Education, Variation in Earnings, and Nonmonetary Compensation

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ABSTRACT

The NAS-NRC Twin Offspring data support the proposition that for those with low levels of education, earnings may be an adequate proxy for compensation, whereas the opposite holds for highly educated individuals. The inclusion of variables that control for reasons (monetary or nonmonetary) individuals chose their occupation explains an additional 9 percent of the variation in earnings for those with 16 or more years of education (and lowers the male-female wage gap by almost 40 percent) and only an additional 2 percent for those with 15 years or less (no affect on male-female wage gap).

I. Introduction

Nonmonetary factors are likely to be an important part of total compensation for many jobs. Nurses, for example, often explain how the rewards from helping others help to compensate them for their hard work. Nonetheless, nonmonetary factors are rarely included in eco-

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nomic models of worker behavior. A failure to account for the role of nonmonetary compensation can seriously distort our understanding of important policy issues, such as discrimination, comparable worth, and the economic value of education. For example, estimated earnings differences across sexes are often used as estimates of the magnitude of sex discrimination. Yet, estimated earnings differences may overstate the magnitude of discrimination if nonmonetary rewards are a more important part of total compensation for female workers.

In this paper, the importance of nonmonetary job attributes in total compensation packages is explored. More specifically, the question addressed by the research is: "Does the ability of earnings to measure total compensation decline as a worker's education level rises?" The empirical models are designed to determine whether earnings are a suitable measure of total compensation for two groups: (1) those with less than 16 years of education and (2) those with 16 or more years of education. In addition, the models are designed to ascertain whether estimates of sex discrimination are sensitive to the inclusion of nonmonetary compensation measures.

The research hypothesis is based, in part, on earlier research on the trade-offs between job attributes and earnings. Adam Smith (1937, p. 100) noted that "the wages of labour vary with ease or hardship, the cleanliness or dirtiness, the honourable or dishonourableness" of the job. Lucas (1972) found that workers receive higher wages in compensation for jobs that have poor work environments and repetitive routines. Duncan (1976) and Atrostic (1982) focus on the relationship not only between earnings and nonpecuniary compensation but also education and nonpecuniary rewards. This research suggests that job amenities and education are positively related. For example, Duncan finds that education's importance in determining pecuniary benefits carries over to nonpecuniary benefits as well. When combining these benefits into a single compensation measure, he finds that the relationship between education and compensation is stronger than the relationship between education and earnings. Taken together, the results imply that use of earnings to proxy compensation may be inaccurate and that the degree of inaccuracy will vary with education.

The ability of earnings to proxy compensation varies with education because those with more education (and more income) presumably have more income to purchase all goods and services including nonmonetary rewards. Strumpel (1975) argues that "he who is fairly satisfied with the amount of income received and has a secure and steady job will raise his sights to non-material aspects of the job, like the satisfaction it provides." In addition, potential income effects on the demand for job amenities are augmented by tax effects because marginal tax rates are positively related to income, not compensation.

If consumption of nonmonetary characteristics vary not only by education but also by sex, earnings differences between males and females may not be an accurate measure of differences in compensation, and therefore, discrimination. For example, Antos and Rosen (1975) found that characteristics of the students and the particular school accounted for the differences in wages between black male and black female teachers.

The model presented below is not capable of determining whether differences in nonmonetary compensation across education groups result from demand side or supply side effects. The results do indicate, however, that the importance of nonmonetary attributes of jobs differ significantly across education and sex groups.

II. The Empirical Model

The working population is divided into two education categories. The first group (group L) consists of those with small investments in education and the second (group H) consists of those with large investments in education. The earnings of an individual from groups L and H are denoted by Y^l and Y^h, respectively.

A. Econometric Specification

The relationship between earnings and components of the total compensation package is represented by a hedonic equation in which the dependent variable is observed earnings and the independent variables are components of total compensation.[1] A hedonic equation is specified for each education group. These are given by equations (1) and (2).

$$(1) \quad Y_i^h = a^h \text{comp}_i^h + b^h x_i^h + e_i^h$$

$$(2) \quad Y_i^l = a^l \text{comp}_i^l + b^l x_i^l + e_i^l$$

where

Y_i^k = observed earnings for individual i in group k, $k = l, h$
comp_i^k = a vector of the components of compensation of individual i in group k, $k = l, h$
x_i^k = a vector of factors that affect the earnings of individual i in group k, $k = l, h$

1. If one were interested in specifying a demand system for these compensation factors they would have to model all of these factors simultaneously. Since the focus of this paper is to examine the determinants of the observed earnings as a function of other compensation factors we can treat observed earnings as the dependent variable and alternative forms of compensation as the independent variables.

e_i^k = error term for individual i in group k, $k = l, h$
a^k, b^k = vectors of coefficients for each group k, $k = l, h$.

