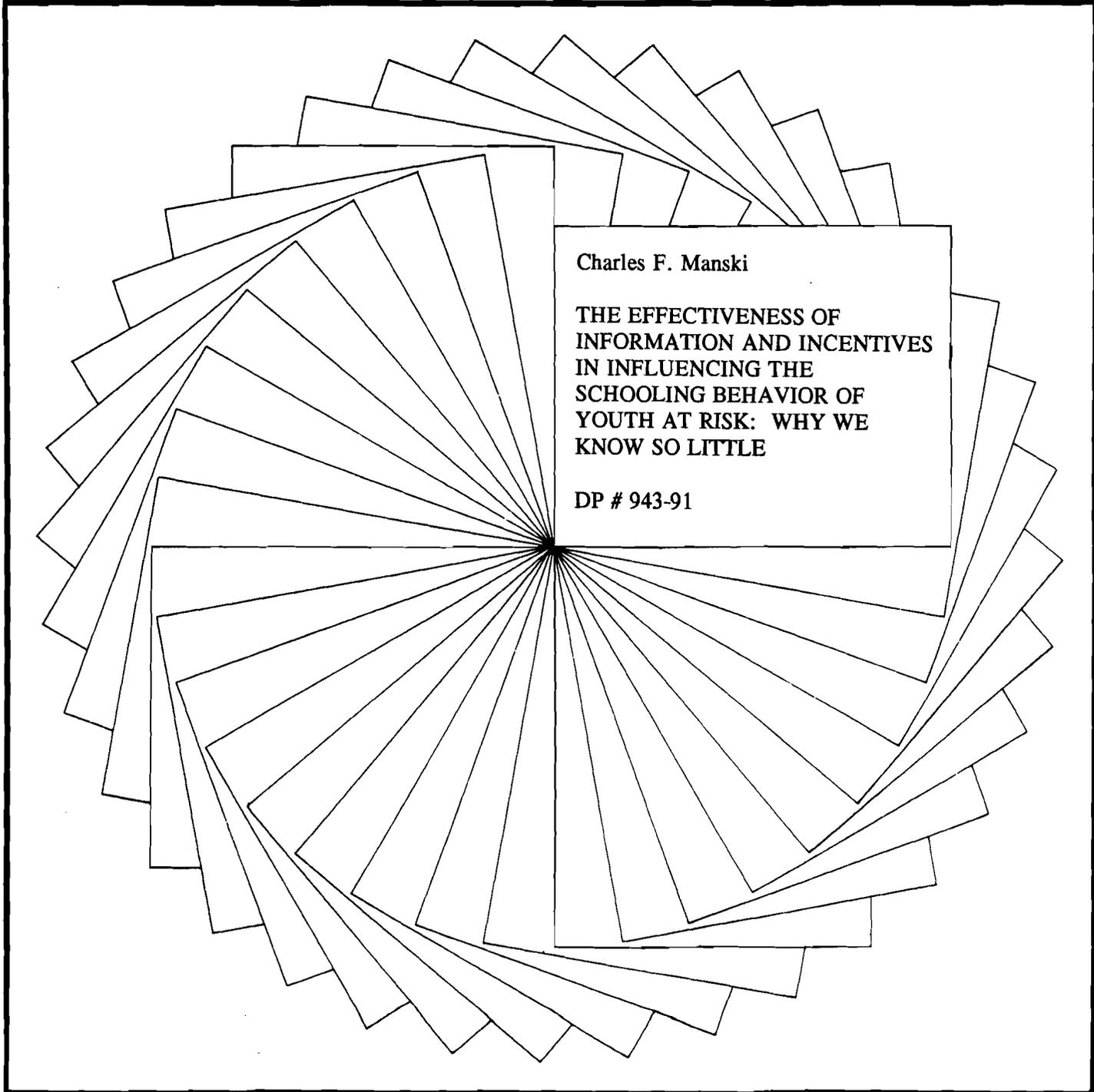




Institute for Research on Poverty

Discussion Papers



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INFORMATION AND INCENTIVES
IN INFLUENCING THE
SCHOOLING BEHAVIOR OF
YOUTH AT RISK: WHY WE
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**THE EFFECTIVENESS OF INFORMATION AND INCENTIVES IN INFLUENCING
THE SCHOOLING BEHAVIOR OF YOUTH AT RISK: WHY WE KNOW SO LITTLE**

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Abstract

In attempting to encourage at-risk students to remain in school, two approaches are in use: information strategies, which assume that with accurate information students will choose to continue their educations, and incentive strategies, which assume that something has to be done to enhance the value of education if students are to choose to stay in school. Social science research on schooling behavior has not yet provided the knowledge necessary to evaluate the effectiveness of these two approaches, since we do not know how youth form expectations about the returns to schooling and how such expectations influence behavior.

