Does Schooling Raise Earnings by Making People Smarter?

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October 25, 1998

1 Introduction

Schooling raises individuals' scores on cognitive tests. It also raises individual earnings. What is the connection between these two facts?

Many have interpreted the substantial economic returns to schooling as evidence for the importance of cognitive skills as a determinant of individual earnings. But skill enhancement is not the only way schooling affects earnings. We shall argue that schooling raises wages and output per hour of labor in part by transforming individuals in ways that are profitable for employers, but are not the sort of 'skills' that appear as arguments in a production function. We do not question that schools also produce such skills and that these skills are important in production, but if we are correct, skill enhancement explains only part of the contribution of schooling to individual earnings.[1]

Instead, we argue, schooling also raises earnings by its effects on individuals' norms and preferences, making the prospective worker more attractive

[1]Schooling may affect earnings by other avenues as well, for example by enhancing the individual's ability to respond flexibly to disequilibrium situations associated with rapid change (Schultz (1975) and Rosenzweig (1995) for example) or by fostering productivity-enhancing neighborhood effects in the production or diffusion of social capital. We address these disequilibrium returns or social capital explanations in Bowles and Gintis (1998a).

to the employer by attenuating problems of work incentives and labor discipline. Schooling, we will show, may contribute to what we term *incentive enhancing preferences*. If we are right, explanations of recent empirical trends in the economics of education and of inequality that rely solely on a shift in demand away from unskilled and towards skilled labor are likely to provide misleading guides to public policy.

The availability of data on individuals' cognitive performance scores on dozens of test instruments appears to have crowded out other reasonable hypotheses concerning less copiously measured individual attributes. Two examples of the importance of the latter are the following. The first is from a recent survey of 3,000 employers conducted by the U. S. Census Bureau in collaboration with the Department of Education (Bureau of the Census 1998) which asked "When you consider hiring a new nonsupervisory or production worker, how important are the following in your decision to hire?" Employers ranked "industry based skill credentials" at 3.2 on a scale of 1 (unimportant) to 5 (very important), with "years of schooling" at 2.9, "score on tests given by employer" and "academic performance" both at 2.5. By far the most important was "Attitude" ranked 4.6, followed by "communication skills" (4.2).

The second example is from the far more detailed Employers' Manpower and Skills Practices Survey of 1693 British employers reported in Green, Machin and Wilkenson (1998). Of the somewhat more than a third of the establishments reporting a "skill shortage", personnel managers identified the recruitment problem as "lack of technical skills" in 43 percent of the cases, but "poor attitude, motivation, or personality" in a remarkable 62 percent of the cases. Poor attitude was by far the most important reason for the recruitment difficulty given. The importance of motivation relative to technical skill was even greater among the full sample.

Both examples illustrate a possible bias: we tend to refer to "skill shortages" when we mean any difficulty in recruiting or retaining suitable employees. Among economists, at least, other more conceptual biases are at work, the main one being the presumption that anything rewarded in a competitive labor market must be a skill. Our essay is addressed to this second bias which, if we are correct, acquires its plausibility by default, there being no widely accepted model of why individual traits that are *not* skills might be rewarded in a competitive labor market equilibrium.

We begin by introducing evidence that the measured skills produced by schooling explain only part (rarely more than half) of the contribution of schooling to earnings. We then address the following puzzle: why might employers pay more for employees exhibiting personal traits other than pro-

ductive skills? We show that paying more for non-skill traits is readily motivated in a model of the principal-agent relationship between employer and employee. The reason is that where contracts are incomplete, characteristics of the parties to an exchange affect the level and distribution of gains from trade, even when these characteristics are not attributes of the goods and services being transacted. Incentive enhancing preferences are an example of these individual characteristics, and may thus account for some of the contribution of schooling to higher earnings. The evidence and model we present illustrate a flaw in the commonplace equation of higher earnings with "superior skill."

2 Why do the educated earn more?

There is no longer any doubt those with more schooling earn more at least in substantial measure *because* they are educated, and not solely because schooling covaries with ability, parental social status and other traits rewarded in the labor market.[2] While schooling may also perform a credentialing function, the magnitude of the resulting diploma effects, where these have been identified, represent only a small proportion of the statistical association between years of schooling and earnings.[3]

Because schooling increases earnings and imparts skills, many have supposed that the acquisition of skills is the mechanism whereby schooling increases earnings. Why would employers pay the education premium? Tacitly accepting this argument, economists tend to equate differences in levels of schooling with skill differences.[4]

Yet it has proven remarkably difficult to give an adequate account of the skills that schools produce and to document their reward in labor markets. The most straightforward approach is to ask what schools teach and to consider the economic returns to the resulting curricular outcomes. It is simple to identify individual characteristics that are acquired through instruction and that also appear to raise earnings. But these characteristics typically explain only a small fraction of the observed economic return to schooling. Thus the economic contribution of the curricular content of schooling has proven elusive. Altonji (1995), for example, found that additional years

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[2]See Card (1998) for a survey of recent studies of the returns to schooling in the United States.

[3]Heckman, Layne-Farrar and Dodd (1995), for example, identify statistically significant credentialing effects, but the economic return to years of schooling *per se* remains substantial even accounting for these effects.

