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NOTES

EDUCATION MATCH AND JOB MATCH

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Abstract—Using a new data set, this paper gives evidence in support of the intuitive notion that overqualified workers are less satisfied with their jobs and are more likely to quit. However, training time is inversely related to overqualification, which suggests why such seeming mismatches occur and may in fact be optimal.

I. Introduction

This paper gives evidence in support of the intuitive notion that overqualified workers are less satisfied with their jobs and are more likely to quit. However, training time is inversely related to overqualification, which suggests why such seeming mismatches occur and may in fact be optimal.

The definition of overqualification used in this paper refers to educational attainment in excess of that required for adequate performance of the worker's job. This has been referred to as "surplus schooling" or "overeducation" by several authors (e.g., Duncan and Hoffman (1981); Tsang and Levin (1985); Rumberger (1987)). Although workers can be overqualified in a number of ways, educational requirements are a common factor in most hiring decisions and are easily quantified.

After discussing the relation between education and training, I describe the original data set used in this paper. Section IV presents results of wage, satisfaction, quit intention, and training equations. The paper concludes with suggestions for further research.

II. Education and Training

An important prediction of the human capital theory is that workers share the costs of specific on-the-job training by accepting a lower starting wage with a higher growth rate over time (Oi, 1962). This sharing arrangement insures both the firm and the worker against non-optimal turnover, and workers and firms will enter into a match only if they expect to reap the

rewards of any investment in specific training over time. If ability and education are positively correlated, training costs are likely to be inversely related to overeducation, and many combinations of education attainment and probability of turnover will yield the same expected return to the firm.

Further, not all jobs require large investments in firm-specific training. The primary cost of turnover in this case is hiring costs. Since education is a highly visible indicator of work quality, employers screening workers for jobs which do not require specific training may find the cheapest screen is the worker's education.[1] In addition, overeducated workers may constitute a pool from which promotions are made, thereby reducing hiring costs for higher level jobs.

Individuals investing in education do so in expectation of receiving a return high enough to compensate them for the costs of their investment. Since education and earnings are highly correlated, workers will seek jobs whose educational requirement match their educational attainment. However, job search is costly and workers may optimize by accepting an offer for a job which requires less education than they possess. These workers may continue searching for a better match and therefore may have higher turnover. Since turnover will be less costly in jobs with low investment in firm-specific capital, we expect workers with a mismatch in education to be in jobs with a low specific training component.

III. Data and Empirical Specification

This paper uses original data collected in the Eugene, Oregon area in 1986. The sample was drawn from employees of eighteen manufacturing and warehouse firms, excluding firms in the highly cyclical forest products industry. I selected manufacturing and warehouses since workers and jobs in these industries are similar, and there is significant worker mobility across these industries.

To generate the sample, all manufacturing firms and warehouses in the area with more than forty employees were asked to participate in the study. Eighteen firms participated in the study, representing 50% of the eligible firms. Worker information was collected by

[1] The screening literature includes Arrow (1973) and Spence (1974).

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posting notices informing workers that a researcher would be in the employee lunchroom at particular times, i.e., between shifts or during break or meal-times, and employees who completed a twenty-minute questionnaire would be paid $5.00 for their time. All respondents were guaranteed confidentiality, with no names requested on the questionnaire.

The sample I examine consists of 414 male and 213 female employees. The key variables in this study are the education variables, job satisfaction, quit intentions, and on-the-job training, described below.

To obtain data on the incidence of educational mismatch, workers were asked "What level of formal education do you feel is actually needed by a person to do your job, not just to be hired?" This question was followed by a choice of six categories ranging from "no formal education is necessary" to post-college education.[2] In order to construct a continuous measure of surplus schooling I converted each category to a single school-year equivalent.[3] Actual schooling is measured as number of years of completed schooling. Surplus or deficit schooling is defined as the absolute value of the difference between actual schooling and that required to perform the job. On average, actual education exceeds reported required education, although 21% of the women and 14% of the men report having less education than their jobs require.