If the compensation factors explain a larger amount (or proportion) of earnings for group H relative to group L, part of the larger variation in earnings associated with higher levels of education should not necessarily be interpreted as variation in monetary return, but rather as variation in the components of the desired compensation package.

B. Data

The NAS-NRC Twin Offspring sample is used to test the propositions outlined in the previous section. This sample is exceptional because it contains detailed information on the monetary and nonmonetary reasons for selecting a given occupation.[2]

The original twin sample was collected through a mail questionnaire that was sent to a sample of white male twins who (1) were born between 1917 and 1927, and (2) both served in the military. The twin sample is not a random sample from the population. Comparing the mean education and earnings of the twins with those of a random sample of the population reveals that the twins earn more and are better educated than an average member of the random population.

During the years 1979–82 the twins were asked to provide the addresses of their offspring. Comparisons of the earnings and education levels in the offspring sample suggest that although the sample is not random, the coefficients resulting from simple earnings equations are similar to coefficients that have been estimated from random samples.

The NAS-NRC Twin Offspring sample contains information on earnings, education, sex, and other variables useful in explaining earnings. In addition, because the data includes similar information on the offspring's parents, it is possible to control for family background variables such as father's and mother's education as well as family income.

Monetary and nonmonetary compensation measures are obtained from the answers given to a group of questions introduced with "As best as you can remember, was the following a reason for your entering your present occupation?" The survey includes the following factors: 1) pay offered including fringes, 2) prospects for eventual financial success, 3) chance to help others, 4) represented a challenge, 5) job security, 6) provided much free time, 7) liked that kind of work, 8) status, 9) convenient hours, 10) convenient location, 11) no other option, 12) your schooling, 13) military training, 14) personal contacts, 15) family business, 16) interesting work,

2. The problems associated with this type of retrospective survey data are discussed below.

17) person to person contact, and 18) chance for independent work. In addition the individuals were asked to list the three most important factors. This type of retrospective survey, however, raises problems which may cause results based on analysis of this data to be biased.

1. Data Problems

Retrospective answers regarding the reasons for choosing an occupation may not accurately reflect the reasons at the time the occupational choice was made. For example, if someone entered his occupation for monetary reasons, yet ended up with low earnings, he may not report *ex post* that money was a motivating factor. Because individuals may try to rationalize their occupational choices, survey respondents may simply be putting a "good face" on their limited options. For example, a student who changes his occupation because he did not have the ability to succeed in his preferred choice may be unlikely to reveal this. Rather, he may report that he chose his occupation because it was interesting or challenging. Thus, the data used in the analysis may impose an upwards bias to the correlations between nonmonetary factors and earnings since those with low earnings and limited options may report that nonmonetary factors were important when in fact *ex-ante* they were not.

Fortunately, there is some empirical evidence to suggest that the potential bias caused by the retrospective nature of the data is not severe. Members of the low earnings group more often report that monetary factors induced them to choose their occupations. Additionally, low earnings group members most often report that they entered their occupation because they had no other options.[3] These results suggest that in spite of their low earnings and limited choices (relative to the others in the sample) individuals are still willing to respond that they entered their occupation for the earnings it offered and admit that they chose their occupation because they had no other option.

2. Occupation-Compensation Variables

In order to utilize all of the data concerning occupational choice, a weighted variable for each of the factors is assigned a value of 0 if the individual did not list the factor as a reason for entering their occupation, a value of 1 if they listed the factor as being important but did not list it as one of the three most important factors, a value of 2 if it was the third

3. See Table 1B for these results.

most important factor, a value of 3 if it was the second most important factor and a value of 4 if it was the most important factor.[4]

III. Empirical Results

Table 1A lists the means and standard deviations of all variables except the occupation-compensation variables for both education groups. Table 1B gives the means and standard deviations of the occupation-compensation variables for both education groups. Group *H* consists of those with more than 15 years of education and group *L* consists of those with less than 16 years of education. This breakdown was chosen because those with less than 16 years of education may not receive the benefit of a college degree even though they attended some college. Conveniently, this breakdown divided the data set almost in half. The mean earnings for group *H* is $20,039 with a standard deviation of $11,281. The comparable numbers for group *L* are $14,529 and $8,075, respectively. These numbers emphasize the difference in the variation in earnings between education groups. On average, individuals in group *H* have wealthier and better educated parents, and less on-the-job experience (since they attended school while individuals in group *L* worked), than individuals in group *L*. Group *H* has higher percentages of males and Jews and a lower percentage of Catholics than does group *L*.