This paper diagnoses the shortcomings of present research and prescribes innovations in social science practice that may lead to credible evaluation of information and incentive policies. In it I lay out elements of a new program of research on schooling behavior and expectation formation based on decision-theoretic analysis of subjective data. The methodological issues addressed here are relevant to the evaluation of information and incentive policies in other areas as well, where the unwillingness of economists to exploit subjective data and the failure of social psychologists to formalize their ideas have combined to limit our understanding of human behavior.

1. Introduction

Many controversies in social policy boil down to disagreements about the determinants of human behavior, specifically about the effectiveness of different policy instruments in influencing behavior. One such controversy concerns the effectiveness of information and incentive strategies in influencing the schooling behavior of so-called at-risk youth. Although support for measures to improve the human capital of these youth is widespread, there is no consensus about the best way to keep them in school and to improve their performance.

INFORMATION STRATEGIES: One line of thinking begins from the premise that remaining in school and performing well are generally in students' own self-interest. It is assumed that youth who drop out of school or who fail to perform up to their abilities misperceive their returns to schooling. It follows that, to influence schooling behavior, we should provide youth with information that convinces them of the value of schooling. We should correct the misperceptions that presently lead youth to make poor schooling decisions.

The idea that providing information can influence schooling behavior is reflected in traditional counseling programs. Moreover, it underlies the widespread belief that youth are influenced by the "role models" in their environment. It is often argued that if youth learn about the returns to schooling from observing the experiences of their peers, families, and neighbors, then schooling behavior can be influenced by altering the role models that youth observe.

It is widely held, for example, that increasing the number of minority students who enroll in college would have an external effect of the multiplier type. The following quote presents the usual reasoning: "When large numbers of minority students attend college, they become role models for the youth in their communities, who then often seek higher education. The situation is like a Catch-22.

In poor communities, there are very few role models" (W. Van Deburg, quoted in the University of Wisconsin student newspaper The Daily Cardinal, January 22, 1990, p. 1).

INCENTIVE STRATEGIES: A second line of thinking begins from the premise that students correctly perceive the returns to schooling. If a student chooses to drop out or to not make an effort, it is because the student knows that the returns to schooling are low. Ogbu (1978), for example, states that "blacks, from generations of experience, realize that they face a job ceiling." Rosenbaum and Kariya (1989) assert that "since grades have little influence on youth's wages or jobs..., school performance has little payoff in any kind of job attainments."

If one accepts the second perspective, it follows that better information is not the key to improving school performance. Rather, better incentives are needed. We should use "carrot and stick" programs to influence schooling behavior. We should make sure that students who perform well are rewarded. Those who do not perform should, perhaps, be sanctioned.¹

The idea of using incentives to influence schooling behavior is reflected in traditional policies ranging from the honor roll through corporal punishment. Recently enacted programs bring to bear positive and negative financial incentives. On the one hand, programs such as those promoted by the "I Have a Dream" Foundation guarantee students college scholarships if they perform well in high school. On the other hand, Wisconsin's "Learnfare" policy sanctions families receiving AFDC payments if their children drop out of high school or do not maintain normal attendance levels.

POLICY IN THE DARK: As matters stand, some individuals assert that youth who are at risk misperceive the returns to schooling whereas others contend that these youth are well informed. These contradictory assertions, which lead to differing policy recommendations, are able to coexist because empirical analysis is lacking. The substantial body of social science research on schooling

behavior offers only fragments of the knowledge needed to evaluate the effectiveness of information and incentive policies. We possess little hard evidence on two central questions:

- (1) How do youth form expectations of the returns to schooling?
- (2) How do expectations influence behavior?

In the meantime, policy-making goes on in the dark. Programs embodying many combinations of information and incentives are continually proposed and implemented across the country, in the absence of any basis for judging their effectiveness. Lacey (1989) laments the lack of assessments of the impact of the "I Have a Dream" programs. Corbett et al. (1989) describe how the design of Wisconsin's Learnfare program has made a proper evaluation difficult or impossible. The U.S. General Accounting Office (1990), in an overview of private programs offering information and incentives to at-risk youth, observes that data permitting a systematic evaluation of these programs are not available.

DIAGNOSIS AND PRESCRIPTION: This paper has two objectives. The first is to diagnose the shortcomings of social science research that make it possible for contradictory assertions to persist about youths' perceptions of the returns to schooling. The second is to prescribe innovations in social science practice that may provide credible evaluation of information and incentive policies.

