

# EDUCATIONAL PRODUCTION RELATIONSHIPS

## Education, Technology, and the Characteristics of Worker Productivity\*

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Economists have long noted the relationship between the level of schooling in workers and their earnings. The relationship has been formalized in numerous recent studies of the rate of return to schooling and the contribution of education to worker productivity. Almost no attempt has been made, however, to determine the mechanism by which education affects earnings or productivity. In the absence of any direct evidence, it is commonly assumed that the main effect of schooling is to raise the level of cognitive development of students and that it is this increase which explains the relationship between schooling and earnings. This view of the schooling-earnings linkage has provided the conceptual framework for studies which seek to "control" for the quality of schooling through the use of variables such as scores on achievement tests and IQ. [26, 46]

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The objective of this paper is to demonstrate that this interpretation is fundamentally incorrect. It will be seen that rejection of the putative central role of cognitive development in the schooling-earnings relationship requires a reformulation of much of the extant economic research on education, as well as a radical rethinking of the normative bases of the economics of education in particular, and neo-classical welfare economics in general. In Section I, I will present data to suggest that the contribution of schooling to worker earnings or occupational status cannot be explained by the relationship between schooling and the level of cognitive achievement. Indeed, the data there introduced strongly suggest the importance of noncognitive personality characteristics which have direct bearing on worker earnings and productivity. In Section II, I will give substantive content to the relevant personality variables operative in the relationship between education and earnings. With the theoretical literature on the personality requisites of adequate role-performance in a bureaucratic and hierarchical work-environment as a frame of reference, I will sketch some mechanisms through which schools affect earnings. This involves scrutinizing the social relations of education and the pattern of rewards and penalties revealed in grading practices. I will argue that the authority, motivational, and interpersonal relations codified

in the "social structure" of schools are closely similar to those of the factory and office. Thus a path of individual personality development conducive to performance in the student's future work roles is facilitated. Further, I will show that the grading structure in the classroom reflects far more than student's cognitive attainment, by affording independent reward to the development of traits necessary to adequate job performance.

If my basic thesis is correct, much of the existing body of economic literature on schooling must be reconsidered. First, we must redefine the concept of "quality" in education, particularly in studies of the determinants of earnings which have thus far relied on measures of cognitive development as the sole measure of educational quality (e.g., [9]). Second, the extensive body of research on "educational production functions" is seen to lack economic relevance, since the dependent variables in most of these studies have been restricted to measures of cognitive achievement [4, 9, 28]. Third, the extensive body of literature on resource allocation in schooling—extending from planning model to rate of return studies—requires reformulation. The normative base of these studies requires that the mechanism by which schooling contributes to earnings operates independently from the character structures of the individual students. That is, they assume that the process of schooling does not affect the tastes and personalities of the future workers being processed for higher productivity. Yet the data below strongly suggest that the economic productivity of schooling is due primarily to the inculcation of personality characteristics which may be generally agreed to be inhibiting of personal development. The "economic productivity" of schooling must be measured against an "opportunity cost" reflected in the development of an alienated and repressed labor force. Fourth, the

above point is simply a special case of a more general problem in neoclassical welfare economics. Our analysis shows that taste and personalities are not determined outside the economic system, but are rather developed as part of the economic activities about which social policy is to be made. Thus the main theorems of welfare economics, being based on the independence of individual preferences from the structure of economic institutions [19], fail.

While our evidence suggests the reformulation of much of the existing work in the economics of education and welfare theory, it may also provide resolutions to some of the outstanding anomalies that have arisen in recent years. For example, a number of studies have shown very low monetary returns to the education of lower class people and blacks in the U. S., even with the level of cognitive development taken into account [51]. These results are readily explained by our model, where they likely result from the failure of schooling to inculcate the required noncognitive personality traits in the observed groups. Moreover, it is often found, both in the U. S. and in underdeveloped countries, that the economic return to vocational schooling is quite low [45]. This is especially surprising in that vocational education dwells exclusively on the supposedly "economically relevant" content of schooling. Our interpretation renders the finding of low economic returns of vocational schooling understandable, in view of its misplaced emphasis on the "skill content" of schooling, and a corresponding underemphasis on the broader socialization function involving the generation of a disciplined, obedient, and well-motivated workforce. Lastly, recent years have seen the revival of so-called "genetic" theories to explain the pattern of racial and social class inequalities [15, 32]. Neither proponents nor opponents of this view seem seriously

to have questioned the importance of cognitive ability in occupational status and earnings, but have restricted their considerations to the narrow question of "heritability" of intelligence, in the naive view that IQ lies at the heart of economic success. Our results would indicate that this debate is close to irrelevant, save at the very extremes of the "ability" distribution.