[4]See for example Juhn, Murphy and Pierce (1993) and Katz and Murphy (1992).

of science, math, and foreign language in high school contribute to subsequent earnings, but that the value of courses taken in an additional year of high school is far less than the value of an additional year of high school.[5] Moreover, those school programs most deliberately designed to contribute to occupational skill enhancement—vocational programs—appear to have limited success.[6]

A more promising approach might be to define skills broadly as generic cognitive capacities, and to explore the contribution of schools to labor-market success *via* their teaching of the kinds of mental capacities required in employment. The most direct test of the proposition that the contribution of schooling to the development of skills accounts for the effect of schooling on earnings is to ask if earnings covary with years of schooling in populations that are homogeneous with respect to level of skill. A positive answer in a well-specified model suggests that schools contribute to earnings by means other than their contribution to skills.

An approximation of this test is available: we can compare two estimated regression coefficients for a years-of-schooling variable, one in an equation in which a measure of cognitive skill also appears and another in which the measure is absent. An approximation of this test is available. Suppose that the income-generating structure for a given demographic group is

$$\ln(w) = \beta_0 + \beta_s s + \beta_c c + \beta_b b + \epsilon \tag{1}$$

where w, s, b, and c measure earnings, schooling, parental socioeconomic background, and cognitive skill level, and ϵ measures stochastic influences on earnings uncorrelated with the other explanatory variables. Most estimates lack measures of cognitive skill and hence estimate

$$\ln(w) = \beta_0' + \beta_s' s + \beta_b' b + \epsilon' \tag{2}$$

with ϵ' representing the stochastic influences as above plus the influences of cognitive skill operating independently of demographic grouping, socioeconomic background and schooling. We can compare two estimated regression coefficients for a years-of-schooling variable, one in an equation like (1) in which a measure of cognitive skill also appears (β_s) and another like (2) in which the cognitive measure is absent (β_s'). Subject to a number of estimation biases that we address in another paper (Bowles and Gintis 1998a),

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[5]These results control for family background, aptitude, and participation in an academic program and are invariant to the use of OLS, OLS fixed effects, or instrumental variable estimation.

[6]For instance, Altonji (1995) finds, both for OLS and instrumental variables estimates, lower than average returns to vocational programs.

available from the authors upon request, the ratio of the first to the second, which we write as

$$\alpha = \frac{\beta_s}{\beta_s'}, \tag{3}$$

is a measure of the contribution of what we call *incentive enhancing preferences* to the estimated return to schooling (Gintis 1971). If schooling affected earnings solely through its contribution to skills (assuming these to be adequately measured by the test scores used), α would be zero, because the regression coefficient of years of schooling would fall to zero once the skill level of the individual is accounted for, there being (by hypothesis) no contribution of schooling to earnings beyond its effect on skills. By contrast, if the contribution of schooling to skills explained none of schooling's contribution to earnings, α would be unity. This is illustrated in Figure 1.
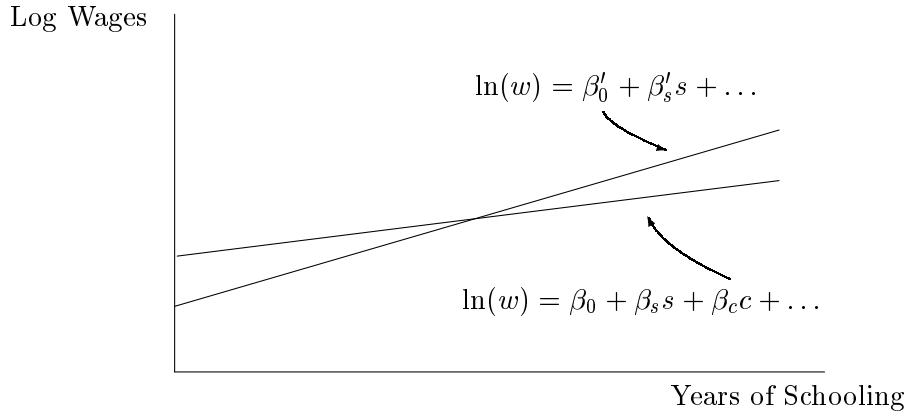
Figure 1: Estimating the Incentive Enhancing Preferences in the Returns to Schooling. Years of schooling is s, $\ln(w)$ is the natural logarithm of the wage and cognitive performance is measured by the variable c. Our measure of the portion of the returns to schooling that cannot be explained by cognitive performance is $\alpha = \beta_s/\beta_s'$.

We have been able to locate twenty-five studies allowing fifty-eight estimates of the relationship between the coefficient of schooling and income with and without a direct measure of cognitive skills, and thus an estimate of α (these studies are available from the authors).[7] Methods of estima-

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[7]We have found an additional five studies, allowing an additional six estimates, where the dependent variable is a measure of occupational status rather than earnings: Bajema (1968), Conlisk (1971), Duncan (1968), Sewell, Haller and Ohlendorf (1970) and Porter (1974). The mean value of α in these studies is 0.89, and the lowest is 0.81. These results

tion differ of course, and the demographic groups covered and the years for which the data apply vary considerably. We have surveyed these studies and selected what we considered to be the best specified estimates in each study. For example, we favored estimates using measurement error correction and instrumental variables estimation or other techniques to take account of endogeneity of the explanatory variables. We have included all studies available to us.

