EXPERIENCE, PERFORMANCE, AND EARNINGS*

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This study provides direct evidence concerning the relationship between experience and performance among managerial and professional employees doing similar work in two major U. S. corporations. The facts presented indicate that while, within grade levels, there is a strong positive association between experience and relative earnings, there is either no association or a negative association between experience and relative rated performance. If we are correct that the performance ratings given to managerial and professional employees in any grade level adequately reflect those employees' relative productivity in the year of assessment, the results imply that the human capital on-the-job training model cannot explain a substantial part of the observed return to labor market experience.

There is abundant evidence that earnings grow with labor market experience over most of a normal worklife. Since the advent of human capital theory,[1] the vast majority of labor economists have accepted, or at least not openly challenged, this theory's contention that the upward sloping segment of the experience-earnings profile reflects on-the-job training, which causes the relevant underlying experience-productivity profile to slope upwards. However, there are other potential explanations of the relationship between experience and earnings in which productivity growth plays a very minor role. For instance, Mincer [1974, p. 80] recognizes the possibility that the positive association between experience and earnings might only "reflect the prevalence of institutional arrangements such as seniority provisions in employment practices." He then makes the observation that sets the stage for this study: "Such practices, however, do not contradict the productivity-augmenting hypothesis, unless it can be shown that growth of earnings under seniority provisions is largely independent of productivity growth." [2]

Thus, the human capital interpretation of the experience-earnings profile is distinguished from other interpretations by the pre-

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1. This event can be marked by the publication of Becker [1964].
2. Mincer has seniority provisions under collective bargaining agreements in mind when he makes this statement, but his logic applies equally well to other institutional settings.

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diction that earnings growth reflects productivity growth.[3] Despite the dominance of human capital theory over labor economics during the past fifteen years, there exists no evidence that corresponding pieces of the experience-earnings and experience-productivity profiles have slopes of the same sign. There is a simple explanation of why this important proposition has not been addressed empirically: it is very difficult to measure an individual worker's productivity in an advanced industrial society. However, if the hypothesis is to be tested, this measurement problem must be addressed.

This study has as its basis the assumption that job performance ratings done by immediate supervisors are valid indicators of the relative current productivity of white male managerial and professional employees engaged in comparable work (i.e., that an employee rated ahead of X percent of his peers is more productive than X percent). Under this assumption, which will be supported at length below, it is possible to compare the relative earnings and relative productivity of employees in similar jobs who have different amounts of experience. The evidence to be presented, drawn from the personnel records of two major U. S. corporations, has as its most important implication that, while greater experience moves white male managerial and professional employees toward the upper tail of the earnings distribution for their grade levels, it does not move them toward the upper tail of the relevant performance distribution. Thus, the primary finding to be discussed appears to be at odds with what would be expected, given the human capital interpretation of the experience-earnings profile.

Section I describes the two company personnel files used in the research and discusses how they were transformed for statistical analysis. Section II demonstrates that, while there is a positive association within grade levels between relative earnings and experience, there is not a positive association between relative performance and experience. Potential criticisms of the way in which we have come to our main conclusion, that a substantial fraction of experience-earnings differentials cannot be explained by experience-productivity differentials, are considered in Section III. Factors that might possibly explain the finding are briefly considered in Section IV.

3. In the human capital model, productivity growth does not necessarily produce earnings growth; if a worker's productivity were enhanced by firm-specific on-the-job training financed solely by the firm, the earnings profile would be flat. However, if growth in earnings is observed, according to the model, either general or specific training (financed partially by the worker) and thus growth in productivity must have occurred.

I. The Company Personnel Files

Company personnel departments are a rich and little-explored source of economic microdata. Most major U. S. corporations collect and computerize extensive information on the demographic characteristics, earnings, and job performance of their employees. Hence, they represent a primary potential supplier of evidence concerning the relationship between experience-earnings and experience-productivity profiles.

The Company A and Company B Personnel Data Files

Two large corporations in the U. S. manufacturing sector, hereafter called Company A and Company B, have provided computerized personnel records for virtually all the members of their exempt workforces.[4] The Company A file contains information computerized (and, thus, roughly current) through March 15, 1977; it has only a limited amount of historical data and only persons active during at least one pay period since mid-1975 are included on the file. The Company B records contain information entered through July 1, 1977, including a complete log of all personnel actions since 1971 for persons active on or after September 1, 1976, and an abbreviated personnel action log for persons active on or after January 1, 1974.

All samples drawn from the Company A data set were limited to employees in jobs categorized as managerial or professional under the Equal Employment Opportunity Commission's job classification scheme. The samples extracted from the B file include only employees in those grade levels into which the Company classifies its managerial and professional jobs. To be included in an analysis, an employee in a selected position or grade level had to be white, male, "active," full time, regular, and domestically based as of the appropriate date(s).

Both the A file and the B file contain data on each employee's education, birth date, service date, and current physical work location. Both files also record each individual's most recent performance rating and current salary. In addition, the Company B file contains usable information on each individual's performance evaluation history and salary history.

Time with the company was calculated for each individual by reference to his service date. The schooling information in each file

4. Both companies deleted information on the name, address, and social security number of each worker to insure employee anonymity. Neither company provided the personnel records for a very small number of their top executives, as the records contained sufficiently detailed information that these individuals might have been identifiable even without name, address, or social security number.

was used to categorize individuals by highest level of educational attainment: less than high school, high school diploma, bachelor's degree, master's or law degree,[5] or doctorate. A pre-company experience variable was computed to equal age minus schooling minus company service minus five. For this purpose, it was assumed that those with less than a high school education had spent 10 years in school, high school graduates 13 years, college graduates 16 years, master's degree holders and lawyers 18 years, and Ph.D.'s 21 years. Dummy variables were created for the Company A and Company B physical work locations which place each site in one of four regions: Northeast, North Central, South, or West.

Performance Ratings at Company A and Company B

One piece of information that distinguishes a typical company personnel file from other sources of economic microdata is the assessment of how well each individual performs his or her job. At both Company A and Company B, supervisors review each managerial and professional employee's performance roughly once a year. Company A's "Employee Assessment" form instructs the reviewer to:

> List the six most important job duties or Areas of Accountability in decreasing order of importance. Next establish standards of performance or Expected Results for each area. Be sure to set your standards and/or objectives so that successful accomplishment falls into the 2 (Good) column. These standards should be discussed with the employee at the *beginning* of the assessment period. At the end of the assessment period, indicate the extent to which the results were obtained. . . .

The reviewer is then instructed to rate the subordinate's overall performance in his or her current job as: outstanding, good, acceptable, not acceptable, or too new to rate. In addition, the reviewer is asked to provide a separate assessment of each employee's potential for advancement, rating each employee as follows: promotable with no apparent limitations, promotable beyond next level, promotable one higher level, not promotable, or too new to rate. After a feedback session, the completed rating form is signed by both the rater and the ratee, and then given to the rater's superior for comments and a signature.

Company B's "Supervisor's Guide for Performance Review and Development Planning," in use from 1970 through the end of 1976, offered the following suggestions to the reviewer:

> The performance review of employees demands care and attention and should be carried on without distractions or interruptions. Before you begin a performance

5. The Company A education coding system does not include a separate law degree category. There are nine lawyers included with those holding master's degrees in the basic Company B regression sample.

review, refresh your knowledge of the content of the employee's position description. If only a generalized description is available, take time to think through the specific components of the job. It is very important that you analyze how the employee is performing in *each* of his areas of major responsibility. The more concrete your thoughts are, the more helpful your suggestions will be. The review should cover a sufficiently long span so that a pattern of performance can be observed. Except for extremely unusual cases, a period of 4 to 6 months experience with the employee should be sufficient to enable you to make objective judgments about him and thus complete a performance review.

