the results are consistent with the L&R model. The coefficient on the gender dummy variable tends to become less negative, and eventually turns positive as the number of promotions increases.

CONCLUSIONS

The results of this paper indicate that an important factor in the firm's decision of whether or not to promote an employee is the probability of separating from the firm. This variable was usually significant, and always negatively related to being promoted. In terms of the L&R model, these results demonstrate that the firm weighs the probability of separating from the firm against the employee's ability in determining promotions. The results also imply that there are significant costs associated with promotion that the firm wants to recoup over the tenure of the employee. In addition, it was found that women in the upper levels of the firm hierarchy are promoted at rates similar to or greater than their male counterparts which is also consistent with the L&R model. Of course the empirical analysis did not control for all the relevant factors, and there might be some unobserved factor that can account for the findings. In general, however, the results appear quite robust, and are very supportive of the theoretical predictions of the L&R model.

The paper also demonstrates that a substantial part of what might be considered discrimination against women regarding advancement in the firm, might be due to the omission of an important and relevant economic variable. When the model included a control for the probability of separating from the firm, the coefficient on the gender dummy variable increased (became more positive) dramatically. This is an important result with substantial policy implications. As long as women, for whatever reasons, are the ones who specialize in home production, then we can expect them to experience less favorable outcomes in the labor market, such as the one currently under study. To call this phenomenon discrimination is not quite appropriate, since the firm is basing its decision on productivity related criteria. The currently popular characterizations of the "glass ceiling" syndrome or the "mommy track" as forms of discrimination might be incorrect.

TABLE 5
Ordered Probit Estimates of the Starting Salary Grade
(standard errors in parentheses)

	1979		1980		1981	
VARIABLE	COL (1)	COL (2)	COL (1)	COL (2)	COL (1)	COL (2)
FEMALE	-.616	-.450	-.520	-.469	-.670	-.409
	(.169)	(.197)	(.148)	(.157)	(.121)	(.148)
SEPARATION (PREDICTED)		-1.210		-.614		-2.724
		(.738)		(.666)		(.656)
PRIOR EXPER	.298	.300	.300	.301	.321	.331
	(.029)	(.029)	(.029)	(.029)	(.021)	(.024)
PRIOR EXPER SQ	-.004	-.004	-.004	-.007	-.006	-.005
	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)
MA	1.386	1.348	1.008	.969	1.491	1.339
	(.145)	(.150)	(.130)	(.134)	(.117)	(.123)
PHD	3.624	3.530	2.765	2.664	3.369	3.198
	(.243)	(.247)	(.231)	(.255)	(.192)	(.192)
ENGINEER	.705	.577	.470	.404	.844	.906
	(.202)	(.227)	(.165)	(.185)	(.155)	(.156)
BUSINESS	.573	.488	.470	.415	.764	.933
	(.220)	(.235)	(.175)	(.191)	(.154)	(.171)
SCIENCE	.464	.421	.096	.012	.482	.573
	(.214)	(.217)	(.159)	(.183)	(.153)	(.151)
LAW	-.648	-.347	-.434	-.417	-.122	-.767
	(.423)	(.444)	(.517)	(.524)	(.327)	(.408)
N	552		704		1006	

The two education dummy variables, indicating masters and doctoral level degrees, refer to the level of education at time of hire. The reference group is bachelors. The major fields of study of the degree are represented by four dummy variables; one indicating engineering, one indicating a business degree, one indicating a science degree, and one indicating a law degree. The reference group was all other types of majors. The standard errors in column 2 are *not* the correct standard errors, but are derived from the information matrix of the second stage ordered probit without taking account of the predicted variable (*QUIT*).

TABLE 6
Probit Estimates of the Probability of Current Promotion By Number of Previous Promotions (standard errors in parentheses)

# OF PROMOTIONS	VARIABLE	1979	1980	1981
0	FEMALE	-.123	-.161	-.092
		(.094)	(.087)	(.080)
N		2004	2016	2238
1	FEMALE	-.063	-.356	-.024
		(.127)	(.110)	(.093)
N		1585	2016	1863
2-3	FEMALE	-.206	-.240	-.046
		(.132)	(.107)	(.092)
N		2740	2769	2718
4+	FEMALE	.645	.448	.231
		(.208)	(.178)	(.165)
N		3749	3914	4005