*The Cognitive Element in Schooling's  
Contribution to Worker Earnings*

The "market value" of a worker depends on a certain array of personal characteristics—cognitive, affective, and ascriptive.<sup>1</sup> The bulk of modern sociological theory affirms the minor importance of ascriptive traits in the general allocation of social roles and status positions, at least among white, male Americans. Thus we may take the individual traits generated or selected through schooling, insofar as they relate to the augmentation of worker earnings, as predominantly cognitive and affective. Hence we propose to test the adequacy of two polar "ideal type" models—the Cognitive and the Affective. According to the Cognitive Model of education's contribution to worker earnings and occupational status ( $Y$ ), the variable  $E$  (years of education, corrected for differences in "quality" in the form of physical, teacher, peer-group, and content resources) is a proxy for a set of cognitive achievement variables  $A$  (e.g., reading speed, comprehension, reasoning ability, mathematical or scientific achievement). According to the Affective Model, on the

<sup>1</sup> By 'cognitive characteristics' we mean individual capacities to logically combine, analyze, interpret, and apply informational symbols. By 'affective characteristics' we mean propensities, codified in the individual's personality structure, to respond in stable emotional and motivational patterns, to demands made upon him in concrete social situations; and by 'ascriptive characteristics', we mean such non-operational attributes as the individual's race, sex, caste, religion, social class, eye color, geographical region, etc.

other hand,  $E$  is a proxy for a set of relevant personality variables  $P$ . Using a linear regression model to capture the income- and occupational-status-generating process, a test of the Cognitive Model is particularly immediate. If  $Y$  is a measure of income and/or occupational status, then the "contribution of education" can be interpreted as the beta coefficient in the regression

$$(1) \quad Y = a + b_{YE}E + u.$$

If the Cognitive Model is correct, then in the extended regression

$$(2) \quad Y = a + b_{YA \cdot E}A + b_{YE \cdot A}E + u,$$

we expect  $b_{YE \cdot A} = 0$ . That is, introducing achievement variables into the restricted regression (1) reduces the contribution of  $E$  by 100%. If, on the other hand, the Affective Model is correct, and if  $A$  and  $P$  are related only through their common dependence on  $E$ , then  $b_{YE} = b_{YE \cdot A}$ , and the reduction in the contribution of  $E$  is 0%.

Clearly we have divergent implications, empirically testable by available data. Appendix I exhibits the results of many studies, including measures of  $Y$ ,  $A$ , and  $E$ , comprising all investigations the author has come upon.<sup>2</sup> These studies, despite their divergent measures of relevant variables and use of distinct sample populations, show two broad uniformities: (a) The reduction in the coefficient of  $E$  due to the introduction of achievement variables is much closer to zero than to 100%—the actual range is 4% to 35%; and (b) the increase in explained variance is negligible—i.e., less than 5% of explained variance. At first glance, these studies provide strong support for the Affective Model, and indi-

<sup>2</sup> These are restricted to U. S. samples, predominantly white, male, average mean intelligence. Also, I have indiscriminantly mixed "achievement" and "intelligence" measures of  $A$ . The results of these investigations are strikingly similar for both measures, so their synthesis presents no problems for the purposes of our investigation.

cate that cognitive development is not the central means by which education enhances worker success.

Two possible objections to this analysis, however, induce us to expand the model. On the one hand, there may be relations between  $P$  and  $A$  beyond their common dependence on  $E$ . This might occur either through a direct relation between  $P$  and  $A$  (i.e., income-relevant personality traits facilitate the acquisition of cognitive achievement—see below) or because both  $A$  and  $P$  depend on variables not included in our simple equations, such as genes and social class. In either case, the reduction in  $b_{YE}$  through the inclusion of  $A$  would exceed that of a properly specified model, and the outcome would be even more in favor of the Affective Model, in that this model becomes compatible with the observed small but significant reduction (see below). On the other hand, one might hold that while theoretically the introduction of  $A$  into the income-education regression should reduce the coefficient of  $E$  to zero, in fact, both  $A$  and  $E$  are so subject to errors in measurement that the results are significantly altered in practice.<sup>3</sup> In particular, if  $E$  is really a “proxy” for  $A$ , but  $A$  is measured with significantly greater error than  $E$ , the latter becomes a more reliable indicator of achievement than  $A$  itself.

We shall take these objections seriously and introduce a more extensive model, including important background measures of abilities ( $I$ ) and social class ( $S$ ). Moreover, we shall allow for the “observed” measures of  $E$  and  $A$ , which we denote by

<sup>3</sup> By “errors of variables” we include more than simple test reliabilities and validities in reportage, but the larger errors arising from an incomplete or a partially misdirected measuring instrument. Thus to measure  $E$  by “years of educational attainment” introduces errors because this measure abstracts from the *quality* of schooling. Similarly, a measure of “achievement” may inherently capture only a portion of the “theoretical” variable.