Considering the employee's performance over an extended period will aid greatly in minimizing the influence of recent incidents and will help you to be objective and fair minded. Each factor being reviewed should be considered separately and be based on fact rather than opinion.

Reviews should be based on the employee's performance in his present position and only for the period since his last review. Since previous ratings should not be allowed to influence the current reviews, many managers prefer to make their evaluations without having the past records at hand.

The supervisor began the review by listing up to four of his subordinate's strengths ("He is particularly good at:"), and indicating whether "each is (essential, important, supplementary) to his job." The supervisor then indicated up to four areas where there was room for improvement ("He could use help in:") and the relative importance of each to the subordinate's job. Finally, the reviewer was told:

Now that you have completed your analysis of his strengths and opportunities for improvement, check the box opposite the paragraph that most nearly describes your evaluation of his overall performance:

- ☐ EXCELLENT: Consistently exceeds expected performance in accomplishing objectives and position requirements.
- ☐ SUPERIOR: Exceeds expectations and demonstrates high level performance in accomplishing objectives and position requirements.
- ☐ GOOD: Accomplishes objectives and position requirements as originally anticipated and in a manner resulting in expected performance.
- ☐ SATISFACTORY: Acceptable performance of position requirements with indication of ability for improvement.
- ☐ MINIMUM ACCEPTABLE: Probationary performance level for employees in same position for more than twelve months, requiring consultation with the employee and a specified plan for improvement within a designated period of time.
- ☐ UNACCEPTABLE: Unsatisfactory. Does not perform at an acceptable level of accomplishment.

The rating chosen then became the basis of the rater's recommendation for a salary action (which was reviewed by the appropriate group of the rater's superiors). No ratings in the bottom two categories were observed.

At the beginning of 1977, the Company B performance/salary review process was altered. One relevant change was in the number and description of the overall performance rating categories. Under

the new program there are only four rating categories. Even though only the first four rating categories were ever used under the old program, the different descriptions under the old and new plans led to different rating distributions in the two regimes. For this reason, the performance ratings done before January 1, 1977, are not comparable to those done after that date.

As both companies' evaluation procedures indicate, a performance rating should be based on how well an individual, in the year of evaluation, is carrying out the responsibilities of his or her job. Thus, a performance rating should reflect an employee's current level of performance relative to the level of performance deemed normal for someone in his or her position. It follows that the ratings of two employees are comparable only if the workers are in similar jobs.

For compensation purposes, companies assess the relative importance and difficulty of their myriad positions and group them in light of these assessments into grade levels. For both companies under analysis, this grading is based on a position description filled out (and kept current) by the supervisor of the job (with the concurrence of higher level supervisors, when necessary). The "Exempt Position Description" form in Company B (which is quite typical) obtains information about the following: the basic purpose of the job, the duties and responsibilities of the position, and the job holder's relationship to others within or outside the organization. In addition, the form elicits:

> Functional Scope Data: A listing of the functional statistics commonly used in the industry and/or profession to indicate scope and size of responsibility, e.g.: a) Sales Volume, b) Total Employment, c) Operating Budget, d) Department Payroll, e) Total Assets, f) Number Supervised—direct and indirect, g) Cost of Rentals, h) Purchasing Volume, i) Other.

and

> Position specifications: The normal knowledge or training required; the normal minimum experience and the required personal characteristics such as level of maturity, tactfulness, judgment, creativity, etc. All of the foregoing should be regarded as being necessary for an average employee in order to attain a satisfactory level of proficiency in the job.

The jobs held by sample members from Company A fall into nineteen grade levels; those held by sample members from B fall into twelve. In light of the way in which jobs are classified into grade levels, it is assumed that positions within a grade level are of equal importance and difficulty.[6] Thus, within a grade level it seems most rea-

6. Interviews with a number of Company B supervisors lent strong support to this assumption.

TABLE I

CHARACTERISTICS OF WHITE MALE MANAGERIAL AND PROFESSIONAL SAMPLES USED IN REGRESSION ANALYSIS

	Mean (standard deviation)	
	Company A (N = 4,788)	Company B (N = 2,841)
Highest level of educational attainment:		
Less than high school diploma (yes = 1)	0.050	0.026
High school diploma (yes = 1)	0.449	0.466
Bachelor's degree (yes = 1)	0.444	0.401
Master's or law degree (yes = 1)	0.049	0.082
Doctorate (yes = 1)	0.007	0.025
Age (years)	43.1	44.1
	(10.5)	(9.9)
Pre-company experience (years)	6.8	9.5
	(6.7)	(7.7)
Company service (years)	16.8	14.9
	(10.4)	(9.6)
Annual salary (dollars)[a]	17,884	20,008
	(3,240)	(4,916)
Performance rating:		
(1) Not acceptable/satisfactory (yes = 1)[b]	0.002	0.012
(2) Acceptable/good (yes = 1)[b]	0.053	0.366
(3) Good/superior (yes = 1)[b]	0.743	0.584
(4) Outstanding/excellent (yes = 1)[b]	0.202	0.038

a. These figures are based on current dollar salaries as of March 15, 1977, for Company A and as of July 1, 1976, for Company B.

b. Performance rating 1 is worst, and performance rating 4 is best. The Company A performance category description precedes the slash and the Company B description follows the slash.

sonable to assume that a higher performance rating implies higher productivity.

A Comparison of the Two Companies' Workforces

Examination of Table I reveals great similarity in the demographic characteristics of the basic Company A and Company B regression samples.[7] In both companies, nearly 50 percent of the sample

7. The basic regression samples consist of all white males who were "active" full-time regular domestically based managerial and professional employees as of March 15, 1977, at Company A and as of July 1, 1976, at Company B for whom valid information on education, birth date, service date, physical work location, most recent performance rating, current salary, and current grade level was available. The requirements that education, birth date, service date, and physical work location be available resulted in the exclusion of 22 Company A employees and 791 Company B employees. At the time we obtained the Company B data, the firm was in the process of adding educational codes to its computerized personnel system. Almost all of the Company B exclusions resulted from not yet complete (and apparently randomly missing) educational information.

did not graduate from college. The Company B sample contains a somewhat higher proportion of people with advanced degrees; this is consistent with the organization's involvement in research and development activities. On average, Company A's employees have somewhat less pre-company experience than Company B's employees (6.8 years versus 9.5 years), but somewhat longer company service (16.8 years versus 14.9 years). The average annual salary at Company B exceeds the average annual salary at Company A by nearly $2,900.[8] There is a larger concentration of people in the top performance categories at Company A than at Company B; this is most likely attributable to the differences in the sets of rating instructions given the supervisors at the two companies.

II. Relative Earnings and Relative Performance

This section offers evidence for three propositions:

1. Managerial and professional employees with more than average pre-company experience and company service have higher than average salaries;

2. About 40 percent of the earnings differentials associated with pre-company experience and with company service occur within grade levels;

3. These within-grade-level earnings differentials cannot be explained by within-grade-level differentials in job performance. The third proposition, which is the study's major finding, is demonstrated both by a test in which performance rating dummies are entered into a within-grade-level human capital earnings function and by estimating and contrasting multinomial logit earnings and performance category equations.

Earnings Function Results

The regression results presented in Table II allow us to compare the earnings of groups of managerial and professional employees stratified by both educational attainment and labor market experience. These findings are based on a standard semi-log earnings function:

$$\ln(y) = \mathbf{x}\beta + \epsilon,$$

8. This figure was produced by inflating the Company B mean salary to March 1977 dollars using the Consumer Price Index to make it comparable to the Company A mean salary, then taking the difference between the two mean salaries.

where y equals annual salary rate, $\mathbf{x}$ is a vector whose elements capture highest level of educational attainment, pre-company experience, company service, and region, β is a vector of parameters to be estimated, and ϵ is an equation error. As stated above, the pre-company experience variable was constructed to equal age minus years assumed spent in school by those with different degrees minus company service minus five. Thus, in the presence of dummy variables capturing highest degree received and a company service variable, differences in pre-company experience will be indistinguishable from differences in age.