The results for the occupational factor variables (using the 0–1–2–3–4 ranking formulation) are given in Table 1B. The mean of the "pay and fringes" variable is 1.18 and .75 for groups *L* and *H*, respectively, indicating that this variable exerts more influence on the occupational choice of

4. Since this ranking is arbitrary and imposes a particular structure of weights that need not hold it is important to compare these results with results using different formulations of the occupational factor variables. Two alternative formulations of these variables were used. The second specification assumed that individuals acted upon the most important factor in choosing their occupation. We formed a dummy variable whose value was 1 if the factor was the most important in the choice of occupation, and was 0 otherwise. An analogous dummy variable was created for each of the occupational factor variables. The third specification controlled for the individual's propensity to report that numerous factors are important in their choice of occupation. The intuition behind this is that those responding yes to only a few reasons weigh them more heavily than those who report many reasons as very important. We used the weighted occupation factors (0–1–2–3–4 ranking) normalized by the number of important reasons reported to control for this propensity. The qualitative results for these specification are similar although the "most important factor" specification performed the worst of the three (in terms of R^2). Recall that this specification only considers the most important factor and ignores information regarding other factors that the respondent claimed to consider in their decision.

Table 1A
Means and Standard Deviations of Variables

	Low Education (Group L)		High Education (Group H)	
Variable	Mean	S.D.	Mean	S.D.
Education	12.91	1.04	16.72	1.11
Earnings	14,529	8,075	20,039	11,281
Father's education	12.44	2.92	14.23	2.85
Mother's education	11.94	2.60	13.29	2.69
Family income	17,124	12,436	24,164	16,295
Experience	7.10	4.81	5.63	4.08
Annual hours	2,013.7	522.1	2,193.6	558.8
Catholic	.31	.46	.23	.42
Protestant	.65	.48	.67	.47
Jewish	.02	.12	.08	.28
Married	.53	.50	.52	.50
Divorced/separated	.16	.31	.05	.23
Number of observations	652		785	

the low education group. The same is true for job security, convenient hours and convenient location. Group H weighs interesting work, challenging work, independent work, person to person contact, a chance to help others, liking the work, status and the prospects for future financial success more heavily than group L. This is consistent with the notion that high educated individuals can better afford to concern themselves with the nonmonetary aspects of their jobs and that these characteristics are readily available in the marketplace. It is interesting to note that the "no other option" variable is twice as large for group L, indicating that a lack of occupational choice is a bigger problem for less educated individuals.

Table 2A lists the estimated regression coefficients for equations (1) and (2).[5] In all instances the results for group L are given in Column 1 and the results for group H in column 2. Table 2A contains the estimates of the standard earnings equation excluding the occupational factor variables. In

5. The specifications were also estimated in semi-log form. The same conclusions can be inferred from that specification. The mills ratio from a probit equation explaining choice to work or not was also used but did not change the results since almost all individuals work.

Table 1B
Means of Occupation-Compensation Variables

Variable	Low Education (Group *L*) Mean	High Education (Group *H*) Mean
Schooling	.62	1.11
Military training	.11	.06
Personal contacts	.66	.74
Pay/fringes	1.18	.75
Future success	.75	.92
Person-to-person contact	.87	1.11
Interesting	1.56	2.08
Independent	.82	1.00
Help others	.61	1.08
Challenging	1.10	1.48
Job security	1.27	.84
Free time	.40	.39
Like work	1.33	1.48
Family business	.12	.08
Status	.14	.24
Location	.68	.36
Hours	.67	.41
No option	.28	.14

both equations, father's education, mother's education, and family income are not significant. This is not surprising since the individuals in each group have basically the same education and a large part of the effect of family background on earnings flows through its indirect effect on educational attainment. The coefficients for experience and experience squared are of the expected sign. The earnings profile for group *H* peaks rather early in the life cycle. This may occur because there are relatively few individuals who have a lot of experience. The earnings profile at large levels of experience is based more on the interpolation of the data at the low end of the experience scale than on actual earnings of individuals with large amounts of experience. Females earn significantly less than males in both education groups. This difference is $3,995 and $5,513 for groups *L* and *H*, respectively. Religion is not a significant determinant of earnings. Those who are married earn significantly more than singles in both educa-