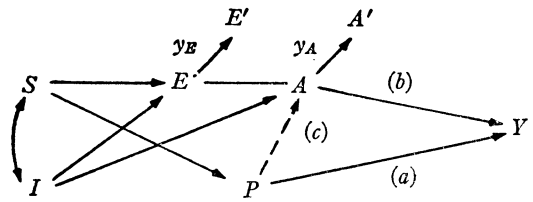


FIGURE 1

$E'$  and  $A'$ , to include an element of random error, so that  $r_{EE'} = y_E$  and  $r_{AA'} = y_A$ . It will be assumed that all errors are uncorrelated, so that recursive regression analysis may be applied.<sup>4</sup> The recursive schema is shown in Figure 1, where the elimination of path (a) corresponds to the Cognitive Model, and the elimination of path (b) to the Affective Model (the dotted arrow (c) will be discussed later).<sup>5</sup> Here  $P$  is treated as a “hypothetical variable” [29], in that we shall not specify its content in this Section. As part of the Affective Model, however, we shall assume that education ( $E$ ) and social class ( $S$ ) are *important* elements in the determination of  $P$ , and that education has at least as great a direct importance as social class.

We must now recalculate the “expected” fall in  $b_{YE}$  due to the introduction of cognitive variables, based on this larger model, and with  $y_A$  and  $y_E$  as parameters. It will be shown that for all reasonable values of these parameters—and for many unreasonable as well—the Affective Model predicts far more accurately than the Cognitive. The Affective Model in its crude form tends to *underpredict* (predicted reduction = 0%, while actual re-

<sup>4</sup> The statistical techniques of recursive regression, or “path analysis”, are described in [14].

<sup>5</sup> It might be asked why certain paths have been *a priori* excluded from Figure 1. That  $Y$  depends directly only on  $A$  and  $P$  follows from our exclusion of the influence of ascriptive traits and further from the very definition of  $A$  and  $P$  themselves; insofar as  $Y$  depends on  $I$ ,  $I$  should be included among the variables  $A$ , and insofar as  $Y$  depends on traits involved in  $S$ ,  $S$  must be included directly in  $P$ . Studies show moreover, that the direct path from  $S$  to  $A$  is negligible [29, 40].

duction = 4%–35%). Hence in reestimating its predictions, we shall remain conservative by always underestimating the Affective Model's predicted reduction in  $b_{YE}$  when  $A$  is introduced. Manipulation of the normal equations in two-variable regression ([33], p. 61) gives

$$\frac{b_{YE \cdot A}}{b_{YE}} = 1 - \frac{r_{EA}}{1 - r_{EA}^2} (z - r_{EA})$$

where  $z = r_{AP}/r_{EP}$ . In terms of the imperfectly measured variables  $E'$  and  $A'$ , this clearly becomes

$$(4) \frac{b_{YE' \cdot A'}}{b_{YE'}} = 1 - y_A^2 \frac{r_{EA}}{1 - y_A^2 y_E^2 r_{EA}^2} \cdot [z - r_{EA}] + [1 - y_E^2] r_{EA}.$$

To estimate this equation, taking  $y_E$  and  $y_A$  as parameters, we require estimates of  $r_{EA}$  and  $[z - r_{EA}]$ . A conservative assessment of the Affective Model requires that we choose a small value for  $r_{EA}$ , since the larger is  $r_{EA}$  (holding  $z - r_{EA}$  constant), the larger the predicted reduction in  $b_{YE'}$ . Empirical measures [11, 13, 26] show  $r_{E'A'} \approx .6$  to  $.7$ . Since  $r_{EA} = r_{E'A'}/y_A y_E$ , the assumption of significant errors in variables pushes  $r_{EA}$  quite high (in terms of the assumptions of Table 1, even above unity).

TABLE 1

$y_A^2$	$y_E^2$	Reduction in $b_{YE'}$ , percentage		
		Model A $p_{AP}=0$	Model A $p_{AP}=.12$	Cognitive Model
1.00	1.00	00%	24%	100%
0.75	0.85	08%	19%	73%
0.60	0.70	11%	18%	49%
0.50	0.70	09%	15%	40%
0.80	0.80	12%	22%	72%
0.80	0.70	16%	27%	71%
0.70	0.60	17%	26%	62%

However, there is reason to believe the error in measuring  $A$  is *not* independent of  $E$  (e.g., through the conceptual variable

“test-taking ability,” which might increase with level of education) so our underestimate of  $r_{EA}$  will take the form of *not* correcting for measurement error; that is, we assume  $E$  accounts for about 50% of the variance in achievement.