Equations (1) and (4) indicate that, with pre-company experience and company service held constant, individuals with advanced degrees receive substantially higher salaries than individuals with less education. The proportional reward to education within the two companies studied appears quite similar, except that, holding experience constant, college graduates are relatively better off at Company B; the percentage earnings differential between those with a high school diploma but not a bachelor's degree and college graduates with comparable labor market experience is only 13 percent at Company A as compared with 22 percent at Company B.

In both companies, controlling for educational attainment and company service, there is a positive association between salary and pre-company experience, and, controlling for schooling and pre-company experience, a positive association between salary and company service, which weakens with length of service but does not vanish within the set of feasible differences in years of service.

Regressions (2) and (5) include grade-level dummies, and hence provide information on within-grade-level earnings differentials. These within-grade-level salary differentials are central to this study, since performance ratings are conditional on the importance and difficulty of an employee's position, and thus, on his grade level. This implies that the performance ratings can at most explain the fraction of a total earnings differential that occurs within grade levels.

As can be seen by comparing regressions (1) and (4) with regressions (2) and (5), relatively little of the return to educational attainment takes the form of higher within-grade-level earnings. Controlling for pre-company experience and company tenure, systematic within-grade-level earnings differences account for an average of only 12 percent in Company A and 10 percent in Company B of the total earnings differential between those with a bachelor's degree and less educated workers and for an average of only 22 percent and 13 percent

TABLE II

EARNINGS FUNCTION ESTIMATES

	Company A			Company B		
	Dependent variable = ln (annual salary as of March 15, 1977)[a] (N = 4,788)			Dependent variable = ln (annual salary as of July 1, 1976)[a] (N = 2,481)		
	(1)	(2)	(3)	(4)	(5)	(6)
Less than high school diploma (yes = 1)	−0.247	−0.075	−0.077	−0.263	−0.014	−0.016
	(.010)	(.007)	(.007)	(.024)	(.012)	(.012)
High school diploma (yes = 1)	−.131	−.013	−.015	−.221	−.022	−.024
	(.005)	(.003)	(.003)	(.008)	(.005)	(.005)
Master's or law degree (yes = 1)	.104	.022	.020	.099	.011	.015
	(.010)	(.006)	(.006)	(.014)	(.007)	(.007)
Doctorate (yes = 1)	.214	.051	.054	.256	.051	.052
	(.025)	(.016)	(.016)	(.024)	(.012)	(.012)
Years of pre-company experience/10	.043	.023	.027	.070	.026	.028
	(.008)	(.005)	(.005)	(.014)	(.007)	(.007)

(Years of pre-company experience)^2/100	−.003 (.003)	−.003 (.002)	−.004 (.002)	−.001 (.005)	−.002 (.002)	−.002 (.002)
Years of company service/10	.202 (.008)	.087 (.006)	.088 (.006)	.192 (.013)	.056 (.007)	.056 (.007)
(Years of company service)^2/100	−.031 (.002)	−.013 (.001)	−.013 (.001)	−.028 (.004)	−.005 (.002)	−.005 (.002)
Performance rating 1 (worst; yes = 1)	—	—	−.053 (.027)	—	—	−.036 (.016)
Performance rating 2 (yes = 1)	—	—	−.039 (.006)	—	—	−.018 (.004)
Performance rating 4 (best; yes = 1)	—	—	.025 (.003)	—	—	.026 (.009)
Constant	yes	yes	yes	yes	yes	yes
Region dummies (3)	yes	yes	yes	yes	yes	yes
Grade level dummies (18; 11)	no	yes	yes	no	yes	yes
R^2	.356	.741	.747	.335	.849	.851
SEE	.144	.091	.090	.190	.091	.090

a. The mean (standard deviation) of the dependent variable is 9.776 (0.179) at Company A and 9.876 (0.233) at Company B.
Note. Standard errors are in parentheses below coefficient estimates.

of the total earnings differential between advanced degree holders and those with only a bachelor's degree.[9] Thus, college graduates earn more than less educated workers almost entirely because they are assigned to jobs in grade levels with higher mean earnings; the same is somewhat less true of advanced degree holders as compared with those with only a bachelor's degree.

In contrast, a large fraction of the return to pre-company experience and to company service reflects higher within-grade-level earnings. At the appropriate sample mean for pre-company experience, 48 percent (in A) and 34 percent (in B) of the salary differential associated with an additional year of this construct occurs within grade levels. At the appropriate mean for company service, 44 percent (in A) and 38 percent (in B) of the return to an additional year of tenure occurs within grade levels. Thus, a substantial fraction of the observed relationship between experience and earnings cannot be explained by between-grade-level differences in mean salaries.

Why do workers with more education, more pre-company experience, and more company service have higher within-grade-level earnings? One possible explanation would be that such workers have acquired valuable skills during their years in school and in the labor force, and as a result their productivity exceeds that of less educated and less experienced workers in the same grade level. If this explanation were valid, it would be expected that the introduction of performance rating dummies into the ln(earnings) equations which have grade-level controls would move the estimated coefficients of the schooling, pre-company experience, and company tenure variables toward zero. However, comparison of equations (2) and (5) with equations (3) and (6) reveals that, although higher rated performance is associated with significantly and substantially higher earnings, introduction of the rating dummies has virtually no effect on the relevant education and experience coefficients. *Thus, performance does not appear to be a mediating factor in the within-grade-level positive relationship between either education or labor force experience and earnings.* In other words, within groups of similar jobs, despite the positive correlation between "human capital" and earnings, there does not appear to be a positive correlation between "human capital" and performance.

9. These figures are weighted averages. The weights for the first set are the proportions of those with less than a high school education and of high school graduates in the less educated worker group; the weights for the second set are the proportions of master's or law degree holders and of doctorates in the advanced degree group.

Multinomial Logit Results

The multinomial logit models estimated for Table III offer another way of looking at the earnings-performance nexus.[10] In constructing the models, employees rated either "not acceptable" or "acceptable" (in A) or "satisfactory" or "good" (in B) were categorized as below-average performers for their grade level.[11] Employees rated "good" (in A) or "superior" (in B) were categorized as average performers for their grade level. Employees rated "outstanding" (in A) or "excellent" (in B) were categorized as above-average performers for their grade level. Next, employees were categorized as having either a below-average salary, an average salary, or an above-average salary for their grade level. Salary categories were assigned on the basis of each individual's percentile ranking in the relevant within-grade-level salary distribution in such a way as to make the salary and the performance categories comparable. Suppose, for example, that X_1 percent of the individuals in grade level k were in the lowest performance category, X_2 percent were in the middle performance category, and X_3 percent were in the top performance category. An individual in the bottom X_1 percent of the grade level k salary distribution would be assigned to the lowest salary category, an individual in the next X_2 percent of the grade level k salary distribution to the middle salary category, and an individual in the top X_3 percent of the grade level k salary distribution to the top salary category. Assuming that performance ratings accurately reflect relative productivity, if more productive workers were always paid more than less productive workers, the assignment of individuals to salary categories would be identical with the assignment of individuals to performance categories.[12]

A maximum likelihood multinomial logit procedure was used to estimate the effects of education, pre-company experience, and

10. Nerlove and Press [1973] discuss the multinomial logit model.

11. The small number of employees with the lowest observed performance rating, "not acceptable" in Company A and "satisfactory" in Company B, made it seem advisable to combine the bottom two categories at each company to create a "below-average" category.

12. The samples used for constructing the performance and salary categories consisted of all "active" full-time regular domestically based white male managerial and professional employees in each grade level for whom both a valid salary and a valid performance rating were available. There were fewer people in the multinomial logit samples due to the more stringent data availability requirements that had to be satisfied. Thus, unless relative rated performance in the larger sample is perfectly related to relative salary, our procedure need not (and does not) result in the number of logit sample members in each salary category equaling the number of logit sample members in the corresponding performance category.