Table 2A
Simple Earnings Equation for Groups L and H

	Low Education (Group *L*)		High Education (Group *H*)	
Variable	Coefficient	T-Value	Coefficient	T-Value
Intercept	−6,068.87	−1.55	−16,459.99	−2.55*
Father's education	−5.65	−0.05	146.16	1.21
Mother's education	14.62	0.14	4.25	0.03
Family income	.02	0.93	.01	0.43
Experience	609.69	3.54**	1,210.87	4.51**
Experience^2	−11.60	−1.25	−47.31	−2.60*
Female	−3,995.25	−7.36**	−5,513.42	−7.26**
Annual hours	5.18	9.91**	3.85	5.63**
Catholic	−128.11	−0.08	2,182.84	0.78
Protestant	−662.63	−0.43	2,203.82	0.81
Jewish	811.09	0.31	2,818.20	0.93
Married	1,942.65	2.93*	1,988.88	2.46*
Divorced/separated	1,010.92	1.04	3,072.57	1.83
Education	593.74	2.31*	1,212.78	3.64**
Adjusted R^2	.34		.23	
F-Value	26.73		18.59	

* Indicates significance at the 95 percent confidence level.
** Indicates significance at the 99 percent confidence level.

tion groups. The coefficient on hours normally worked is also significant for both education groups. Additionally, differences in education within each education group is significant for both education groups. Finally, note the difference in the adjusted R^2 between the two groups. The adjusted R^2 for group *L* is .3439 whereas it is only .2274 for group *H*.

Table 2B shows what happens when the occupational factor variables based on the 0–1–2–3–4 ranking formulation are included in the model. The change in the adjusted R^2 from the simple specifications in Table 2A to the occupational factor model given in Table 2B is striking. Group *L*'s adjusted R^2 rises .0227 to .3666. Group *H*'s adjusted R^2 rises .0882 to .3156. Thus, the inclusion of the occupational factor variables explains an additional 9 percent of the earnings variation in group *H* but only an additional 2 percent of the earnings variation in group *L*. This difference is especially dramatic when one considers that the 9 percent increase is on a

Table 2B
Earnings Equation Including Nonmonetary Factors (0–1–2–3–4 Ranking)[a]

	Low Education (Group *L*)		High Education (Group *H*)	
Variable	Coefficient	T-Value	Coefficient	T-Value
Intercept	−4,288.90	−1.06	−18,672.60	−2.90*
Father's education	−89.42	−0.85	94.29	0.64
Mother's education	50.22	0.46	−35.70	−0.25
Family income	.02	0.91	.02	0.87
Experience	516 88	2.99**	1,048.91	4.09**
Experience^2	−8 42	−0.98	−30.95	−1.78
Female	−4,006 19	−7.07**	−3,368.53	−4.26**
Annual hours	4.72	8.73**	3.19	4.82**
Catholic	−599 17	−0.38	1,565.22	0.58
Protestant	−1,228 51	−0.80	2,015.54	0.77
Jewish	990.05	0.39	3,165.89	1.10
Married	1,734.93	2.63*	2,059.70	2.68*
Divorced/separated	578.19	0.59	2,234.89	1.39
Education	475.65	1.82	1,163.74	3.55**
Compensation Factors				
Pay/fringes	494.31	2.63*	1,094.11	3.45**
Future success	428.05	1.72	1,403.88	4.48**
Person-to-person contact	371.08	1.41	−236.04	−0.69
Interesting	248.85	1.10	280.95	0.95
Independent	−302.60	−1.16	307.82	0.88
Help others	−2.11	−0.01	−641.05	−2.00*
Challenging	691.57	2.83*	557.76	1.64
Job security	41.47	0.19	568.55	1.47
Free time	−177.81	−0.48	−694.06	−1.34
Like work	−28.99	−0.12	682.15	2.05*
Status	98.92	0.13	1,725.19	2.41*
Location	−145.28	−0.42	−754.01	−1.34
Convenient hours	−349.15	−1.07	−1,161.51	−2.05*
No option	−100.84	−0.28	−685.79	−1.13
Adjusted R^2	.36		.32	
F-Value	12.91		12.56	

a. Other variables that pertain to occupation factors but not nonmonetary compensation were included in the regression but were not reported.
* Indicates significance at the 95 percent confidence level.
** Indicates significance at the 99 percent confidence level.

much larger base since the total variation in earnings for group H is larger than for group L. Moreover, the small change in R^2 for the group L regression indicates that the occupational factor variables can be omitted from the analysis.[6] In contrast, the change in R^2 for group H is significant indicating that the occupational factors are important determinants of earnings.