Similarly, we shall settle for an underestimate of  $[z - r_{EA}]$ . Abstracting from  $p_{AP}$ , and using the fundamental theorem of path analysis [14], we have

$$(5) \quad r_{AP} - r_{AE} r_{PE} = p_{AI} p_{PS} \{ r_{EA} [1 - p_{EI}^2 - p_{EA}^2 - r_{EA} p_{EI} p_{ES}] - p_{EI} p_{ES} \}.$$

Thus in general we have

$$(6) \quad [z - r_{EA}] = r_{PE}^{-1} \{ p_{AP} + p_{AI} p_{PS} \cdot [r_{EA} (1 - K_E^2) p_{EI} p_{ES} (1 - r_{EA}^2)] \}.$$

Using figures from [11, 40], we find the highest estimate of the second term on the left-hand side of (6) to be  $p_{PS}(.05)/r_{PE}$ . Since

$$(7) \quad r_{PE} = p_{PE} + r_{ES} p_{PS},$$

we have

$$(8) \quad 1 = (p_{PE}/r_{PE}) + r_{ES} (p_{PS}/r_{PE}).$$

Since  $r_{ES} \geq 0.6$  [15], we have  $(p_{PS}/r_{PE}) < 1.7$ . But assuming the direct link between  $E$  and  $P$  to be strong (an assumption of the Affective Model), this estimate is seen to be significantly inflated. Indeed, if  $S$  and  $E$  are roughly equal in their direct linkage with  $P$ ,  $(p_{PS}/r_{PE})$  is significantly *less* than unity. At any rate, the elimination of the second term in (6) will not bias our results greatly against the Affective Model.

In treating  $r_{PE}$ , we shall again settle for an underestimate of  $[z - r_{EA}]$ . We have

$$(9) \quad P = p_{PE} \cdot E + p_{PS} \cdot S + p_u U_p$$

where  $U_p$  is the contribution to  $P$  outside the model. If we then write  $p_{PS} = p_{PE/a}$ , we



find that

$$(10) \quad r_{EP} = R_P / \sqrt{[(1 - r_{ES}^2) / (a + r_{ES})^2] + 1}$$

where  $R_P$  is the "proportion" of the variance of  $P$  explained within the model. Moreover, taking  $r_{ES} = .6$  [1, 13], the denominator on the right side of (10) declines from 1.24 to 1.00 as " $a$ " passes from  $\frac{1}{2}$  to infinity. Thus we can safely take

$$(11) \quad R_P^{-1} < r_{EP}^{-1} < (1.2)R_P^{-1}$$

Returning to (6) and (4), we find that the Affective Model implies a reduction in  $b_{YE'}$  with the following upper bound:

$$(12) \quad \frac{b_{YE' \cdot A'}}{b_{YE'}} < 1 - y_A^2 \frac{r_{EA}}{1 - y_A^2 y_E^2 r_{EA}^2} \cdot \{p_{AP} R_P^{-1} + [1 - y_E^2] r_{EA}\}$$

Moreover, this upper bound is probably a good approximation as well, so (12) can be treated as the "prediction" of the reduction in  $b_{YE'}$  by the Affective Model.

We shall test equation (12) using two estimates of  $p_{AP}$ . First, we shall assume there is no direct relation between  $A$  and  $P$ , so  $p_{AP} = 0$ . Second, we shall assume a small direct relation, taking (arbitrarily)  $p_{AP} = .12$ .<sup>6</sup>

The corresponding analysis for the Cognitive Model's prediction of the reduction in  $b_{YE'}$  follows from a similar but simpler derivation. We find

$$(13) \quad \frac{b_{YE' \cdot A'}}{b_{YE'}} = 1 - \frac{y_A^2}{1 - y_A^2 y_E^2 r_{EA}^2} \cdot [1 - y_E^2 r_{EA}]$$

Table 1 illustrates our predictions for alternative hypotheses as to the validities of  $A$  and  $E$ , and with our alternative

<sup>6</sup> Theoretical evidence of such a direct relationship can be found in [44]. In addition, I shall suggest below that a central trait developed through schooling and relevant to job adequacy is "motivation according to external reward," which is clearly conducive to higher levels of cognitive achievement.

assumptions concerning  $p_{AP}$ .<sup>7</sup> If the empirically derived reductions shown in Appendix I are correct, the Cognitive Model must be fairly decisively rejected. Moreover, the Affective Model "predicts" with the proper order of magnitude. Of course, the latter's validity can only be ascertained when a correct specification of the variables  $P$  are obtained. A preliminary attempt in this direction will be presented in the following Section. Roughly, if education does contribute to earnings, and if this contribution cannot be accounted for in terms of cognitive variables, it is reasonable to expect the noncognitive traits rewarded through grading and promotion, hence presumably integrated into the student's personality, to do the job.<sup>8</sup>

*The Structure of Social Relations and the Pattern of Rewards in Schooling*

The cogency of the Affective Model depends in the last instance on the quantitative specification of the personality variables  $P$ . Ideally, this would involve isolating a fixed set of measurable traits, exhibiting their concordance with level of occupational status or income, showing their correlation with years of school, and describing the mechanisms by which schools generate them. In this section, our

<sup>7</sup> As previously noted, Table 1 is based on the assumption that  $r_{EA} = .5$ . The reader can verify that these results are quite insensitive to alternative specifications of  $r_{EA}$ .