Diagnosis is performed in Sections 2 and 3, which critique the economic and social-psychological literatures on schooling behavior. Economics, which has traditionally used only choice data in empirical analysis, has suffered from its failure to exploit subjective data. Social psychology, which has made extensive use of subjective data, has suffered from its failure to formalize its verbal conceptualizations of behavior.

Prescription is offered in Sections 4 and 5, which propose a joining of the positive aspects of present economic and social-psychological practice. I describe elements of a new program of

research on schooling behavior and expectation formation, one based on decision-theoretic analysis of subjective data.

Although the substantive focus of this paper is schooling behavior, the methodological issues addressed here arise in the evaluation of information and incentive policies elsewhere. Section 6 calls attention to the broader implications of this paper.

2. Econometric Analysis of Choice Data

The idea that education is an investment and that schooling behavior depends on perceptions of the returns to schooling is most explicit in the work of economists. Hence it is appropriate to begin with the economics literature on schooling behavior.

Theoretical models of schooling as investment in human capital first appeared thirty years ago in the work of Becker (1964), Mincer (1958), Weisbrod (1962), and others. Empirical analyses of individual schooling behavior began a decade later, when researchers initiated the use of random utility models to analyze the college enrollment decisions of high school graduates.² Early efforts were made by Comay et al. (1973), Radner and Miller (1975) and Kohn, Manski, and Mundel (1976). The work of Willis and Rosen (1979) is notable for its attempt to interpret enrollment decisions as reflecting youths' choices between alternative expected life-cycle earnings streams. The study by Manski and Wise (1983), which examines in detail the effects of college costs on enrollment decisions, assesses the influence of a major federal financial aid program on college-going. The literature has been reviewed by Freeman (1986) and by McPherson (1988).

Economic analyses of schooling behavior assume that observed outcomes are determined by youths' opportunities, preferences, expectations, and decision rule. Opportunities are represented by a choice

set defining the feasible schooling and other options. Preferences are embodied in a utility function expressing the value of each of the life outcomes that a youth might experience. Expectations are represented by a set of subjective probability distributions over outcomes, each distribution being conditional on choice of a given schooling option and on the information possessed by the youth. The decision rule explains how behavior depends on opportunities, preferences, and expectations; the usual assumption is that youths choose a feasible option that maximizes expected utility.

TREATMENT OF EXPECTATIONS: Other social scientists may find objectionable many aspects of the prevalent economic models of schooling behavior: the assumption that individuals' preferences are unaffected by their social environments, the focus of attention on the monetary returns to schooling, the conventional assumption that youth make decisions by maximizing expected utility. From the perspective of this paper, however, the most severe deficiency of the economic work to date is its rudimentary treatment of expectations.

Early in their careers, economists are taught to believe only what people do, not what they say. The dominant view is deep skepticism about the credibility of subjective statements.³ Hence, the tradition in econometric analysis of schooling behavior has been to attempt to infer the structure of decision making from choice data alone. (See, for example, the exposition in Manski and Wise, 1983, Chapter 2.)

Behavioral analysis based on choice data alone is possible only if the researcher is willing to impose strong prior assumptions on opportunities, preferences, and expectations. Otherwise, it is impossible to disentangle the separate contributions of these forces in producing observed behavior.

The usual practice concerning opportunities is to try to reconstruct what each youth's options must have been and then to treat the imputed choice set as if it were the actual one. The utility function

embodying preferences is assumed known up to a parameter vector, to be estimated from the choice data. Expectations are handled in one of two ways.

The subjective probability distribution of outcomes conditional on each feasible option may be assumed known up to a parameter vector, to be estimated from the choice data. Or subjective distributions may be assumed to coincide with realized distributions of outcomes, in which case expectations may be estimated from observed outcome data. The former approach is applied in the empirical analysis of Manski and Wise (1983, Chapter 6). The latter one has had two main variants. The "myopic expectations" assumption presumes each cohort to believe that its outcome distributions will be the same as those realized by past cohorts (see, for example, Freeman, 1971). The "fulfilled expectations" assumption presumes each cohort to know the outcome distributions that it will actually realize in the future (see, for example, Willis and Rosen, 1979).⁴

Neither of these approaches is satisfactory if we are to learn how youth actually form their expectations. In the former case, one uses choice data to jointly infer expectations and preferences. This is inherently difficult because different combinations of expectations and preferences can generate similar patterns of behavior. In the latter case, one simply assumes, with no attempt at verification, that expectations bear a specific relationship to realizations. To implement either approach, the researcher must presume to know what background information youths possess and use in forming their expectations.