A comparison of the coefficients across education groups reveals that occupational factor coefficients are higher (in absolute value) for group H in 15 out of the 18 possible cases. For example, a group H member who chooses his occupation, in part, for the leisure time it offers earned less than a similar individual who did not name leisure time as an important occupational determinant. This model indicates that the earnings difference would be approximately $2,800 when leisure time is the most important occupational determinant. For an individual in group L the comparable number is $720. Similar results are found with respect to convenient hours, convenient location and a chance to help others.

Surprisingly, an insignificant relationship was found between earnings and job security. Those who chose occupations, in part, for the job security did not have significantly lower earnings than those who did not base their occupational choice on job security.

Group H members who based their occupation choice on job status received significantly higher earnings. It is possible that if status is determined by earnings, then those seeking status are implicitly seeking higher monetary rewards.

We now focus on the monetary occupational factors. For group L, the coefficient on the weighted occupational factor "pay and fringes" is $494 indicating that those who entered their occupation for the pay and fringes earn significantly more than those who did not. The comparable number for those in group H is $1,094. The model predicts that those in group L who named "pay and fringes" as the most important occupational determinant earn approximately $2,000 more than those who did not consider this factor. The comparable figure for those in group H is $4,400. The coefficient on the occupation factor "prospects for future financial success" is $428 for group L and $1,403 for group H. The model predicts that group L members who reported that this factor was the most important in their choice of occupation would earn approximately $1,700 more than those who did not consider this factor at all. For those in group H with a similarly strong concern for future financial success the gain in earnings would be approximately $5,600.

6. The test for whether the addition of explanatory variables are significant is obtained by examining changes in R square from the restricted and unrestricted models, adjusted for the number of restrictions. The .0227 change for group L is not significant.

At this point it is useful to compute what the gain in earnings would be if the two most important factors in the choice of occupation were the prospects of future financial success and the pay and fringes versus an alternative situation in which these two factors played no role in the choice of occupation. The gain presumable is a proxy for the monetary compensation a member of each education group could earn if they only cared about the monetary rewards. For group *L* the gain in earnings would be approximately $3,200 whereas for group *H* this gain would be almost $9,000. In other words, those individuals who choose their occupations based on the current monetary reward and the prospects for eventual monetary reward earn a hefty earnings premium over those who did not. Compensation choices can result in an observed earnings difference of over $9,000 for those with a large investment in education. In contrast, this difference is only approximately $3,200 for those with less education.

Table 2B also shows that for the high education group the earnings differential between the sexes fell dramatically after accounting for compensation factors. In the simple specification (without the compensation factors) earnings differences between males and females were $3,995 and $5,513 for groups *L* and *H*, respectively. When the compensation factors are included, the male-female earnings differential for group *L* remains the same. For group *H*, the earnings difference drops approximately $2,150 to $3,368. This smaller difference suggests that part of the earnings difference between males and females with large investments in education is due to differences in other forms of compensation. This has important implications on determining the degree to which females are discriminated against and on issues dealing with comparable pay and worth.

IV. Summary

Empirical research on the relationship between education and compensation have largely focused on monetary rewards. This paper demonstrates that the ability of earnings to proxy total compensation worsens with the level of education. The empirical model suggests that had high educated individuals only sought monetary rewards from their occupation they would earn considerably more money. This was not the case for those without a college degree implying that estimates of rates of return to education are likely to be underestimated if based on monetary rewards.

This paper also finds evidence that using monetary compensation to examine issues such as discrimination and comparable worth may be inappropriate. Estimated earnings differences between the sexes fell markedly for those with 16 or more years of education after controlling for

nonmonetary forms of compensation. These results emphasize the inherent difficulties of implementing any policy that uses earnings comparisons across different jobs and/or different demographic groups.

Finally, this research has implications for measuring the riskiness of investment in education. The variation in earnings was shown to be considerably higher for those with high levels of education. Higher variance, however, does not necessarily imply that investment in education is risky and uncertain. Instead, the research suggests that much of this earnings variation among similarly educated individuals can be explained by nonmonetary factors.

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