TABLE IIIA

MULTINOMIAL LOGIT SALARY CATEGORY AND PERFORMANCE CATEGORY EQUATION ESTIMATES

	Company A (N = 4,784)				Company B (N = 2,822)			
	Salary category (1)[a]		Performance category (2)[a]		Salary category (3)[a]		Performance category (4)[a]	
	Category 2[b]	Category 3[b]	Category 2[b]	Category 3[b]	Category 2[b]	Category 3[b]	Category 2[b]	Category 3[b]
Less than high school diploma (yes = 1)	−2.538	−3.036	0.214	0.503	−0.330	−0.054	−0.026	1.774
	(0.287)	(0.342)	(0.308)	(0.367)	(0.288)	(0.553)	(0.271)	(0.585)
High school diploma (yes = 1)	−0.583	−0.571	0.231	0.470	−0.279	−0.848	0.217	0.491
	(0.186)	(0.203)	(0.166)	(0.184)	(0.113)	(0.283)	(0.108)	(0.287)
Master's or law degree (yes = 1)	—	—	—	—	0.265	0.413	−0.665	−0.656
					(0.167)	(0.390)	(0.159)	(0.383)
Doctorate (yes = 1)	—	—	—	—	1.414	0.282	−0.682	−0.332
					(0.341)	(1.076)	(0.287)	(0.524)
Master's degree, law degree or doctorate (yes = 1)[c]	1.156	1.645	0.105	0.238	—	—	—	—
	(0.474)	(0.489)	(0.348)	(0.362)				

Years of pre-company experience/10	0.439	0.834	−0.806	−1.318	0.546	0.441	−0.512	−0.991
	(0.268)	(0.296)	(0.267)	(0.292)	(0.165)	(0.393)	(0.162)	(0.405)
(Years of pre-company experience)^2/100	−0.072	−0.081	0.198	0.273	−0.073	0.078	0.040	0.147
	(0.094)	(0.106)	(0.099)	(0.110)	(0.055)	(0.120)	(0.054)	(0.134)
Years of company service/10	1.122	2.890	0.429	−0.122	1.131	0.928	0.095	−0.582
	(0.280)	(0.322)	(0.261)	(0.290)	(0.164)	(0.402)	(0.153)	(0.408)
(Years of company service)^2/100	−0.133	−0.408	−0.127	−0.060	−0.132	0.035	−0.068	0.014
	(0.070)	(0.078)	(0.063)	(0.070)	(0.046)	(0.100)	(0.042)	(0.117)
Constant	yes	yes	yes	yes	yes	yes	yes	yes
Region dummies (3; 2)[d]	yes	yes	yes	yes	yes	yes	yes	yes
Grade level dummies (15; 8)[e]	yes	yes	yes	yes	yes	yes	yes	yes
χ^2	711.30		351.70		413.37		216.96	
d.f.	50		50		36		36	

a. All equations were estimated using a maximum likelihood multinomial logit procedure.

b. Category 1 represents the lowest level, category 2 the middle level, and category 3 the highest level of salary or performance. The coefficient estimates reported are equal to $\beta_2 - \beta_1$ (under category 2) and $\beta_3 - \beta_1$ (under category 3).

c. Since none of the thirty-five Company A doctorates were in the lowest salary category, individuals at Company A with doctorates were included with the master's or law degree group.

d. In the Company B sample, individuals in the West region were included with the North Central region group.

e. Individuals in grade levels where not all of the salary and performance categories were represented were excluded from the sample.

Note. Standard errors are in parentheses below the coefficient estimates.

company service on the probability of an individual's being in each of the salary categories and in each of the performance categories. The multinomial logit model specifies the probability that an individual is in category i to be of the form, $e^{\mathbf{x}\beta_i}/\sum_{i=1}^{3} e^{\mathbf{x}\beta_j}$, $i = 1, 2, 3$, where $\mathbf{x}$ is a vector of individual characteristics containing education dummies, pre-company experience and company service variables, region dummies, and grade level dummies, and the β_1, β_2, and β_3 are vectors of parameters. The coefficients presented in Table IIIA are estimates of the elements in vectors equal to $\beta_i - \beta_1$, $i = 2, 3$.

If the higher within-grade-level earnings of those with more education, more pre-company experience, and more company service were a reflection solely of the higher relative productivity of such workers, one would expect the estimated coefficients in salary category equations (1) and (3) to equal the estimated coefficients in performance category equations (2) and (4). In fact, the estimated coefficients in the salary category equations are markedly different from the estimated coefficients in the performance category equations. At both Company A and Company B, those with less than a college education appear to have a much lower probability of being in one of the top two salary categories than do those whose highest degree is a bachelor's degree, but an equal or higher probability of being in one of the top two performance categories. Those with advanced degrees, on the other hand, appear to have a substantially higher probability of being in one of the highest two earnings categories than do those whose final degree was a bachelor's degree, without having a substantially higher probability at A and actually having a substantially lower probability at B of being in one of the top two performance categories.

At both Company A and Company B, pre-company experience appears to decrease an individual's chances of being in the bottom salary category, while increasing his chances of being in the bottom performance category. At both companies, additional company service has a significant and strongly positive effect on the probability that an employee will be in one of the top two salary categories; at Company A the incremental effect of an additional year of service falls as the amount of accrued seniority gets larger but does not vanish within the feasible set of values for the variable. While the initial years of service at Company A have a small but significant positive effect on the probability of an individual being in the middle performance category rather than in either the top or the bottom performance category, this effect vanishes in under seventeen years (i.e., within two years beyond the mean amount of company service). At Company

TABLE IIIB

MULTINOMIAL LOGIT SALARY CATEGORY AND PERFORMANCE CATEGORY EQUATION ESTIMATES

	Company A (N = 4,784)			Company B (N = 2,822)		
	Bottom category	Middle category	Top category	Bottom category	Middle category	Top category
Salary categories						
Probability of average sample member being in category (sample means in brackets)	0.030 [0.052]	0.758 [0.748]	0.212 [0.200]	0.330 [0.380]	0.644 [0.582]	0.025 [0.038]
Percentage change in probability attributable to:						
(1) an additional year of pre-company experience	−4.117 (1.536)	0.098 (0.212)	1.027 (0.751)	−2.771 (0.517)	1.319 (0.268)	1.997 (1.898)
(2) an additional year of company service	−8.331 (0.903)	0.184 (0.130)	2.241 (0.465)	−5.028 (0.388)	2.373 (0.208)	3.480 (2.785)
Performance categories						
Probability of average sample member being in category (sample means in brackets)	0.048 [0.055]	0.783 [0.743]	0.169 [0.202]	0.368 [0.381]	0.606 [0.582]	0.026 [0.037]
Percentage change in probability attributable to:						
(1) an additional year of pre-company experience	5.784 (1.427)	−0.270 (0.165)	−1.147 (0.691)	2.827 (0.477)	−1.648 (0.291)	−2.682 (1.846)
(2) an additional year of company service	0.537 (0.760)	0.001 (0.097)	−0.704 (0.414)	0.787 (0.335)	−0.410 (0.205)	−2.103 (1.343)

a. The probability figures reported here were derived using the fitted values of the multinomial logit coefficients reported in Table IIIA. The sample mean values of the education dummies, region dummies, and grade dummies and the mean amount of both pre-company experience and company service were assumed. The standard errors are "back-of-an-envelope" approximations calculated with the probability of an average sample member being in each category treated as known rather than estimated.

Note. Standard errors are in parentheses below the percentage change estimates.

B, length of tenure has no significant effect on a person's performance category.