The mean value of α in our studies is 0.82, meaning that introducing a measure of cognitive performance into an equation using educational attainment to predict income reduces the coefficient of years of education by an average of eighteen per cent. This suggests that a substantial portion of the returns to schooling are generated by effects or correlates of schooling substantially unrelated to the skills measured on the available tests. In Figure 2 we present these data, along with the year(s) to which the earnings data pertain.[8]

A single study, Huang (1997) uses the same cognitive test as well as earnings and schooling measures over a long period of time and thus allows an assessment of the secular movement of α. Huang presents estimates, based on the General Social Survey, of the returns to three levels of schooling among eight demographic groups using appropriate measures of family background as co-predictors of the logarithm of earnings. Confining ourselves to the thirty three cases where the estimated return to schooling is positive and significant at the ten per cent level, the mean estimates of α are: 0.85 for 1974-1982, 0.90 for 1984-1989, and 0.95 for 1990-1994. There appears to be no tendency for the skills component in the returns to schooling to increase over time.
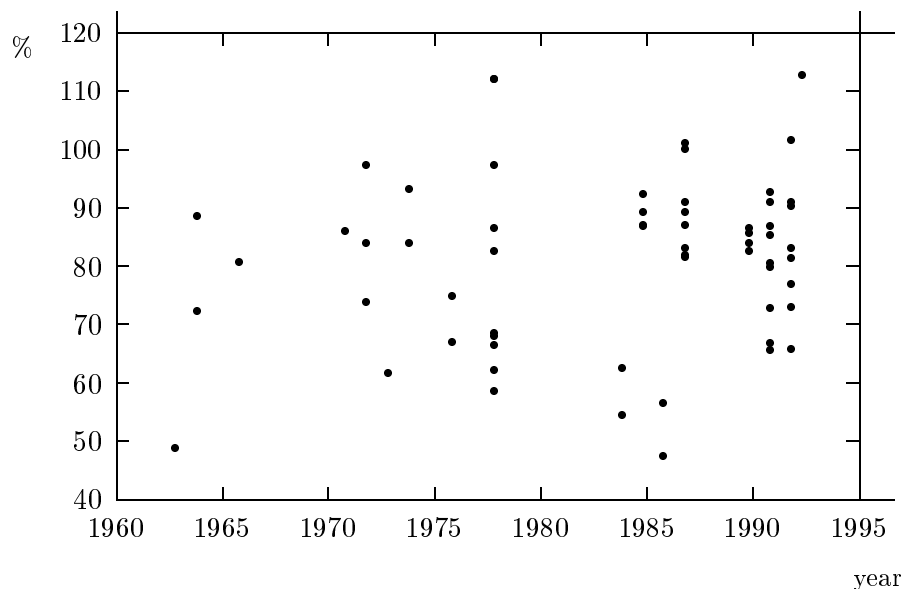
These data do not indicate the unimportance of skills as an influence on earnings, or more narrowly on the returns to schooling. However they do suggest that at a major portion of the effect of schooling on earnings operates in ways independent of any contribution of schooling to cognitive functioning.[9] Rather, we will suggest, schooling contributes to earnings in

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are not reported in Figure 2.

[8]In a regression using categorical variables to take account of the demographic groups studied the estimated positive time trend is small and statistically insignificant; there is inadequate evidence to sustain the conclusion that the role of skills in the contribution of schooling to earnings has increased over the past three decades.

[9]There is additional evidence that skill demands at work explain at least some of the returns to schooling. Alan Krueger (1993) found that increased use of computers explained a third to a half of the increased returns to schooling during the 1980's. However Krueger's data do not indicate that the economic return to schooling derives substantially from the covariance of the level of schooling and the extent of computer use at work: the estimated

% 120
   110
   100
    90
    80
    70
    60
    50
    40
   1960   1965   1970   1975   1980   1985   1990   1995

year

Figure 2: The Component (%) of the Private Return to Schooling that is Unrelated to Cognitive Performance: A Summary of Fifty-Eight Estimates from Twenty-Five Studies

part by fostering the development of individual traits that contribute to labor discipline and hence are valuable to employers given the informational asymmetries between employer as principal and employee as agent, and the

coefficient of years of schooling in Krueger's main sample when estimated without the computer use variables in the equation is reduced when the equation is estimated including a variable measuring computer use at work, but by only nine percent for his 1984 sample and 13 percent for his 1989 sample. Moreover Raphael and Toseland (1995) found that the estimated effect of schooling on log wages is reduced by only one fifth when the extent of on-the-job use of eight distinct skills (including use of mathematics and use of computers) is measured and included in the estimating equation. Farkas, England, Vicknair and Kilbourne (1997) found that including a measure of the skill demands of the respondent's job in a log wage equation reduced the estimated return to schooling by an average of twenty-six percent for six estimated equations involving male and female whites, Mexican-Americans and African-Americans (age, experience, mother's education, and rural residence were included in the equation). These data concern the U.S. alone, and we do not draw any inference from them about the returns to schooling in other economies. We suspect, and there is some evidence (Boissière, Knight and Sabot 1985) that in societies where schooling is more limited in its scope, the skill component in the returns to schooling may be considerably larger than in the U.S. However according to Moll (1995), in a sample of black workers in South Africa, the value of α for returns to primary schooling is 0.73, for secondary schooling it is 0.67, while for higher education the value is 0.92. These are well within the range of estimates presented in Figure 2.