<sup>8</sup> Approaches to the sources of worker productivity other than that followed in this Section are available. For instance, noting that the demand and supply of educated labor have increased in step in recent years, in that relative wages have not significantly changed [2, 22], we may ask if the rise in demand can be accounted for in terms of cognitive variables. The cognitive requirements for jobs included in [47] exhibit high reliabilities [16], and even tend to overestimate these requirements [38]. An analysis of this body of data [48, 39] shows cognitive demands requiring a total increase of 0.44 years of education per worker, between 1940 and 1960, whereas the actual increase in level of education is several times this value. Thus the demand for "educated labor" must include significant noncognitive components.

aim will be considerably less ambitious. We shall outline a set of traits held by long sociological tradition [37, 49, 50] as requisite for adequate job functioning in production characterized by bureaucratic order and hierarchical control. We then show that schooling is conducive to the development of these traits in students.<sup>9</sup>

We shall focus on two aspects of schooling central to the patterning of personality development. First, the *structure of social relations* in education—including sources of motivation, authority and control, and types of sanctioned interpersonal relations—by requiring the student to function routinely and over long periods of time in role situations comprising specific expectations on the part of the teacher, other students, and administrators, tends to elicit uniformities of response codified in individual personality [5, 12]. Second, the system of grading, by rewarding certain classroom behavior patterns and penalizing others, tends to reinforce certain modes of individual response to social situations. According to any of the variants of behaviorist psychology, this *pattern of reward* will educe the corresponding pattern of personality traits in the students. Part of the myth of liberal education is that, however important the teacher's expectation may be in eliciting student performance, his actual *assessment* and *grading* of this performance depends only on concrete, observed cognitive attainments. Yet

<sup>9</sup> In this paper we shall treat only those required traits which are *common* to all levels in the hierarchy of production, and are inculcated in most schools on all levels. Actually the personality requisites of job adequacy no doubt vary from level to level within the hierarchy of production, and different levels of schooling (e.g., grade school, high school, junior college, college) likely reflect these differential needs. Moreover, within a particular educational level, we would expect different types of schooling to subsist side by side (e.g., ghetto, working-class, and middle-class-suburban high schools), reflecting the differential positions in the production hierarchy that its students are destined to fill. These complications, however important, cannot be treated here.

studies show that cognitive variables never account for more than 30% of the variance in grade point average (37). In addition, many studies illustrate the importance of specific personality measure in prediction grades [17, 25, 30], although these by and large correct inadequately for actual achievement levels.

Before attempting a systematic assessment of the body of empirical information on the effect of social structure and pattern of reward in schooling on personality development, I should like to present two studies [19] illustrating the breadth and counter-intuitive nature of the process of grading, in which explicit measures of cognitive achievement are available. First, an analysis based on data collected on 649 upper-ability senior-high school males [31] (National Merit Scholarship Finalists) shows no value of any combination of five achievement variables (College Entrance Examination Board: SAT-Math, SAT-Verbal, Scientific Performance, Humanities Comprehension, Scientific Comprehension), despite significant variance in these achievement measures and in grades within the sample. Of some 65 additional personality variables, two—"Citizenship-Teacher's Rating" (CitT) and "Drive to Achieve-Student Self Rating" (DrA)—have greatest power to predict GPA, with  $p < .001$ . This example illustrates (a) since these traits are not rewarded *through* their contribution to achievement, that teachers grade *independently* on the basis of personality; (b) since DrA is rewarded, that subjective motivation is taken into consideration in grading; (c) since CitT is positively rewarded and can be interpreted as "conforming to the dominant role-structure" of the school, that grading reinforces the student's personality development through participation in the particular structure of social relations in schools, and; (d) while grades depend on achievement in general, when 'ability' is con-

trolled, little additional effect of achievement can be detected, so the *subjective experience* of an individual student (who of course cannot control his intelligence) is that grades depend primarily on affective

behavior. In this study, the pattern of reward is no less reflected in the remaining personality traits (Tables 2-4). Thus Table 2 shows that students are uniformly penalized for creativity, autonomy, initiative,