The point estimates (and approximate standard errors) presented in Table IIIB were calculated using the estimated coefficients from the multinomial logit models (and the variance-covariance matrix of the parameter estimates). In both Company A and Company B, the point estimates of the multinomial logit coefficients imply that for the mean sample member an additional year of either pre-company experience or company service would do the following: (1) substantially reduce the probability of being in the below-average salary category, increase the probability of being in the average salary category, and increase by a larger percentage the probability of being in the above-average salary category; and (2) increase the probability of being in the below-average performance category, reduce or leave unaffected the probability of being in the average performance category, and reduce by a larger percentage the probability of being in the above-average performance category. Thus, the multinomial logit coefficient estimates strongly suggest that while pre-company experience and company service tend to move individuals with average measured characteristics toward the top of the relevant within-grade-level salary distribution, they tend to move them toward the bottom of the relevant within-grade-level performance distribution. It seems clear that at least among the samples of employees at Company A and Company B under analysis, higher relative productivity cannot be offered as a satisfactory explanation of the higher relative within-grade-level salaries associated with additional labor force experience.[13]

III. Potential Criticisms

Our finding that a substantial fraction of the experience-earnings differential among managerial and professional employees in major U. S. corporations cannot be explained by an experience-performance differential is inconsistent with the explanation of the experience-earnings profile associated with human capital theory. Thus, it is likely that this paradigm's adherents will argue that the test which we have conducted was ill-conceived. In this section we attempt to anticipate and address potential criticisms of our approach. We have grouped these criticisms according to whether they question our econometric

13. It is perhaps worth commenting that, although the data used in this study only permit us to conclude that at Companies A and B the within-grade-level portion of the experience-earnings differential cannot be explained by an experience-performance differential, there is no direct evidence on the extent to which the cross-grade-level portion of the experience-earnings differential at Companies A and B reflects higher productivity of more experienced workers.

methods or our key assumption that within similar jobs, rated performance is monotonically related to productivity.[14]

Econometric Issues

As stated above, the key piece of information used in our analysis is the performance rating given to each employee. Since this assessment seems to be conditional on an employee's job assignment and, hence, his grade level, our analysis has focused on whether the within-grade-level portion of the experience-earnings differential (a substantial part of the total experience-earnings differential) could be explained by a within-grade-level experience-performance differential.

A critic might correctly point out that by looking within grade levels at a given firm, we most likely induce a negative partial correlation between experience and unobserved ability. Even if in the whole relevant sample, experience and ability have a zero correlation, within a given grade level, more experienced employees most likely are less able than less experienced employees, since otherwise they probably would have been promoted to jobs in higher grade levels. A critic might also point out that performance ratings are almost surely error-ridden proxies for relative within-grade-level productivity.

With regard to our earnings function results, it can be shown formally that neither the existence of a negative within-grade-level correlation between experience and ability nor random error in the performance ratings we have used to capture relative productivity can explain the failure of the estimated within-grade-level return to labor market experience to move toward zero when performance rating controls are introduced.[15]

14. Another potential criticism might be that our work is flawed because we look at cross-sectional data rather than at changes over time in the relative earnings and relative performance of members of a cohort. This argument is dealt with in Medoff and Abraham [forthcoming]; longitudinal data from another large company yield the result that, for white male managers or professionals remaining in a grade level, relative earnings rise and relative performance falls with the passage of time.

15. For a sample of people in a grade level, let earnings be a function solely of productivity:

$$\ln Y = \alpha_1 C + \epsilon_1, \quad \alpha_1 > 0, \tag{1}$$

and productivity be a function of both experience and ability:

$$C = \alpha_2 X + \alpha_3 A + \epsilon_2, \ \alpha_2, \ \alpha_3 > 0, \ \mathrm{cov}(X,A) < 0. \tag{2}$$

Suppose that we have a variable which captures productivity with error for those in the given grade level:

$$P = C + \epsilon_3. \tag{3}$$

Assume that these three equations accurately describe the relevant relationships and that ϵ_1, ϵ_2, and ϵ_3 are uncorrelated with each other, with X, and with A. Under these conditions, if $\ln Y$ is first regressed on X alone and then regressed on both X and P, the expected value of the experience coefficient falls toward zero when P is added. This model is laid out more fully in Medoff and Abraham [forthcoming].

The conclusions that can be drawn from our multinomial logit results also appear to be unaffected. It is true that if there is a negative within-grade-level correlation between experience and ability, the estimated effect of experience on performance will be biased downward. It should not be forgotten, however, that the estimated effect of experience on earnings will *also* be biased downward. The goal of our multinomial logit analyses is *not* to derive consistent estimates of the effect of experience on either performance or salary. Rather, they are intended to yield an answer to the question: Can the 40 or so percent of the total earnings advantage enjoyed by more experienced managers and professionals at the firms we have studied that occurs within grade levels be explained by the fact that the more experienced employees within these grade levels are better performers? Our answer of "no" does not depend on the consistency of either our estimate of the impact of experience on performance or our estimate of the impact of experience on earnings. All that the response depends on is that the *difference* between these two estimated experience effects be a consistent estimate of the difference between the two "true" experience effects. We know of no reason why it should not be.

It also seems unlikely that classical measurement error in our performance variable should in any way affect the main conclusions derivable from our multinomial logit models. In a linear model, error in the dependent variable of the type under discussion will weaken the equation's overall explanatory power but will not lead to inconsistent estimated coefficients. In the relevant multinomial logit models, the performance ratings form the basis for the dependent variables. We do not see how errors that arise out of random error in the performance ratings would lead to inconsistency in the estimated multinomial logit coefficients. Consistency is all that matters for our purpose.

Use of Performance Ratings

The validity of our analysis depends on the assumption that within a grade level, for the samples studied, performance ratings are valid indicators of relative productivity. There is an extensive literature on white-collar performance evaluations.[16] Since critical articles are more likely to find their way into personnel journals than those that applaud current practices, performance evaluation programs have been subject to a fair amount of criticism.

16. For good general discussions and further references, see Barrett [1966], Bass and Barrett [1972], Landy and Trumbo [1976], and McCormick and Tiffin [1974].

Much of this criticism focuses on the possibility that supervisors may be overly lenient in rating their subordinates. While inflated ratings are a matter of concern for personnel administrators, there is no evidence to suggest that such inflation distorts the relative rankings of employees by true performance. Even if the ratings of all employees are biased upwards, the best employees should be rated above average, and the worst employees below average. This is all that matters for the present study.

A second criticism of performance ratings asserts that since different supervisors may have divergent beliefs about what constitutes good performance, ratings done by different supervisors should not be compared. While it does seem unlikely that any two supervisors would be completely consistent in their ratings, the results of laboratory studies suggest that a high degree of interrater reliability can be expected.[17] In any event, so long as subordinates with particular observed characteristics are not systematically paired with superiors who rate more or less generously, our findings cannot be called into question on account of variation in supervisors' rating standards.

A third potential weakness of performance ratings is that employees' personal characteristics (race, sex, age, time with company) might influence supervisors' performance assessments. Whether race or sex affects ratings is irrelevant in the context of the present study, since we have restricted our analysis to samples of white males. Evidence that supervisors systematically underrate the relative performance of older or more senior workers would be very relevant. However, in our review of the pertinent literature, we have found no such evidence.