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resulting incompleteness of the employment contract.

3 Endogenous Enforcement of the Employment Contract

In the following pages we develop this interpretation of the economic returns to schooling, addressing two questions. First, how might schooling contribute to earnings independently of its contribution to skill? Second, is the postulated answer to this question consistent with competitive equilibrium if employers have complete information about the characteristics of employees?

Sociological accounts frequently stress the motivational aspects of the contribution of schooling to the economy, often under the heading of "socialization for work."[10] The reason an employer would be more willing to pay a premium for the services of a 'well socialized' employee than a shopper would be to pay a higher price for the fruit of a 'well socialized' grocer is that the employment relationship is generally contractually incomplete.[11] A costlessly enforceable promise of a wage is exchanged not for costlessly enforceable labor services but rather for the employees' agreement to accept the employer's authority during the hours of work. This authority is then used to secure the flow of labor services that, when combined with other productive inputs, produces output. The employer's payment of a wage superior to the employee's next best alternative, coupled with the threat of termination of the contract, constitutes an essential part of the necessarily endogenous enforcement of the employers objectives in the exchange.

In such a model, which we will formalize presently, employers choose to pay for non-skill aspects of individuals that assist in the exercise of the employer's authority. Examples of such profitable individual traits are a predisposition to truth telling, identification with the objectives of the firm's owners and managers as opposed to the objectives of co-workers or customers, a high marginal utility of income, a low disutility of effort, and a low rate of time preference—an orientation toward the future rather than the present. We call these *incentive enhancing preferences.*

Just as the employer's valuation of productive skills of employees will depend on the product mix and production functions in use, the valuation of incentive enhancing preferences will vary with the nature of the endogenous enforcement problem. Where monitoring is impossible, for example,

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[10]See Parsons (1959) and Dreeben (1967).

[11]It is interesting to note that the theory of social exchange (Blau 1964) on which the sociologists' account of schooling as influencing individual preference structures is readily based, is recognizable to an economist as a theory of incomplete contracts.

the importance of truth telling might be heightened. Where one employee is expected to monitor other employees, behavioral traits, demographic markers, or costly to acquire credentials contributing to the legitimacy of the exercise of authority might be highly valued by employers.

By developing incentive enhancing preferences in individuals and thus attenuating the costs of endogenous enforcement of the labor contract, schooling may have economic effects similar to, and perhaps complementary with, work norms and other shared values that often prove individually or collectively useful when individuals interact in the absence of complete contracting.

But do schools produce incentive enhancing preferences? We know of only one study that has attempted to provide an answer. This study is not a satisfactory basis for generalization, but it is nonetheless worth reviewing. The study asked whether schools reward students who exhibit the specific personality traits valued by employers in the workplace. If true, we might reasonably infer that schools foster the development of these traits, and the economic return to schooling might represent payments to individuals with these traits.

In an investigation conducted during the early 1970s, Richard Edwards (1976) used a peer-rated set of personality measures of members of work groups in both private and public employment to predict supervisor ratings of these employees. In a parallel investigation with a distinct sample, Bowles, Gintis and Meyer (1975) used the same peer rated personality variables to predict grade point averages of students in a high school controlling for SAT (verbal and math) and IQ. Edwards found that being judged by their peers to be "perseverant", "dependable", "consistent", "punctual", "tactful", "identifies with work", and "empathizes with orders" was positively correlated with supervisor ratings, while those judged to be "creative" and "independent" were ranked poorly by supervisors. Meyer found virtually identical results for the high school students in his grading study; independently of the student's skill level, schools reward with higher grades the same traits that Edwards found to predict favorable supervisor ratings. The simple correlations between grade point average and the twelve identified personality traits are barely distinguishable from the analogous correlations in Edwards' study of employees.[12] Teachers and employers in these samples reward the same personality traits.

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[12]These results are reported in Bowles et al. (1975). For the ten personality traits common to both studies, the simple correlations with grade point average explain 96 percent of the variance in the simple correlations of these traits with supervisor ratings.

We would like to know, of course, if schools produce the traits they reward, and if traits valued by supervisors are rewarded by enhanced pay.[13] But the juxtaposition of the Edwards and Meyer data is suggestive that the incomplete contracts model of the employment relationship coupled with the incentive enhancing preferences account of schooling may provide insights into the nature of the contribution of schooling to individual earnings.

As thus far developed, however, the incomplete contracts model is an insufficient basis for an analysis of the private returns to schooling. First, none of the relevant principal agent models has been formulated in a way that would allow schooling to impact on the process of endogenous enforcement. Second, it is not clear in the above account why enhanced schooling in an entire population would raise rather than lower equilibrium wages, since if schooling renders employees more susceptible to the exercise of authority by the employer, it is counterintuitive to think that this disciplining effect would result in wage increases. An appropriate model thus remains to be developed.