TABLE 2—PERSONALITY VARIABLES CORRELATED WITH GPA CORRECTED FOR ACHIEVEMENT, CIT, AND DRA (SIGNIFICANCE LEVELS IN PARENTHESIS)

<i>Positively Rewarded:</i>	SAT-Math (15%)
Perseverance (1%)	Scientific Comprehension (15%)
Good Student (1%)	<i>Negatively Rewarded (Penalized):</i>
Self-Evaluation (5%)	Independence-Self-Reliance (1%)
Popular (5%)	Initiative (5%)
Acceleration of Development (5%)	Complexity of Thought (5%)
Mastery (5%)	Originality (Barron) (6%)
Control (6%)	Originality (11%)
Status (11%)	Independence of Judgment (13%)
Popularity (TR) (13%)	Creative Activities (13%)
Suppression of Aggression (14%)	Curious (14%)

TABLE 3—CORRELATIONS OF VARIOUS PERSONALITY TRAITS WITH CIT

<i>Positively Rewarded:</i>	Mastery (15%)
Deferred Gratification (1%)	Initiative (15%)
Perseverance (1%)	<i>Negatively Rewarded (Penalized):</i>
Control (1%)	Cognitive Flexibility (1%)
Popularity (1%)	Complexity of Thought (1%)
Social Leadership (1%)	Originality (Barron) (1%)
Good Student (Parent value) (1%)	Sense of Destiny (1%)
Self-Evaluation (1%)	DRS-Creativity (1%)
Scientific Comprehension (1%)	Independence of Judgment (5%)
Intellectuality (1%)	Independence-Self-Reliance (10%)
Esthetic Sensitivity (5%)	Curious (15%)
Suppression of Aggression (5%)	Self-Confidence (15%)
Comradeship-Sharing (5%)	Verbal Activity (15%)
SAT-Math (10%)	
Artistic Performance (10%)	

TABLE 4—CORRELATIONS OF VARIOUS PERSONALITY TRAITS WITH DRA

<i>Positively Rewarded:</i>	Initiative (1%)
Self-Evaluation (1%)	Status (1%)
Perseverance (1%)	Breadth of Interest (5%)
Deferred Gratification (1%)	SAT-Math (5%)
Originality (1%)	Scientific Performance (5%)
Independence (1%)	Verbal Activity (5%)
Responsibility (1%)	Conformity (10%)
Control (1%)	<i>Negatively Rewarded (Penalized):</i>
Artistic Performance (1%)	Cognitive Flexibility (1%)
Creative Activities (1%)	Complexity of Thought (1%)
Sense of Destiny (1%)	Originality (1%)
Popularity (1%)	Independence of Judgment (1%)
Social Leadership (1%)	SAT-Verbal (5%)
Good Student (1%)	
Mastery (1%)	



tolerance for ambiguity, and independence, even after correcting for achievement, CitT, and DrA, and rewarded for perseverance, good student values, and other traits indicative of docility, industry, and ego-control. Moreover, the content of CitT is exhibited in Table 3, showing a similar pattern of evaluative behavior on the part of the teacher, especially in the penalized traits (no doubt as a result of the objective needs of 'classroom control' in the typically-structured school, rather than his personal value-preferences). Lastly, Table 4 shows that DrA is associated with the same pattern of penalized traits, while the rewarded traits exhibit two separate dimensions: on the one hand, high DrA may involve conformity with classroom norms, and on the other, to their rejection in favor of autonomous personal development—hence the appearance of Artistic Performance, Creative Activities, Self-Confidence, Initiative, Self-Assurance, Breadth of Interest as associated with DrA.<sup>10</sup>

The National Merit Scholarship study is weak in two respects. First, it deals with only one ability grouping, and second, it aggregates over diverse study-areas—natural science, social science, humanities, language, etc. A similar result can be derived, however, from a path analysis the author has fit to data supplied by Cline [7], covering 114 high school seniors of varying ability, in the specific area of natural science performance. This data-source includes a measure of intelligence, three creativity measures, achievement level in science, a teacher rating of the student's "science potential," and average science grades over the three years of high school. Path analysis [19] indicates that

<sup>10</sup> This divergence replicates [18]. Here, as throughout this Section, space limitation forbids adequate explanation of the content of these personality measures. Their precise content can be found in the corresponding sources, or in [19].

over the broader ability spectrum of students: (a) teacher attitudes are the major determinants of grades; (b) "achievement" is only one determinant of teacher attitudes, and hence of grades received; (c) intelligence is directly rewarded in terms of grades, beyond its contribution to actual achievement, whereas many other equally important determinants of achievement (e.g., "creativity") are in no way rewarded; (d) the direct effect of actual achievement on teacher attitudes is statistically insignificant.