One cannot conclude a priori that any systematic bias in performance ratings associated with age or tenure should be in the direction of understating rather than overstating older or more senior workers' relative productivity. While one might argue that the typical supervisor would tend to give a higher than deserved rating to an employee in a given grade level with less than average experience because of, say, lack of familiarity with his or her weaknesses or because of lower performance expectations, it seems equally plausible to argue that the typical supervisor would favor an employee with greater than average experience because of, say, friendship developed over a period of years or because of lower expectations for someone

17. Relevant research includes Borman [1975] and Whitlock [1963]. Lawler [1967, p. 371] refers to Whitlock's work and asserts that "other studies have shown that raters tend to agree upon the weight to be assigned to . . . different behavior specimens; thus, inter-rater reliability is possible." Unfortunately, he does not specify what other studies he has in mind.

who is more likely to be a "stayer" as opposed to a "mover" in the corporate hierarchy. (If the idea that a supervisor would implicitly assume there to be a negative partial correlation between experience and what one can expect from an employee seems implausible, the reader should reassess its plausibility remembering that the relevant partial correlation is with grade level held constant.) In fact, the limited empirical evidence that is available on the issue of age- and seniority-related bias in performance ratings suggests that more experienced employees tend to be rated somewhat *higher* than is warranted by their true relative performance.[18] Thus, it appears that, so long as older or more senior workers are not systematically below superiors who underrate subordinates with these characteristics (which we find most doubtful), unequal treatment in ratings is not an acceptable explanation for more experienced workers in a grade level receiving ratings that are no higher and perhaps somewhat lower than those received by otherwise comparable less experienced workers.

Another related possibility is that perhaps even within grade levels at a company, more experienced workers might tend to be assigned more difficult tasks than less experienced workers (perhaps because more is expected of those with more experience). If this were the case, employees with greater than average experience could have greater productivity than their less experienced peers and still receive no higher or even lower performance ratings. However, since jobs are grouped into grade levels on the basis of the importance and difficulty of the tasks the job holder must perform, any difference in the potential value of the tasks performed by employees in the same grade level should be small. Further, the only evidence we have seen that bears on this point suggests that older workers in a group of employees holding similar jobs tend to be assigned *less* difficult rather than *more* difficult tasks. In an article discussed at greater length in Section IV of this study, Dalton and Thompson [1971] report that among engineers at six companies there was a negative relationship between supervisors' assessment of the complexity of the tasks a subordinate was typically asked to perform and the subordinate's age. (Their finding is illustrated graphically in Figure I in Section IV.)

18. Two studies of blue collar workers, one by Rothe [1949] and one by Rundquist and Bittner [1948], contain some evidence that the ratings of long service laundry workers and of container inspectors tend to be inflated. A study by Ferguson [1949] of ratings given to assistant life insurance sales managers and another study by Stockford and Bissell [1949] of ratings given to first line supervisors at a manufacturing plant suggest that superiors tend to be more lenient in rating those whom they have known for a longer period of time.

An analysis of promotion probabilities and percentage salary increases in Company B can provide two tests of our contention that performance ratings mirror relative true performance. These tests are based on the seemingly reasonable assumptions that, holding educational attainment, experience, and grade level constant, differentials in promotion probabilities reflect differentials in productivity and that, holding the same variables plus ln(salary) constant, differentials in percentage salary increases also reflect productivity differentials.[19] Under these assumptions, a strong positive association between rated performance and probability of promotion or a strong positive association between rated performance and percentage salary increase among employees in the same grade level who have the same amount of schooling and experience can be taken as evidence of a strong association between relative performance rating and relative productivity.

Table IV presents estimates of the effects of educational attainment, experience, and rated performance on promotion probabilities and percentage total salary changes.[20] A maximum likelihood logit procedure was used to estimate the promotion equations; ordinary least squares was used to estimate the percentage salary change equations.

The partial effect of rated performance in 1976 on the probability that a Company B employee received a promotion between July 1, 1976, and July 1, 1977, is estimated in equation (1). The results imply that individuals with either of the bottom two performance ratings were substantially and significantly less likely to have been promoted than otherwise comparable individuals with either of the top two ratings. The equation (2) results support the same conclusion with regard to the effect of rated performance as of July 1, 1974, on the probability of having received a promotion between July 1, 1975, and July 1, 1977.

19. Holding productivity constant, ln(salary) should be negatively related to percentage salary increase if firms tend to increase the relative earnings of those who are paid less and decrease the relative earnings of those who are paid more than they are currently contributing. The assumptions made in the text also permit education, experience, and grade level to have independent effects on probability of promotion and percentage salary increase, although a priori it is not clear in which direction these effects should go.

20. Estimates for Company A are not presented in Table IV because the Company A file does not contain the necessary historical performance rating data. The Company B samples consist of all white males who were "active" full-time regular domestically based managerial and professional employees throughout the relevant periods, for whom education, experience, and physical work location are known, for whom a valid initial performance rating and grade level are available. and, when relevant, for whom the requisite salary data exist.

TABLE IV

ESTIMATES OF THE RELATIONSHIP OF SCHOOLING, EXPERIENCE, AND PERFORMANCE RATING TO THE PROBABILITY OF BEING PROMOTED AND TO PERCENTAGE SALARY INCREASES AT COMPANY B

	Dependent variable = 1 if promoted between July 1, 1976 and July 1, 1977, 0 otherwise (N = 2,728) (1)[b]	Dependent variable = 1 if promoted between July 1, 1975 and July 1, 1977, 0 otherwise (N = 2,491) (2)[b]	Percent salary change July 1, 1976 to July 1, 1977[a] (N = 2,763) (3)[b]	(Percent salary change July 1, 1975 to July 1, 1977)/2[a] (N = 2,491) (4)[b]
Mean (standard deviation) of dependent variable	0.064	0.209	9.712	9.580
	(0.245)	(0.407)	(4.098)	(3.168)
Less than high school diploma (yes = 1)	0.089	−0.072	0.125	0.304
	(0.656)	(0.420)	(0.496)	(0.411)
High school diploma (yes = 1)	−0.390	−0.282	−0.057	−0.317
	(0.229)	(0.143)	(0.194)	(0.158)
Master's or law degree (yes = 1)	0.250	0.045	−0.486	−0.335
	(0.276)	(0.178)	(0.289)	(0.218)
Doctorate (yes = 1)	−0.002	0.169	−0.348	0.321
	(0.488)	(0.314)	(0.504)	(0.395)
Years of pre-company experience/10	−0.711	−0.741	−0.706	−0.743
	(0.318)	(0.220)	(0.287)	(0.249)
(Years of pre-company experience)^2/100	0.083	0.094	0.035	0.051
	(0.112)	(0.083)	(0.096)	(0.090)

Years of company service/10[c]	−1.277	−0.818	−1.517	−0.743
	(0.303)	(0.211)	(0.283)	(0.240)
(Years of company service)^2/100[c]	0.227	0.096	0.256	0.058
	(0.085)	(0.062)	(0.076)	(0.067)
Ln(annual salary)[c]	—	—	−8.296	−9.255
			(0.799)	(0.613)
Performance rating 1 (worst; yes = 1)[c]	—	−1.517	−2.879	−2.155
		(0.743)	(0.684)	(0.488)
Performance rating 2 (yes = 1)[c]	—	−0.631	−1.735	−1.134
		(0.125)	(0.158)	(0.132)
Performance rating 1 or performance	−0.992	—	—	—
rating 2 (worst; yes = 1)[c,d]	(0.205)			
Performance rating 4 (best; yes = 1)[c]	−0.139	0.285	0.991	0.949
	(0.377)	(0.208)	(0.382)	(0.270)
Constant	yes	yes	yes	yes
Region dummies (3)	yes	yes	yes	yes
Grade level dummies (8; 11; 11; 11)[c,e]	yes	yes	yes	yes
χ^2	139.07	225.92	—	—
d.f.	21	25	—	—
R^2	—	—	0.147	0.178
SEE	—	—	3.802	2.888

a. Percent salary change was calculated as the natural logarithm of the annual salary in the ending year minus the natural logarithm of the annual salary in the starting year times 100.
b. Equations (1) and (2) were estimated using a maximum likelihood logit procedure, equations (3) and (4) using ordinary least squares.
c. Years of company service, salary rating, and grade level are as of July 1, 1976, if used in equations (1) and (3) and as of July 1, 1974, if used in equations (2) and (4).
d. Since none of those with the lowest performance rating in 1976 received a promotion between July 1, 1976, and July 1, 1977, the two bottom performance categories were combined in estimating equation (1).
e. Individuals in grade levels where either everyone or no one received a promotion were excluded from the logit samples.
Note. Standard errors are in parentheses below the coefficient estimates.