4 Incentive Enhancing Preferences

Suppose the amount of labor services an employee supplies to a firm is the product of two terms: the number of hours h worked and the employee's effort level e, where $0 \leq e \leq 1$. We assume the employer can contract for hours h, but effort e is not verifiable and hence cannot be determined by contractual agreement. However the employer has an imperfect measure of e that indicates with probability $p(e)$ that the employee has 'shirked,' where $p' < 0$ and $p'' \leq 0$.

We will model the employer-employee relationship as an infinitely repeated game in which the employer hires a team of h employees, each of whom works for one hour, and is paid a wage w at the end of the period. An employee discovered shirking is dismissed and replaced by a new employee (identical to the one replaced), also at the end of the period. The employer as first mover chooses h and w to maximize profits, in the knowledge that a higher wage may induce the employee to supply more effort, since the cost of job loss increases with the wage. The employee then chooses effort e to maximize the present value of expected utility. We call this a *contingent*

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[13]See Jencks (1979) for a survey and analysis of the role of non-cognitive personality traits in earnings and occupational status achievement. Jencks et al. provide evidence for the economic importance of such traits, but supports few inferences about the role of schooling in their production.

renewal model of the employment relationship.[14]

Our model of incentive enhancing preferences depends on the effects of education on the employee's best response function $e = e(w, z)$, which shows the level of effort e chosen by a employee faced with a wage rate w and fallback position z, defined as the expected present value of utility for a dismissed agent. One may think of z as depending on the availability of income-replacing transfers such as unemployment benefits, the expected duration of a spell of unemployment, and the expected stream of utility in the employee's subsequent employment. We abstract from reputation effects and so represent z as exogenous to the employer and employee in their choices of w and e. We will see presently, however, that exogenous variation in the level of schooling will affect firm employment levels and will thus plausibly influence the expected duration of employment and hence the level of z.

Suppose the employee has the utility function $u(w, e)$, which is smooth, strictly increasing and concave in the wage w, and strictly decreasing in effort e. If the discount rate is ρ, then the present value $v(e)$ of having the job is given by

$$v(e) = \frac{u(w, e) + (1 - p(e))v(e) + p(e)z}{1 + \rho},$$

assuming (without loss of generality) that the utility accrues at the end of the period. This simplifies to

$$v(e) = \frac{u(w, e) - \rho z}{\rho + p(e)} + z. \tag{4}$$

This equation has a simple interpretation: the value v of the job equals the value z of the fallback plus the stream of net returns $u(w, e) - \rho z$ discounted by ρ plus the probability of dismissal $p(e)$. The employee then chooses effort e to maximize $v(e)$. This gives rise to a employee best response function $e = e(w, z)$, which is increasing in w.[15] Using a subscripted variable to represent its partial derivative with respect to the subscript, the employee's first order condition can be written

$$v_e = \frac{1}{\rho + p} \left[u_e - (v - z)p' \right] = 0, \tag{5}$$

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[14]Contingent renewal models of this type are analyzed in Gintis (1976), Shapiro and Stiglitz (1984), Bowles (1985), Gintis and Ishikawa (1987) and Bowles and Gintis (1993).

[15]The longer version of this paper Bowles and Gintis (1998b), available on request, proves this and other mathematical results asserted but not demonstrated below.

which implies

$$u_e = (v - z)p';$$

i.e., the marginal disutility of effort must equal the cost of job loss times the marginal effect of increased effort on the probability of job loss. Equation (5) defines the employee's best response function $e(w, z)$. As expected, the best response function is increasing in w and decreasing in z.[16]

We say a parameter a is *incentive-enhancing* if along the employee's best response function, an increase in a increases the marginal effect of effort e on the present value v of having a job; i.e., if $v_{ea} > 0$. We call such a preference 'incentive-enhancing' because, differentiating the first order condition $v_e = 0$ from which the employee's best response function is derived, we get

$$\frac{de}{da} = -\frac{v_{ea}}{v_{ee}},$$

and $v_{ee} < 0$ by the second order condition, so an increase in a shifts up the best response function e(w,z). Thus an increase in incentive enhancing preferences will lead an employee to work harder, holding all else constant.

Here are two examples of incentive enhancing preferences. The argument in the remainder of this section a summary of the theorems presented in Bowles and Gintis (1998b). First, it is easy to see that a reduction in the individual's rate of time preference—that is, a greater orientation toward the future—is an incentive enhancing preference as it raises the importance, in the individual's evaluations, of the prospect of retaining the job in the future and thus in avoiding any behavior that might result in termination— this may be confirmed by differentiating (5) with respect to ρ, using 4.

Second, suppose $u = u(w, e, a)$, where $u_a > 0$, and $u_{ea} \geq 0$ (i.e., an increase in a increases utility derived from the job and does not increase the marginal disutility of effort). Then from 5, $v_{ea} > 0$ and a is incentive-enhancing. If $u_{ea} > 0$, a enhances incentives by reducing the marginal disutility of effort, while if $u_a > 0$, a is incentive-enhancing because it increases the desirability of holding the job, as might occur through an increase in the marginal utility of income or the social stigma of being without work.

For an example of an incentive-enhancing parameter that lowers the disutility of effort, consider the utility function

$$u(w, e, a) = w - \frac{1 - a}{1 - e}. \tag{6}$$

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[16]Actually, $e_w > 0$ holds globally only if $u_{ew} \geq 0$. Under more general conditions, the employee best response function will be inverted u-shaped as a function of w. But necessarily $e_w > 0$ in the neighborhood of a firm's profit-maximizing equilibrium.