3. Social-Psychological Analysis of Subjective Data

The social-psychological literature on schooling behavior is voluminous and diverse. A subdiscipline within educational psychology studies the relationship between student motivation and

achievement. Weiner (1990) observes that the psychological interpretation of the term "motivation" has shifted substantially over the past fifty years, with attention moving from mechanistic explanations of behavior to cognitive ones. The interpretation most relevant to our concerns would seem to be that of "expectancy-value" theory.

EXPECTANCY-VALUE THEORY: According to Feather (1988, p.381): "The distinctive characteristic of this theoretical approach is the attempt to relate action (choice, performance, and persistence) to the perceived attractiveness and aversiveness of expected outcomes. A person's actions are assumed to bear some relation to the expectations that the person holds and to the subjective values (or valences) of the outcomes that might occur after the actions."

This definition clearly subsumes the expected utility model assumed in economic research. There are, however, important differences between the work of social psychologists and economists.

First, researchers applying expectancy-value theory have steadfastly refused to formalize mathematically their use of the concepts "expectations" and "values." As a consequence, it is difficult to determine whether different researchers interpret these concepts in a common, coherent fashion. There are, of course, mathematical psychologists who do use formal models of decision making to analyze behavior (see, for example, Kahneman and Tversky, 1979; or Camerer and Kunreuther, 1989). However, the work of mathematical psychologists seems not to have found application in the field of educational psychology.

Second, social psychologists have not shared economists' inhibitions about the use of subjective data. The prevailing practice is to interpret responses to loosely worded questionnaire items as indicators of youths' expectations and values. Berndt and Miller (1990), for example, ask their sample of junior high school students to respond, on a five-point scale, to the question "How valuable do you think your education will be in getting the job you want?" Mickelson (1990) asks her sample

of high school seniors to express their degree of agreement with the statement "Studying in school rarely pays off later with good jobs." While most of the literature poses such vague questions, an occasional study analyzes responses to somewhat less ambiguous items. In their study of the income expectations of college seniors, for example, Smith and Powell (1990) ask respondents to forecast their "anticipated annual income in 10 years" and their "expected earnings" in the first year of their first job.

EXPECTATIONS FORMATION: Whereas economists have made little effort to understand expectations formation, sociologists and psychologists have devoted substantial attention to this subject.

The dominant theme is that expectations formation is a social phenomenon, each person learning about his or her own prospects by observing the experiences of others. Bandura (1986, p.47) states: "If knowledge could be acquired only through the effects of one's own actions, the process of cognitive and social development would be greatly retarded.... Fortunately, most human behavior is learned by observation through modeling. By observing others, one forms rules of behavior, and on future occasions this coded information serves as a guide for action.... Much social learning is fostered by observing the actual performances of others and the consequences for them."

A large empirical literature seeks to characterize the observational learning process and the way it interacts with learning from one's own experiences. One research tradition tries to interpret and operationalize the "reference group" theory initiated by Hyman (1942). Bank et al. (1990) give an interesting historical account. Unfortunately, the idea of a reference group appears as amorphous today as it was fifty years ago.

A second, more tightly focused, line of work seeks to understand "efficacy"; that is, how students form perceptions of their own abilities. For example, Schunk, Hanson, and Cox (1987) and Schunk

and Hanson (1989) attempt to determine the information students obtain about their own abilities from observing peers performing cognitive tasks. Moreover, they relate students' perceptions of their abilities to their actual performance. Reuman (1989) studies the relationship between classroom ability-grouping practices and students' achievement expectations. Hypothesizing that students form achievement expectations by comparing themselves with others in the same classroom, he concludes that the ability composition of the classroom should affect individual expectations about achievement in specific ways.

These studies of efficacy are interesting and may be relevant to the assessment of information policies. They do not, however, reveal youths' expectations regarding the returns to schooling.

4. Decision-Theoretic Analysis of Subjective Data

The discussion of Sections 2 and 3 implies two negative conclusions. First, we do not now possess the understanding of schooling behavior needed to evaluate the effectiveness of information and incentive policies. Second, and more troubling, present approaches to research on schooling behavior are unlikely to generate the needed knowledge.

As I see it, progress is possible only if the various social sciences break with their conventions and initiate major changes in their research methods. Economists must give up their self-imposed prohibition on the use of subjective data in empirical analysis. It is not realistic to think that the determinants of decision making under uncertainty can be disentangled from choice data alone. Social psychologists, who routinely employ subjective data, must end their dependence on verbal reasoning, which invites conceptual ambiguity and logical inconsistency. Coherent analysis of complex behaviors demands the discipline of formal modeling.