APPENDIX

TABLE 1A
Descriptive Statistics for 1981 Sample By Gender

	MALE		FEMALE	
VARIABLE	MEAN	STD.ERR	MEAN	STD.ERR
CURRENT PROMOTION	0.231	0.422	0.379	0.485
SEPARATION	0.074	0.261	0.201	0.401
EXPERIENCE				
PRIOR	3.040	4.280	2.952	4.475
TENURE	7.408	5.929	2.652	3.780
SERVGD	3.208	3.492	1.413	1.712
EDUCATION				
MA	0.210	0.407	0.228	0.420
PHD	0.202	0.401	0.081	0.274
SALARY GRADE				
GRAD1	0.011	0.107	0.072	0.259
GRAD2	0.064	0.246	0.262	0.440
GRAD3	0.089	0.285	0.254	0.436
GRAD4	0.079	0.270	0.147	0.354
GRAD5	0.127	0.333	0.126	0.332
GRAD6	0.160	0.367	0.058	0.234
GRAD7	0.224	0.417	0.039	0.194
GRAD8	0.112	0.316	0.019	0.137
GRAD9	0.078	0.270	0.018	0.133
GRAD10	0.029	0.168	0.002	0.045
PERFORMANCE RATING				
PERF3	0.371	0.483	0.486	0.500
PERF4	0.435	0.496	0.374	0.484
PERF5	0.140	0.347	0.074	0.263
MARRIED	0.857	0.350	0.522	0.500
CHILDREN				
NCHIL	0.684	0.831	0.889	0.423
NCHIL17	0.899	1.072	0.125	0.465
NCHIL5	0.263	0.577	0.073	0.310
N	9938		995	

NOTES

I am grateful for the helpful comments received from seminar participants at the University of Chicago labor workshop.

1. The labeling of this model as a theory of discrimination is somewhat of a misnomer. The Lazear and Rosen model is similar to theories of statistical discrimination [Phelps, 1972; Aigner and Cain, 1977]. The L&R model is not a theory of group discrimination, since only productivity related attributes of the employee are considered by the firm, and the firm's perception of differences in these attributes among demographic groups is indeed accurate [Aigner and Cain, 1977]. There will be cases of individual discrimination, since some women who are career oriented will be treated unfairly relative to their male counterparts.
2. The worker and the firm have entered into a contract where the worker is always paid the value of their marginal product. Thus, a separation does not involve a financial hardship in the usual way associated with firm-specific human capital investment. In the L&R model the employee pays the full cost of training by accepting a lower wage. If part of this training is firm specific, the employee will only accept this wage if he is sure the firm will pay the value of his marginal product after the training period. Thus, some type of reputation costs would be implied to ensure payment.
3. A rationale for this assumption is found in previous work by Rosen [1982] on the existence of hierarchies. The productivity of upper-level managers affects the productivity of subordinate employees.
4. In the L&R model, F() is the distribution of the value of non-market time, and thus F(q) is the probability that q is greater than the value of non-market time. Since employees are paid the value of their marginal product, q also represents their expected wage.
5. The data for this firm show a dramatic rise in the number of separations after 25 years of tenure with the company. This rise follows a monotonically decreasing trend for the first 25 years of service. Alternatively, a 30-year (total) experience rule was used to select employees, and the results of the analyses were basically unchanged.
6. The firm's reliance on scientific and engineering personnel is the principal reason why the number of females in this sample is relatively low. Over 75 percent of the sample are engineers or physical scientists, both areas in which females are historically underrepresented.
7. In previous work with the same data, this author has found that a promotion leads to about a 5 percent increase in pay whereas an additional year of tenure increases pay about 1 percent [Kaestner, 1992].
8. The data does not distinguish between quits and layoffs, although few management employees in this firm are dismissed.
9. The marriage information is strictly valid only as of the year end for 1983 or at the time of separation, and is not available retrospectively.
10. It is interesting to note that both Viscusi [1980] and Blau and Kahn [1981] conclude that women would actually quit less than men if they had male characteristics. This is a surprising conclusion given that several of the parameter estimates have opposite signs with respect to gender. For example, all else being equal, a married woman is more likely to quit than a married male using the parameter estimates in both Viscusi and Blau and Kahn. From the employer's viewpoint, however, the only important factor is whether they can observe the characteristics that predict quit behavior, and the overall quit rate [Light and Ureta, 1992].
11. The standard errors that result from these two-stage procedures need to be separately calculated to account for the fact that one of the right-hand side variables (i.e. the probability of separating) is a predicted value [Maddala, 1983; Murphy and Topel, 1985]. When the promotion equation is estimated by an ordered probit procedure, however, the second stage estimates are left uncorrected.
12. The marginal effect of a variable on the promotion probability is calculated using the mean characteristics of employees in the particular salary grade group under discussion.
13. The fact that women are rated more highly than men casts doubt upon the idea that the performance rating system is discriminatory itself, and by using this variable the results are masking the true underlying relationship.
14. A full set of results is available from the author upon request.