Suppose also $p(e) = 1 - e$, so full shirking $(e = 0)$ ensures dismissal, and zero shirking $(e = 1)$ precludes dismissal. The first-order condition (5) then implies the employee best response function

$$e(w, z) = 1 - \tilde{a} - \sqrt{\tilde{a}^2 + \rho \tilde{a}}, \qquad (7)$$

where $\tilde{a} = (1 - a)/(w - \rho z)$. This employee best response function is shown in Figure 3.
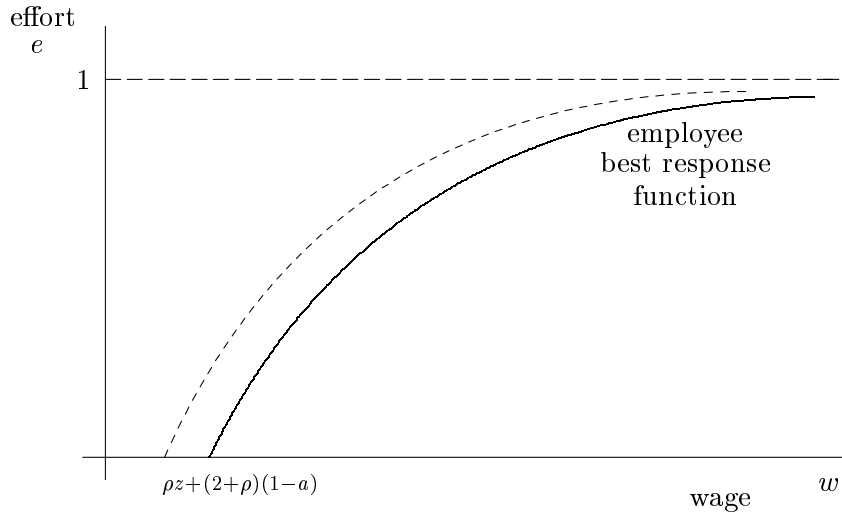
Figure 3: The Employee's Best Response Function: the dashed line indicates the effect of an incentive-enhancing change in preferences for the utility function (6).

The parameter a is clearly incentive-enhancing in this case because from (6) we see that $u_a, u_{ae} > 0$, which implies $de/da > 0$. The utility function (6) represents a as a reduction in the disutility of labor, but transforming (6) by dividing the right hand side by the constant $1 - a$ yields an equivalent representation where a increases the average and marginal utility of income.

5   Schooling and Earnings

Suppose that schools produce both skills c and incentive-enhancing preferences a. We can then write the quantity of effective labor embodied in an hour of work as $(1 + \gamma c)e(w, z, a)$ where $\gamma \geq 0$ is a measure of the importance of skills in the production process, $\gamma = 0$ implying the unimportance of skills. Suppose the firm has revenue function $q(\cdot)$, with $q' > 0$ and $q'' < 0$.

Normalized the price of output at unity, we can write the firm's net profit as

$$\pi = q((1 + \gamma c)e(w)h) - wh. \qquad (8)$$

The first order conditions for profit maximization are

$$\pi_h = (1 + \gamma c)q'e - w = 0 \qquad (9)$$
$$\pi_w = (1 + \gamma c)q'he' - h = 0, \qquad (10)$$

from which the well-known Solow condition

$$e_w = \frac{e}{w} \qquad (11)$$

follows: profit maximization leads employers to equate the average and marginal returns to varying the wage. This equilibrium condition is illustrated in Figure 4, which shows that the equilibrium (w^*, e^*) is located at the tangency between the employee best response function and the firm's minimum iso-cost line $e = w/\mu$, where μ is the cost-minimizing wage/effort ratio.[17] As (9) shows, the firm then chooses the number of hours h of labor to satisfy the standard condition that the wage equals the value of the marginal product of an hour of labor given the effort level e, determined by (11).

An important comparative static result that we use below is that an increase in the employee's reservation position z unambiguously raises both the firm's optimal wage offer and the cost of obtaining effort. Figure 5 illustrates the effect of increasing z, leading to a move from equilibrium (w^*, e^*) to (w^*_+, e^*_+).

What are the effects of changes in the levels of skills c and incentive-enhancing preferences a? Consider a shift from preferences described by a to $a^+ > a$.

An increase in incentive enhancing preferences shifts up the marginal product of labor function and makes labor more profitable to hire at each wage rate, and hence generates an increased demand for labor at each wage. An increase in the demand for labor reduces the expected duration of a spell of unemployment, and hence raises the fallback position of employees. This induces the firm to raise its profit-maximizing wage offer. In effect, the incompleteness of the labor contract provides a reason why changes in