The bulk of existing studies are compatible with these results, and hence tend to lend credence to the Affective Model. Moreover, these studies show that both structure and pattern of reward in schooling conform to the requisites of adequate job-performance in bureaucratically structured and hierarchically organized enterprise [37, 49, 50]. We can organize this discussion around four types of personality requisites—"Subordinacy," "Discipline," "Supremacy of Cognitive over Affective Modes of Response," and "Motivation according to External Reward."

*Subordinacy.* "The principle of hierarchical authority . . . is found in all bureaucratic structures . . . (in a) firmly ordered system of super- and sub-ordination." [49]. Subordinacy and proper orientation to authority are induced through the strict hierarchical lines—administration-teacher-student—of the school. As the worker relinquishes control over his activities on the job, so the student is first forced to accept, and later comes personally to terms with, his loss of autonomy and initiative to a teacher who acts as a superior authority, dispensing rewards and penalties. That proper subordinacy is a factor in grading as well is dramatized in our National Merit Scholarship study. It is supported by Gough [24], where "over-achievers" (students whose grades exceed

that predicted by their IQ) are marked by their teachers as "appreciative," "cooperative," and "reasonable," while "under-achievers" are deemed "dissatisfied," "pre-occupied," "rebellious," and "rigid." Striking additional support is found in [6] (see [19]).

*Discipline.* Weber emphasizes, "organizational discipline in the factory is founded upon a completely rational basis . . . the optimum profitability of the individual worker is calculated like that of any material means of production. On the basis of this calculation, the American system of 'Scientific Management' enjoys the greatest triumphs in the rational conditioning and training of work-performance . . . the psycho-physical apparatus of man is completely adjusted to the demands of the outer world . . ." The extension from production on simple factory lines to bureaucratic organization both conserves and expands this need. In Merton's words [37], "bureaucratic structure exerts a constant pressure . . . to be 'methodical, prudent, disciplined.' . . . The bureaucracy . . . must attain a high degree of reliability of behavior, and unusual degree of conformity with prescribed patterns of actions. Hence the fundamental importance of discipline. . . ." Discipline is reflected in the educational system where regularity, punctuality, and quiescence assume proportions almost absurd in relation to the ostensible goals of "learning." Thus Gough [24] finds overachievers consistently rewarded for being "dependable," "reliable," "honest," and "responsible," (teacher ratings), and Gebhart and Hoyt [17] find them rewarded for "Consistency" (Edwards Personal Preference Inventory); our National Merit Scholarship study shows deferred gratification, perseverance, and control as central elements in the teacher's assessment of "citizenship," a highly rewarded trait. Dramatic conforma-

tion of discipline as independently rewarded through grades is supplied by a brilliant series of studies by Smith [42, 43, 44]. Noting that personality inventories suffer from low validities due to their abstraction from real-life environments, and low reliabilities due to the use of a single evaluative instrument, Smith turned to student peer-ratings of 42 common personality traits, based on each student's observation of the actual classroom behavior of his classmates. Factor analysis allowed the extraction of five general traits, stable across different samples and national cultures. One of these, a discipline factor which Smith calls "Strength of Character"—including such traits as "not a quitter," "conscientious," "responsible," "insistently orderly," "not prone to day-dream," "determined-persevering,"—exhibits three times the contribution of  $R^2$  in predicting post-high-school performance than any combination of thirteen cognitive variables.

*Cognitive vs. affective modes of response.* Occupational roles have been characterized as requiring an upgrading of cognitive demands. Yet the contribution of schooling to job-adequacy may be more accurately described as evincing a *cognitive mode*, and suppressing an affective mode, of reacting to bureaucratic situations. That bureaucratic order requires the dominance of cognitive modes of response has been emphasized by Weber [49]: "bureaucratization . . . very strongly furthers the development of 'rational matter-of-factness' . . . Its specific nature, which is welcomed by capitalism, develops the more perfectly the more the bureaucracy is 'dehumanized,' the more completely it succeeds in eliminating from official business love, hatred, and all purely personal, irrational, and emotional elements which escape calculation." More recently, Keniston [35] notes, "The preferred technique of