15. The model was also estimated including an interaction term between the female dummy variable and the separation probability. In this case, the interaction term was treated as endogenous. The results of this analysis indicated that the effect of the separation variable on the employee's chance of promotion is the same for males and females.
16. Several sensitivity analyses were carried out as checks on the robustness of the results listed in Table 3. First, the basic model was re-estimated using education as a proxy for unobserved employee ability as opposed to the salary grade level. This model tests whether the use of a firm-determined measure of employee ability (e.g. salary grade) may bias the results. Second, the model was estimated using only employees in salary grades 1-6. This analysis was undertaken to test whether the results are sensitive to the inclusion of the upper salary grades where the proportion of women is extremely small. The results from these two analyses were very similar to those reported in the text.
17. This is consistent with the idea that there is very little learning on the job for senior employees. An alternative explanation of the results is that there are very few observed separations among this group of senior employees (approximately 5.8 percent for the 3-5 year period or less than 2 percent per year), and there is not enough information available to the firm for it to form an expectation about employee separations.
18. The model was also estimated on the full sample, and a sample of employees with fewer than two years of tenure. The results were the same as those reported in the text.

REFERENCES

Aigner, D. J., and Cain, G. G. Statistical Theories of Discrimination in Labor Markets. *Industrial and Labor Relations Review*, January 1977, 175-87.

Becker, G. S. *Human Capital*. New York: Columbia University Press, 1975.

Black, D., and Lowenstein, S. Self Enforcing Labor Contracts with Costly Mobility. Unpublished manuscript, University of Kentucky, 1989.

Blau, F. D., and Kahn, L. M. Race and Sex Differences in Quits by Young Workers. *Industrial and Labor Relations Review*, July 1981: 563-77.

Boudreau, J. W., and Berger, C. J. Toward a Model of Employee Movement Utility. *Research in Personnel and Human Resource Management*, 3, 1985, 31-54.

Hashimoto, M. Firm Specific Human Capital as a Shared Investment. *American Economic Review*, June 1981, 475-82.

Kaestner, R. Employee Wage Growth Within the Firm: A Deferred Payment or Human Capital Investment. *Applied Economics*, March 1992, 347-61.

Lazear, E. P. The Job as Concept. Unpublished Manuscript, University of Chicago, 1990.

Lazear, E. P. and Rosen, S. Male-Female Wage Differentials in Job Ladders. *Journal of Labor Economics*, January 1990, S106-S123.

Light, A. and Ureta, M. Panel Estimates of Male and Female Job Turnover Behavior: Can Female Nonquitters Be Identified. *Journal of Labor Economics*, April 1992, 156-81.

Maddala, G. S. *Limited Dependent and Qualitative Variables in Econometrics*. Cambridge: Cambridge University Press, 1983.

Meitzen, M. E. Differences in Male-Female Job Quitting Behavior. *Journal of Labor Economics*, April 1986, 151-67.

Mincer, J. and Polachek, S. W. Family Investments in Human Capital: Earnings of Women. *Journal of Political Economy*, March 1974, S76-S108.

Murphy, K. and Topel, R. Estimation and Inference in Two Step Econometric Models. *Journal of Business and Economic Statistics*, October 1985, 370-79.

Olson, C. A. and Becker, B. E. Sex Discrimination in the Promotion Process. *Industrial and Labor Relations Review*, July 1983, 624-41.

Phelps, E. S. The Statistical Theory of Racism and Sexism. *American Economic Review*, September 1972, 659-61.

Rosen, S. Authority, Control, and the Distribution of Earnings. *Bell Journal of Economics*, Autumn 1982, 131-47.

Seiling, M. Staffing Patterns Prominent in Female-Male Earnings Gap. *Monthly Labor Review*, June 1984, 29-33.

Van de Ven, P. M. M., and Van Praag, M. S. The Demand for Deductibles in Private Health Insurance. *Journal of Econometrics*, November 1981, 229-52.

Viscusi, W. K. Sex Differences in Worker Quitting. *The Review of Economics and Statistics*, August 1980, 388-98.

Williamson, O. E., Wachter, M. and Harris, J. Understanding the Employment Relation: The Analysis of Idiosyncratic Exchange. *Bell Journal of Economics*, Spring 1976, 250-78.

Wise, D. A. Personal Attributes, Job Performance, and Probability of Promotion. *Econometrica*, November 1975, 913-31.