SATISFACTION is measured on a linear scale from zero to ten, where zero represents "not at all satisfied" and ten represents "very satisfied." Workers were asked to circle the value that best reflects their job satisfaction. *QUIT INTENTION* is a dummy variable equal to one if the worker responded that he or she is "very" or "somewhat likely" to make a genuine effort to find a new job with another employer within the next twelve months. On-the-job training (*TRAINING*)

is the response to the question "Did the company provide any on-the-job training?ʼ If yes, how many weeks?"[4]

Table 1 provides a detailed overview of the education variables and of the average values of *SATISFACTION*, *QUIT INTENTION*, and *TRAINING* by occupation and sex. Educational attainment and requirements were highest for professional and managerial workers, and lowest for operatives and laborers. The percentage of workers with surplus education ranged from 29% for female clerical and sales workers to 78% for female operatives. The incidence of surplus education by occupation is similar to that reported by Rumberger (1987) using the *Quality of Employment Surveys*. There is strong evidence of a negative relation between percentage of workers with surplus schooling and average satisfaction, and a strong positive relation between percentage of workers with surplus schooling and quit intentions. The average amount of training provided by occupation also varies inversely with the percentage of workers with surplus schooling. Section IV demonstrates that these relations also hold for individuals after controlling for detailed human capital characteristics and wage.

Table 2 summarizes the variable definitions and sample characteristics for male and female workers. The other independent variables used in the analysis are years of full-time work experience since age 18, years of tenure with current employer, dummy variables equal to one for workers that are handicapped, white, married, or in a job covered by a union contract, as well as dummy variables for five occupational categories.

IV. Empirical Results

The first column of table 3 summarizes the results of the estimation of a standard human capital wage equation for the male and female samples (complete regression results are available on request). The dependent variable is the natural logarithm of hourly wage. In

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[2] Although the interpretation of "required education" can be problematic, none of the respondents indicated that they had any difficulty in responding to this question.

[3] To examine the sensitivity of the results to the conversion used, I estimated all models using three different conversion schemes. For instance, for workers reporting their job required "some college" I estimated the model assigning the school year equivalent as 13, 14, and 15 years. The results presented in the paper are based on the middle values for all categories. The results varied little with the conversion scheme used. The results are less sensitive to the conversion scheme than those based on the *Quality of Employment Surveys* (*QES*), where both actual and required schooling are measured in categories. Data from the *QES* have been used extensively, particularly in studies addressing job risk and working conditions. Rumberger (1987) discusses these data. The 1976 *Panel Study of Income Dynamics* (*PSID*) also has a question on required education. However, the *PSID* question refers to the amount of education needed to be hired. This will affect match quality less directly than the amount of education the worker feels is necessary to do the job.

[4] The 1976 *PSID* and the *QES* have training questions which ask the respondent how long it would take the *average* new person to become fully trained and qualified (*PSID*) or to do the job reasonably well (*QES*). We would not expect the training time necessary for the average worker to depend on the education match of the individual worker. As with the *PSID* and *QES* training variables, the measure of training in this paper may be subject to considerable measurement error, since most of the employers in the sample did not provide formal training programs. Workers tended to be trained informally by their supervisor and coworkers. However, the pattern of responses (reported in table 1) conforms to conventional expectations and is also consistent with tabulations based on the length of time required by the average new worker to learn a job reported in Duncan and Hoffman (1979) using the *PSID*.

TABLE 1.—MEANS OF EDUCATION AND DEPENDENT VARIABLES
BY OCCUPATION AND SEX

	No. of Observations	Education Attainment	Education Requirement	Percent Surplus Education	Satisfaction	Quit Intention	OJT
Males							
Professional and Managerial	56	15.51	14.46	.52	7.41	.34	3.35
Clerical and Sales	23	15.17	13.30	.70	6.35	.52	4.69
Craftsmen and Foremen	113	12.79	11.98	.36	6.57	.41	21.16
Operatives	114	12.57	11.09	.52	6.31	.40	9.35
Laborers	108	13.18	10.17	.72	5.61	.63	4.13
Females							
Professional and Managerial	26	13.98	13.54	.35	7.35	.35	6.35
Clerical and Sales	104	13.11	12.90	.29	7.30	.30	3.61
Craftsmen and Foremen	11	12.36	10.55	.36	7.91	.09	40.05
Operatives	27	12.22	10.00	.78	6.02	.59	6.71
Laborers	45	12.56	9.07	.73	5.24	.56	2.76

TABLE 2.—VARIABLE DEFINITIONS AND SAMPLE MEANS
(STANDARD DEVIATIONS IN PARENTHESES)