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[17]Several authors, most notably Carmichael (1985), have suggested that since the employee receives a rent from this relationship, the employer could extract a one-time fee in exchange for hiring an employee. Adding this to the model would not change our results and would complicate the exposition. Hence we abstract from up-front fees in this paper.
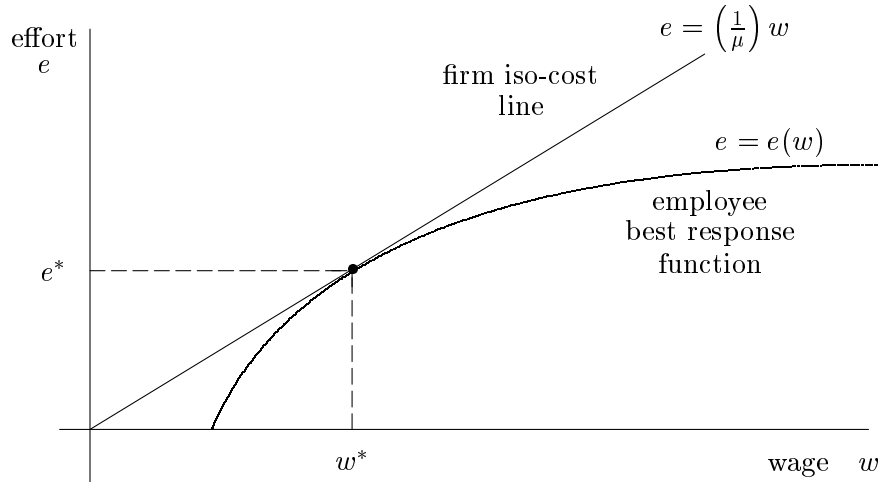
Figure 4: Equilibrium Wage and Effort Levels for the Firm. The Solow condition (11) (profit maximization) obtains at the equilibrium (w^*, e^*), as does condition (5) for the employee's optimal provision of effort.

the incentive enhancing preferences of the employee may raise equilibrium wages even if these traits have no bearing on the production process *per se* and hence cannot be deemed 'skills' in the common sense of the term.

These comparative static results are illustrated in the figures that follow. From Figures 3 and 4 it is obvious that incentive enhancing preferences lower the cost of hiring labor. We also assume all markets are competitive, so a *zero profit condition* holds. Because the profit rate varies monotonically and inversely with μ, the zero profit condition uniquely determines a value of μ consistent with competitive equilibrium. Given a and c for the labor force as a whole, the demand for labor adjusts the equilibrium fallback position z^* so that equilibrium profits $\pi^*(z^*) = 0$, where $\pi^*(z)$ is (8), using the employee and firm equilibrium values of $e(z)$, $w(z)$, and $h(z)$. The zero profit condition implies that an increase in incentive-enhancing preferences a or skill-enhancing human capital c leads to a rise in the equilibrium value z^* of the employee's fallback. An increase in the competitively determined wage rate follows. As a result we can conclude that, given utility function (6), in market equilibrium, an incentive-enhancing increase in a or the discount factor $\delta = 1/(1 + \rho)$, or a skill-enhancing increase in c on the part of employees, leads to an increase in the wage rate w. This conclusions is illustrated in Figure 6. The direct effect of an increase in a on the firm, holding the fallback z constant, is to shift the employee's best response function upwards (the dashed line) and hence to decrease the firm's cost of effort μ.

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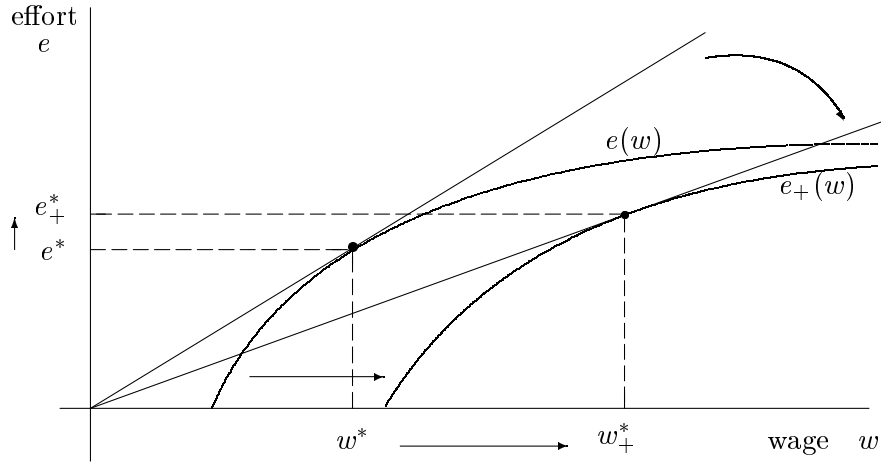
Figure 5: The Effect of an Increase in the Employee Fallback

However this raises the profit rate, violating the zero profit condition. Since μ^* remains unchanged in equilibrium, the whole best response function must shift to the right until it is once again tangent to the firm's original iso-cost line. This can only occur through an increase in the fallback z occasioned by the increased demand for labor. This is depicted at point R in Figure 6.

Figure 6 also makes it clear that a heterogeneous labor force, some with preferences, a, and others with a^+ (but otherwise identical) would be paid wages w_{old} and w_{new}, respectively, in competitive equilibrium, assuming that some of each were hired.

Notice that in the 'new' equilibrium output per worker-hour is also higher (because $e_{new} > e_{old}$) so the incentive enhancing preference change has raised the productivity of labor hours (but not of labor effort).