Promotion-related salary increases are a relatively small part of total salary increases at Company B. Between July 1, 1976, and July 1, 1977, only 9 percent of the total dollar amount of salary increases granted were associated with promotions, while 83 percent were labeled "merit" increases. Regression (3) demonstrates a substantial and significant positive partial correlation between 1976 relative performance rating and 1976–1977 percentage total salary increase. This result suggests that, while a part of so-called "merit" increases is relatively automatic, part does in fact reflect merit. The fourth regression shows that individuals with a given amount of schooling and experience who received higher performance ratings in 1974 received substantially and significantly higher average percentage salary increases between July 1, 1975, and July 1, 1977, than did their lower rated grade-level peers.

Critics of the use of performance ratings in the analysis presented in Section II might make one further argument: since a major use of ratings is to condition decision-making concerning promotions, rated performance is likely to reflect not only a manager's or professional's productivity in his current job but also his supervisor's assessment of his potential for advancement within the company. Holding education constant, more experienced (older) managers and professionals are typically less likely to be promoted out of any given grade level than less experienced (younger) managers and professionals and, hence, apt to be perceived as having limited potential for future advancement.[21] Thus, to the extent that performance ratings are affected by supervisors' assessments of individuals' future potential, more experienced workers might typically receive lower performance ratings than warranted simply on the basis of their current productivity.

The institutional basis for this argument is weak insofar as at both Company A and Company B, the instructions to supervisors preparing ratings clearly ask for an assessment of how well each employee is fulfilling the requirements of his or her current job, not for a forecast of the employee's productivity profile over his or her work life. At Company A supervisors are asked to make entries on a per-

21. Estimation of promotion equations similar to those in Table IV but without performance rating controls yielded education and experience coefficients virtually identical to those reported in Table IV. The coefficients from the equations without rating controls imply that, for a Company B employee with the relevant sample mean characteristics, an additional year of either pre-company experience or company service was associated with a 6 percent lower chance of receiving a promotion between July 1, 1976, and July 1, 1977, and with a 5 percent lower chance of receiving a promotion between July 1, 1975, and July 1, 1977.

formance review worksheet *"during the year* for the purpose of *providing supporting information for the annual employee assessment"* [our italics]; the intent is clearly that each employee's annual performance rating should reflect his or her performance during the appraisal year. At Company B, as seen above, the "Supervisor's Guide for Performance Review and Development Planning" states that "[r]eviews should be based on the employee's performance in his present position and *only for the period* [typically one year] *since his last review"* [our italics].[22]

Finally, it should be noted that at Company A, as at many U. S. corporations, each employee's promotability is formally assessed separately from his performance. A Company A supervisor who believed that a particular employee would do well in a higher level job would not have to convey that information to higher management indirectly by giving the employee a higher than deserved performance rating but could convey his belief directly by awarding the employee an appropriate promotability rating. Statistical results discussed in Medoff and Abraham [forthcoming] based on data from another U. S. manufacturing corporation indicate that the performance ratings and the promotability measure used at that company really do capture different things; while the performance ratings do very much better in explaining current salary, the promotability measure strongly dominates in predicting advancement to a higher grade level.[23]

In light of what we have been able to learn from our review of the relevant personnel literature, from the case studies we have done, and from various analyses with company personnel data, we feel very comfortable in assuming that performance ratings are good indicators of employees' relative productivity in the year of evaluation. Hence, we believe that this diverse evidence strongly supports the interpretation we have given to our results.

22. A small number of Company B supervisors were asked to "list the five most important factors (in order of importance) that you consider when you give a performance rating to a subordinate." Of the thirteen supervisors responding to this question, only one indicated that he considered an employee's potential when awarding a performance rating. For this supervisor, potential was the last factor listed, coming behind "achievement against action plan," "creative element brought to assignments," "need for supervision to complete assignments," and "attitude." All of the thirteen supervisors' responses were consistent with a belief that the actual practices followed by Company B raters closely matched the instructions they were given.

23. The Company A performance measure contributes more to explaining current salary than does the Company A promotability measure. However, we were not able to test whether at Company A the promotability measure dominated the performance measure in predicting promotions because the Company A file did not contain the historical performance rating and promotability rating information such a test would have required.

IV. Toward a Richer Explanation of the Experience-Earnings Relationship

The finding that at least a substantial fraction of the experience-earnings differential cannot be explained by an experience-performance differential among samples of white male managerial and professional employees at Companies A and B does not appear to be an aberration. We observed the same phenomenon in two comparable studies, Medoff [1977] and Medoff and Abraham [forthcoming], of a major airline and of another manufacturing firm. Dalton and Thompson [1971] also obtained similar results in an analysis (supported by the Harvard Business School) of the relative performance and earnings of 2,500 managerial and professional employees of different ages in six technology-based companies. Figure I is based on the information presented by Dalton and Thompson. The average percentile performance ranking of employees in each age group depicted in this figure is determined by supervisors' assessments of the "contribution made to the company during the past year" by their subordinates. Dalton and Thompson's findings imply that although engineers older than thirty five received relatively low performance ratings, they received relatively high earnings. In addition, the Dalton and Thompson results indicate a negative relationship between relative performance and age among first and second level managers after their late thirties.[24] While information on the managers' compensation was not presented, it would be most exceptional if there were a corresponding negative association between relative earnings and age among those past their late thirties. In comparing the relative salaries and performance of older and younger engineers, Dalton and Thompson [p. 59] write:

> While performance rankings begin to fall after the mid-thirties salaries continue to climb until the early forties before leveling off. This increasing discrepancy between a person's performance rankings and his "salary ranking" is one of the factors that makes project leaders reluctant to have older engineers assigned to their projects.

The divergence between experience-earnings and experience-performance differentials among managerial and professional employees in major U. S. firms raises a number of questions: (1) Why might the relative performance of a managerial or professional employee stay constant or decrease over much of his or her worklife? (2) What factors condition the salary determination process such that

24. For a summary of other studies concerning the relationship between experience or age and performance that strongly support the main assertion of this study, see Medoff and Abraham [April 1980].

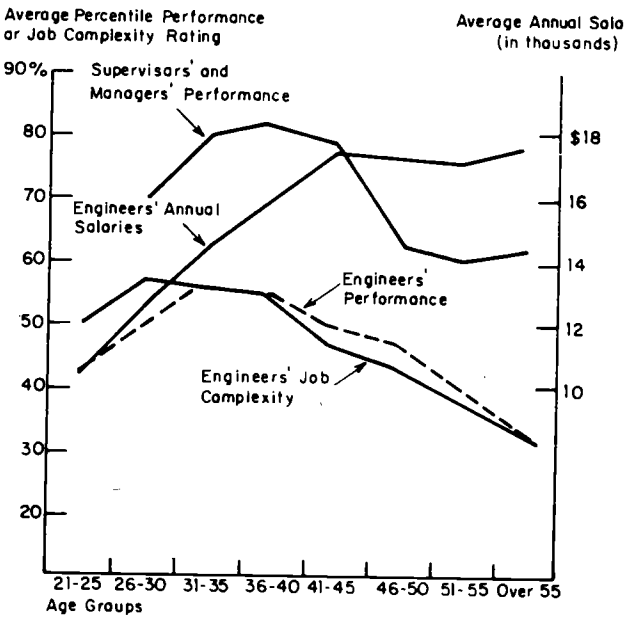

FIGURE I
Age, Performance, and Salary of Engineers; Age and Performance of Supervisors and Managers; Age and Job Complexity of Engineers
(Adapted from Dalton and Thompson [1971])

within grade levels the experience-earnings differential cannot be explained by an experience-performance differential? (3) While the observed divergence between these two differentials appears to be inconsistent with a strictly human capital interpretation of the experience-earnings profile, can the finding be reconciled with competitive theory?