Variable	Definition	Males	Females
WAGE	= hourly wage.	9.99 (4.05)	7.54 (2.81)
SATISFACTION	= ranking of job satisfaction on a scale of 0 to 10 from not at all satisfied to very satisfied	6.35 (2.49)	6.74 (2.61)
QUIT INTENTION	= 1 if worker is somewhat or very likely to make a genuine effort to change employment in the next 12 months; 0 otherwise	0.46 (0.50)	0.38 (0.49)
OJT	= weeks of company provided on-the-job training	10.13 (31.19)	6.15 (19.36)
EDUCATION	= years of schooling completed	13.33 (2.07)	12.95 (1.58)
REQUIRED EDUCATION	= years of schooling needed to perform the job, not just to be hired	11.67 (2.60)	11.68 (2.71)
EXPERIENCE	= years of full-time work experience since age 18	14.59 (11.03)	12.16 (9.58)
TENURE	= years of tenure with present employer	7.33 (7.14)	5.42 (5.93)
HANDICAPPED	= 1 if physical condition limits work; 0 otherwise	0.07 (0.26)	0.08 (0.27)
WHITE	= 1 if worker is white; 0 otherwise	0.95 (0.21)	0.94 (0.23)
MARRIED	= 1 if married; 0 otherwise	0.72 (0.45)	0.57 (0.50)
UNION	= 1 if worker's job is covered by a union contract; 0 otherwise	0.33 (0.47)	0.35 (0.48)
Sample size		414	213

TABLE 3.—ESTIMATES OF THE IMPACT OF EDUCATIONAL MISMATCH ON WAGES,
JOB SATISFACTION, QUIT INTENTION, AND *OJT*

	Dependent Variable			
	Ln (WAGE)[a]	SATISFACTION[b]	QUIT INTENTION[c]	OJT[d]
Males				
REQUIRED EDUCATION	.061[f]	.066		
	(.008)	(.063)		
SURPLUS EDUCATION	.023[f]	−.315[f]	.116[e]	−1.648[e]
	(.008)	(.061)	(.053)	(0.739)
DEFICIT EDUCATION	−.006	.051	−.099	0.556
	(.021)	(.165)	(.184)	(2.596)
EDUCATION			.030	1.599
			(.066)	(1.050)
WAGE		.073[e]	−.129[f]	
		(.037)	(.043)	
Adj R^2 or	.58	.25		0.08
Likelihood Ratio			485.45	
Females				
REQUIRED EDUCATION	.064[f]	.206		
	(.012)	(.107)		
SURPLUS EDUCATION	.022	−.369[f]	.109	−1.749[f]
	(.014)	(.119)	(.078)	(0.669)
DEFICIT EDUCATION	−.035	−.466[e]	.003	−0.469
	(.027)	(.227)	(.249)	(1.880)
EDUCATION			.009	0.714
			(.112)	(0.984)
WAGE		.077	−.256[f]	
		(.068)	(.086)	
Adj R^2 or	.45	.27		.17
Likelihood Ratio			230.68	

Note: Standard errors are in parentheses.

[a] Equation also included the variables EXPERIENCE, EXPERIENCE SQUARED, TENURE, TENURE SQUARED, HANDICAPPED, WHITE, MARRIED, and UNION.

[b] Equation also included the variables EXPERIENCE, TENURE, HANDICAPPED, WHITE, MARRIED, and UNION.

[c] Estimated using maximum likelihood logit. Equation also included the variables EXPERIENCE, TENURE, HANDICAPPED, WHITE, MARRIED, and UNION.

[d] Equation also included years of precompany experience, HANDICAPPED, WHITE, MARRIED, and UNION and controls for five occupational categories.

[e] Significant at the 0.05 level (two-sided tests).

[f] Significant at the 0.01 level (two-sided tests).

addition to the education and wage variables reported in this table, the wage equations include years of work experience and its square, years of tenure with current employer and its square, and dummy variables for handicapped status, race, marital status, and union status. To allow the return to years of surplus education and years of deficit education to differ, the variables SURPLUS and DEFICIT are both included in the specification. (Note that although DEFICIT + SURPLUS + REQUIRED EDUCATION sum to EDUCATION, there is no problem with multicollinearity because total education is omitted from equations with deficit, surplus, and required education.) The relatively high explanatory power is due in part to the fact that since all workers were employed in the same locality, regional and city size differences in the earnings structure were absent.