6   Conclusion

Why, then, do the educated earn more? A part of the answer is doubtless captured by the conventional wisdom: schools teach skills that are scarce in equilibrium because they are limited in supply because they are costly to acquire. But the evidence does not support the argument that cognitive and other skills that have been measured exhaust the mechanisms by which schooling affects wages and labor productivity. If the educated are more skilled in ways not captured by the tests commonly used we may have underestimated this aspect of the contribution of schooling to earnings. But more likely, we think, is our initial response to the question: additional schooling

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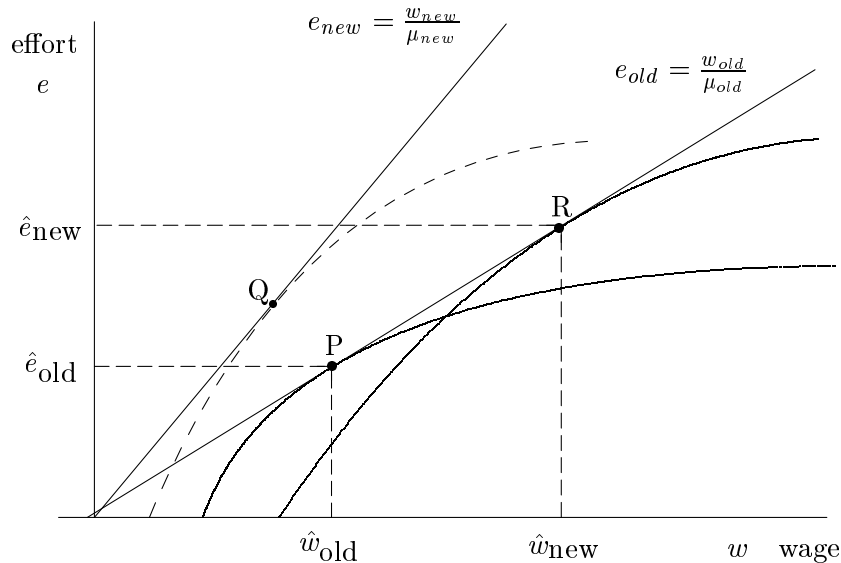
Figure 6: The Partial and General Equilibrium Effects of Raising the Level of Incentive Enhancing Preferences on Wages and Effort. The improvement in incentives initially shifts upwards the employee best response function, yielding a partial equilibrium at Q, inducing an improvement in the fallback position of the employee, displacing the best response function to the right, until the general equilibrium outcome R is obtained.

enhances the labor market value of individuals in ways other than enhanced skills. We have shown that with incomplete contracts governing the employment relationship, the relevant earnings-enhancing effects of schooling will not be confined to skills in the conventional sense, but may be incentive enhancing preferences that, by attenuating the costs of endogenous contract enforcement, are valuable to the employer. Like skills, efficiency enhancing preferences are scarce in equilibrium because they are costly to acquire.

These effects of schooling work by altering the behavioral response of the employee to the employer's incentives and sanctions, rather than by altering a skill that affects the technical specification of labor as a factor of production. This influence on the employee's behavioral response is easily modeled as a reduction in the disutility of labor, but schooling could plausibly affect employees behavior in other ways as well. In a companion paper (Bowles and Gintis (1998c)) we have modelled the effect of schooling on the employee's rate of time preference and the influence of this on labor market outcomes. Alternatively one could represent schooling's effect as a change in the employee's behavioral response to the authority relationship implied

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by the assignment of control rights and monitoring to the employer.

What can one say of the welfare implications of this analysis of the economic returns to schooling? The answer is: very little, the reason being that plausible effects of schooling operate by changing behavioral responses of employees to incentives, sanctions, and authority and these are most conveniently analyzed as changes in the employee's utility function. To assess these changes requires an evaluation of the implied preference changes themselves. Even an apparently innocuous change—a reduction in the disutility of effort—cannot be evaluated simply, as the same results could have been generated assuming that schools increase the shame of job loss or the social stigma of being unemployed. While these changes are behaviorally equivalent in our model, they appear to be at odds normatively.

It is common to attribute *any* trait rewarded on a competitive labor market to an underlying 'skill,' and hence to superior 'merit.' The conclusion that the earnings distribution is consonant with the meritocratic principle readily follows. Our results cast doubt on this interpretation. It is of course true that skills and many dimensions of incentive enhancing preferences, such as a low rate of time preference, trustworthiness, and willingness to work hard (a low disutility of labor), are widely considered meritorious. However , other aspects of incentive enhancing preferences, such as a high marginal utility of income, or a highly competitive attitude toward fellow employees, do not readily fall under the heading of merit. In any case, incentive enhancing preferences have little in common with the characteristics purportedly rewarded in the 'meritocratic society,' such as IQ.

Our conclusion is that because schools both impart skills and transform preferences, their effects cannot be evaluated in a framework that assumes exogenously determined preference orderings. Even in an idealized economy in which all prices accurately reflect social costs and benefits, then, the standard welfare analysis of the returns to schooling might be misleading. This does not mean, of course that schooling cannot be evaluated or that conventional evaluations overstate the value of education. Among the skills and incentive enhancing preferences fostered by schooling some, perhaps most, are highly valued either intrinsically or instrumentally by large numbers of people. These valuations by parents, students and others are a reasonable datum for normative evaluation of schooling; but they are obviously insufficient.

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