Why Might Relative Performance Not Increase with Experience?

Human capital theory argues that with the passage of time workers accumulate productivity-augmenting skills. While on-the-job learning is undoubtedly of some importance, especially when a person is just beginning a job, other factors change over time in a direction that implies a decrease in workers' capacity for their assignments. Most importantly, during periods of rapid technological change, skills workers acquired during the formal education process may soon become obsolete. Skill obsolescence creates the largest problems for those in technical fields; for instance, revisions in college engineering curricula since the 1950s have given increasing emphasis to basic

science and mathematics, which appears to have greatly reduced the "half-life" of an engineering education.[25] Similarly, the recent emphasis on quantitative techniques has most likely caused the business training of many older managers to become substantially obsolete.

A second factor that can be expected to affect performance is the stimulation (or lack of it) offered by an assignment. While learning most likely occurs with doing (at least for a short period of time), boredom is apt to set in eventually. Thus, the passage of time can come to have a negative effect on productivity, mediated by what might be called "on-the-job sensory deprivation."[26]

Motivation is a final potential determinant of within-grade-level performance that is also, most likely, a function of time. Within a grade level, workers with greater than average experience are relatively behind their cohort in terms of movement up the corporate hierarchy. Hence, within a grade level, workers with more experience are likely to have a stronger feeling that they are not on their company's fast track or on any track at all and thus become discouraged. This can lead to a reduction in effort expended on the job, especially since companies appear to avoid discharges (at least among those who are not new hires), demotions, and substantial cuts in relative salaries, fear of which might give employees an incentive to avoid slackening off. Dalton and Thompson [1971, p. 63] observed that the effort of the engineers they studied seemed to decline with age and offered the following explanation of the phenomenon:

> An older engineer often views the future with pessimism. He expects little positive reward, even if he does put forth greater effort.

Further, it has been claimed that older employees value promotions less highly than do younger employees.[27] This suggests that age can be expected to reduce the effort employees expend in trying to advance.

25. See Kaufman [1974].

26. For a discussion of the extensive literature on the importance of boredom in industrial settings, see Maier [1973]. While most of the relevant studies have focused primarily on production jobs, there is no reason why boredom should not have an effect on those who remain in a given nonproduction assignment. Indeed, Kaufman [June 1974, p. 379] argues that, "Although the emphasis on such techniques as job enrichment in recent years has focused mainly on nonprofessional employees, it is the professionals in the organization who are likely to be most affected by the intrinsic motivation of their work."

27. The issue of what rewards are most valued by different groups of employees has received a great deal of attention from industrial psychologists. The study by Hall and Mansfield [1975] lends support to the argument that older workers care less about promotions than younger workers. Their paper also contains references to earlier studies that reached similar conclusions.

Thus, even if obsolescence and encroaching boredom were not a problem for older workers in a job, motivational considerations could explain why, within grade levels, relative performance might not increase with experience. Next, we must address the more difficult question of why within-grade-level earnings do increase with experience.

Why Might Relative Earnings Increase with Experience Even If Relative Productivity Does Not?

At this point in time, neither we nor, to the best of our knowledge, anyone else can provide direct evidence in support of a new interpretation of the experience-earnings relationship; our findings demonstrate only that productivity-augmenting on-the-job training should play a substantially smaller role in any new explanation than it does under human capital theory. Moreover, since we feel that, to be of value, any new interpretation must have an empirical basis, all we wish to do at present is to suggest several alternatives whose validity must be assessed through the collection and analysis of additional information on the origins and functioning of firms' compensation policies.

First, for any of a variety of reasons, employees and employers may enter into implicit contracts that provide for relative earnings growth unrelated to changes in relative productivity over the course of a worker's tenure with the firm.[28] One reason for both firms and workers to prefer such a pay scheme is that deferring part of workers' compensation may deter quitting or behavior that would lead to discharge, increasing the expected present value of each employee's net contribution to the firm and (assuming competition) increasing the expected present value of each employee's lifetime compensation.[29] Moreover, the regular receipt of raises may improve workers' morale, which may in turn increase their productivity and present value of lifetime compensation. Alternatively, steep wage profiles might serve as a self-selection device. For example, workers with high innate quit propensities might be less likely to come to work for a firm that underpaid people at the start of their work lives and made up the difference later on.[30] A different rationale for implicit contracts providing that at least some workers be paid less than they produce

28. For discussion of another type of implicit contract, see Baily [1974] and Azariadis [1975].

29. One implicit contract model that offers a cheating deterrence story is developed in Lazear [1979].

30. See Salop and Salop [1976] for a formal development of this argument.

when young and more than they produce when old might rest on workers being risk-averse and owners of firms being risk-neutral. Not knowing at the beginning of their work lives whether their productivity would grow rapidly or slowly, workers might want a pay scheme that guaranteed annual pay increases of a certain amount independent of whether they turned out to be high-productivity or low-productivity employees. Still another possibility is that workers might prefer deferred compensation if the rate of return on assets the firm can earn exceeds the rate of return on assets accessible to the employee.

While all of the preceding seem at least on the surface to be plausible hypotheses, so far as we know none has any empirical basis. Furthermore, under implicit wage agreements of the sort discussed above, the firm could increase current profits by violating its pledge to pay long-service employees more than their productive value. Thus, some enforcement mechanism must be introduced. One potential *deus ex machina* is the firm's reputation (among present employees, future employees, and the society at large), which is a determinant of its long-run profitability. Whether or not such a mechanism exists is an open question.[31]

A second issue that merits consideration as a factor in the divergence between the earnings and performance of senior employees involves the relationship between a superior and subordinate. It is likely that the disutility from firing or reducing the relative salary of a long-time subordinate employee conditions a supervisor's decisions. This is just an extension of the point that factors other than profits are likely to enter the utility function of a manager.

A third issue which deserves mention is that workers have beliefs concerning "just" relative compensation. These beliefs could stem from certain societal values (e.g., "elders should be respected") and could be quite strong. Thus, a compensation policy which pays each employee his or her value of marginal product at each point in time may not be the policy that would be chosen by the marginal or average employee in the firm.

Each of these points is a member of a larger set that share the realization that individuals are quite likely to prefer a compensation policy which does not relate relative wages only to relative productivity. If any of the points is valid, long-run profit maximization need not imply that when an employee's relative earnings are increasing, the worker's relative performance could not be constant or decreasing. Thus, it is not true that the divergence of experience-earnings and

31. For an empirical analysis of this issue, see Medoff and Abraham [April 1980].

experience-performance profiles must be inconsistent with the tenets of competitive theory. However, whether it is or is not remains to be demonstrated.

V. Conclusion

This study has provided direct evidence concerning the relationship between experience and performance among managerial and professional employees doing similar work at two major U. S. corporations. The facts presented indicate that while, within grade levels, there is a strong positive association between experience and relative earnings, there is either no association or a negative association between experience and relative performance. Since the fraction of the experience-earnings relationship that occurs within grade levels is substantial, at a minimum a substantial portion of this relationship cannot be explained by the human capital model of productivity-augmenting on-the-job training.

An explanation of why in U. S. corporations more experienced workers doing a given job receive higher salaries than their less experienced, but no less productive, peers remains to be documented. At present, there are a number of theories that have been offered as consistent with our findings, but each of them suffers the same deficiency as the human capital theory about the experience-earnings profile: absence of an empirical basis. Nevertheless, we are confident that through future explorations within firms guided by those who administer and those who are affected by corporate compensation policies, the requisite evidence can be obtained. This will represent an important step toward an empirically based interpretation of experience-earnings differentials in particular and earnings differentials in general.

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