technology involves two related principles: that we give priority to cognition, and we subordinate feeling. . . . Thus feeling as a force of independent value—all of the passions, impulses, needs, drives, and idealisms which in some societies are the central rationales of existence—are increasingly minimized, suppressed, harnessed, controlled, and dominated by the more cognitive parts of the psyche." The structure of social relations in education speak to industrial needs. In Dreeben's [12] words, "Although affection is not proscribed in schools, it is expressed less intensely and under more limited circumstances (than in family or peer-group relations). In the long run, matter-of-factness in the accomplishment of tasks governs the relationship between teachers and pupils. . . ." This pattern is repeated in the pattern of rewards in schools. Thus Gebhart and Hoyt [17] find overachievers in high school higher on "Order," and underachievers higher on "Nurturance," and "Affiliation." (Edwards Personal Preference Inventory) Our analysis of the National Merit Scholarship data shows "Originality," "Complexity of Thought," and "Creative Activities" penalized, and similar measures of affective dominance are negatively related to the two main predictors of high grades—CitT and DrA. A similar tension between norms of education and affective, creative development is dramatically illustrated in [18]. Lastly, the Cline study reported above again illustrates that teachers tend to reward the development of cognitive modes but not affective modes, even when these affective modes are conducive to higher levels of cognitive achievement.

*Cathection of External Reward.* In a situation where the attributes of work and technology are determined essentially independent of human needs and worker control, by criteria of profit and "efficiency"

in the narrow sense, the process of work—as an activity which ideally might provide immediate satisfaction and contribute to individual psychic development as an outlet for creativity, initiative and worker solidarity—naturally acquires little intrinsic subjective value. Moreover, in the absence of a solidary and cohesive social community, and in a situation where workers have essentially no control over the attributes of the product of their work, the internal *goal* of work—the contribution to social dividend—provides no source of gratification and personal reward [20, 22, 23]. The lack of subjective reward of work either in terms of process or goal is the key to what in Marxist terms is called "alienation from process and product" [23], and requires workers to be motivated to conscientious and efficient activity through rewards external to work as such—money or hierarchical status [41].

The development of this motivational capacity is entrusted to socialization mechanisms, among which educational institutions are the most prominent and socially flexible. Indeed, in important respects the system of universal education arose during the Industrial Revolution in response to this need [8, 34]. The structure of social relations in schools reproduce rather faithfully the capitalist work-environment. Learning (the activity) is not undertaken through the student's intrinsic interest in the *process* of learning, nor is he motivated by the *goal* of the educational process (possession of knowledge). Thus the student learns to operate efficiently in an educational environment, unmotivated by either the process or product of his activities—in short, in an alienated educational environment in which rewards are in all cases external: grades, class standing, and the threat of failure. The cathection of such forms of "external reward" is a prime outcome of educational socialization

[12], and doubtless an important contribution to "productive" worker characteristics.

## APPENDIX

1. Study: Hansen and Weisbrod (mimeo)  
Sample: 2284 predominantly white, non-southern, above-average IQ veterans  
Y: Earnings  
A: American Air Force Qualification Test  
Other Variables: Age, Race  
Reduction: 19%
2. Study: Conlisk [10]  
Sample: 75 males over a thirty year observation period  
Y: Occupational status, scaled by census-average income for the occupation  
A: IQ, taken at various ages between ages one and 18.  
Other Variables: Parental Income  
Reduction: Less than 10%
3. Study: Duncan [13]  
Sample: CPS-NORC, Oct. 1964; white men 25-34 years of age CPS-OCG (Oct. Changes in a Generation), March 1962: Non-black, non-farm  
Y: 1964 earnings; 1964 Occupational Status  
A: early IQ, later IQ  
Reduction: between 10% and 25%, depending on the particular Y and A used.
4. Study: Cutwright [11]  
Sample: 1% random sample of men registered with Selective Service on April 30, 1953.  
Y: Earnings  
A: AFQT  
Reduction: Between 22% and 35%
5. Study: Duncan, Featherman, and Duncan [15]  
Sample: OCG study, all men 20-64 years old; for details see [18] pp. 103 ff.  
Y: Status of first job  
A: IQ, Army General Classification Test  
Reduction: 20%
6. Study: Bajema [1]  
Sample: 437 males  
Y: Occupational Status, NORC prestige index, age 45  
A: Early IQ Terman Group Intelligence, sixth grade  
Reduction: 13%
7. Griliches and Mason [26]  
Sample: 1964 CPS-NORC veterans file, males, 25-34 years, who have been in army  
Y: log actual income  
A: AFQT  
Other Variables: age, race, sex, SES regional location  
Reduction: 12% to 15%, depending on which of the 'other variables' are entered in.
8. Study: Sewell, Haller and Ohlendorf [40]  
Sample: a one-third random sample of Wisconsin high school seniors of 1957, follow-up in 1968.  
Y: Occupational attainment, using Duncan's (1961) socioeconomic index of occupational status, using data obtained in 1964-65.  
A: IQ, Henman-Nelson Test of Mental Ability  
E: high school = 1; vocational school = 1; some college = 2; college grad = 3  
Reduction: 7%
9. Taubman and Wales [46]  
Sample: All Minnesota high school graduates of 1936  
Y: income in 1953  
A: IQ  
Reduction: 4%

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