The returns to required schooling are about 6% for both men and women, while the return to surplus schooling is slightly less than half that amount. Having less education than required to do one's job does not have a significant effect on wage. These values are similar to those found by Duncan and Hoffman (1981) and Rumberger (1987).

The second column of table 3 summarizes the results of the estimation of the job satisfaction equation, where satisfaction is regressed on required, surplus, and deficit equation, as well as the remaining human capital and individual characteristics. Both male and female workers with too much education for their jobs are less satisfied (significant at the 5% level in two-sided tests), as are women with too little education. Satisfaction is not significantly related to required schooling. Workers with higher wages are more satisfied; however, this result is significant only for men.

Column 3 of table 3 summarizes the logit estimates of the QUIT INTENTION equation. Since workers who change jobs often do so in response to higher

outside wage offers, and actual years of schooling are a more important determinant of outside wage offers than the level of schooling required in a worker's current job, the variable *QUIT INTENTION* is regressed on surplus, deficit, and actual years of schooling as well as the remaining human capital and individual characteristics. The expressed likelihood of quitting is positively related to the number of years of surplus schooling for men (significant at the 5% level in a two-sided test), and is significantly negatively related to hourly wage for both men and women. Thus men with surplus education are more likely to expect to receive an outside offer that exceeds their current wage. However, the likelihood of receiving a higher outside wage offer is inversely related to current wage.[5]

The last column of table 3 summarizes the estimates of the regression of *TRAINING* on years of individual education, surplus education, deficit education, years of precompany experience, and dummy variables for handicapped, race, marital status, and union status, and occupation category. Training time is significantly negatively related to years of surplus schooling for both males and females. An additional year of surplus schooling reduces training time by 1.65 weeks for males and 1.75 weeks for females. However, workers who have less education than their jobs require do not receive significantly more training. Actual education is not significantly related to training time.

Finding an inverse relation between training time and the quantity of surplus schooling provides a rationale for hiring overqualified workers. Whether this inverse relation is due to greater innate ability of workers with surplus education, or the result of firms providing less training to workers they anticipate will be more likely to quit, the costs of turnover may be lower for overqualified workers.[6]

V. Suggestions for Further Research

Underlying these empirical findings is a model of employer and employee search in which turnover is an anticipated and optimal outcome of hiring overqualified workers. The next stage is to model the employer and employee search decisions incorporating these features: hiring costs are a function of educational attainment, training is a function of educational match, and workers can search while employed. One testable prediction of such a model is that, by searching while employed, workers move into better matching jobs, which supports the empirical finding that eventually workers move into jobs with ultimately long duration (Hall, 1982).

DATA APPENDIX

I personally collected the data by on-site visits and by interviews with a representative of the firm for 12 of the firms, while my research assistant collected the data for the remaining 6 firms. The information provided by the firm's representative included information on turnover, methods used by the firm to find applicants for job openings, methods of determining pay raises and promotions, types of training programs used, fringe benefits, overtime policies, information on days lost due to on-the-job accidents, information on sales, production capacity, and union contract. I also obtained additional detailed information for each firm on claims for on-the-job accidents from the State of Oregon Workers Compensation Department. I did not have access, however, to individual personnel records.

The data do not represent a random sample, either of firms or of workers within firms. However, the firms and the workers seem to be representative of the population of firms and workers in the Eugene area. The firms that declined to participate primarily did so because summer was their peak time, the company president was not available to grant permission (e.g., on vacation or too busy) or because the firm did its own in-house surveys and did not want their workers burdened by additional surveys (doubtlessly, a secondary reason was that they wished to avoid establishing a precedent of paying workers for completing a survey).

The extent of worker participation varied with the involvement of the individual firm. About half of the firms gave workers time off from work to complete the survey, and for these firms most of the workers present participated. In the other firms, the surveys were administered during break times, lunch, or before and after work and between shifts. The rate of participation in these cases was lower, but there appeared to be no systematic reason for not participating. Reasons for not participating generally were related to previous commitments.

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[5] Estimations including *SATISFACTION* in the *QUIT INTENTION* equation indicate that more satisfied workers are less likely to quit.

[6] The actual costs of turnover depend on a number of unobserved factors, particularly actual training and hiring costs.