Thus, I believe that we need to research schooling behavior through decision-theoretic analysis of subjective data. The remainder of this paper describes something of what I have in mind. Sections 4.1 and 4.2 outline a way to address one of the two central questions framed in the Introduction: How do expectations influence behavior? Section 5 sketches some ideas on ways to address the other central question: How do youth form expectations of the returns to schooling?

4.1. A PROBABILISTIC CHOICE MODEL OF HIGH SCHOOL COMPLETION

I present here a simple model explaining one aspect of schooling behavior, the decision to complete high school. Given data on youths' expectations and on their choices or intentions, the model yields estimable school-completion probabilities. Section 4.2 shows how the estimated school-completion probabilities may be used to analyze how expectations influence behavior.

I focus on the high school completion decision for the sake of concreteness, to illustrate the approach. Inducing youth to complete high school is an important objective of information and incentive policies, although certainly not the only one.

THE DECISION MODEL: Suppose that schooling is mandatory until age sixteen and that youth decide on their sixteenth birthday whether they will complete high school or drop out. Let $d = 1$ if a youth decides to complete school and $d = 0$ otherwise. Assume that the decision rule has the form

$$(1) \quad d = 1 \text{ if } f(p_1, p_0, u) > 0. \\ = 0 \text{ otherwise.}$$

Here p_1 is the youth's subjective probability that he or she will realize a "good" outcome conditional on completing high school and p_0 is the analogous probability conditional on dropping out of school. A good outcome might, for example, be employment more than forty weeks a year or income above the poverty line. However defined, the outcome should be specific enough to prevent ambiguity in its interpretation by respondents.

In this decision model, the pair (p_1, p_0) express a youth's perception of the returns to schooling. The symbol u represents any other factors that may influence the school-completion decision. We expect that the decision function $f(.,.,.)$ should be increasing in its first argument and decreasing in its second. For example, if youth make decisions by maximizing expected utility, $f(.,.,.)$ could have the linear form

$$(2) \quad f(p_1, p_0, u) = (p_1 - p_0) + u.$$

ESTIMABLE SCHOOL-COMPLETION PROBABILITIES: Suppose that a researcher draws a random sample of youth aged sixteen, who have recently decided whether to complete high school. The researcher questions each respondent about his chosen action d and subjective outcome-probabilities (p_1, p_0) . The researcher may not be able to determine the value u of the other factors that influence schooling decisions but does observe a set x of relevant attributes for each respondent. Then the objective probability that a person with subjective outcome-probabilities (p_1, p_0) and attributes x chooses to complete school is

$$(3) \quad P(d=1 \mid p_1, p_0, x) = P[u: f(p_1, p_0, u) > 0 \mid p_1, p_0, x].$$

(Here and elsewhere the letter "P" denotes an objective probability.)

Given a sample of observations of (d, p_1, p_0, x) , the researcher can estimate the high school completion probabilities $P(d=1 \mid p_1, p_0, x)$. The most direct approach, unencumbered by auxiliary assumptions, is nonparametric regression of d on (p_1, p_0, x) . See Manski (1991) for a brief introduction to nonparametric regression methods and Hardle (1990) for an in-depth treatment.

Alternatively, one could assume that $f(\dots)$ has a specific form and u a specific distribution conditional on x . For example, let $f(\dots)$ have the form (2) and let $u = xb - e$, where b is a parameter vector and where e is distributed normal with mean zero and variance σ^2 , independent of (p_1, p_0, x) .

Then the high school completion probabilities are given by the probit model

$$\begin{aligned} (4) \quad P(d=1 \mid p_1, p_0, x) &= P[(p_1 - p_0) + (xb - e) > 0 \mid p_1, p_0, x] \\ &= \Phi[(p_1 - p_0)/\sigma + xb/\sigma], \end{aligned}$$

where Φ is the standard normal distribution function. Maximum likelihood estimation of the parameters (b, σ) yields an estimate for the school-completion probabilities.

ELICITATION OF EXPECTATIONS: Given data on (d, p_1, p_0, x) , estimation of the school-completion probabilities is a straightforward task. The challenge is design of a survey instrument that effectively elicits youths' subjective probabilities (p_1, p_0) .

Some lessons can be drawn from the probability elicitation experience of Bayesian statisticians, such as Kadane and Winkler (1988), psychologists such as Vallone, Griffin, Lin, and Ross (1990), and market researchers such as Jamieson and Bass (1989). In certain respects, however, the present elicitation problem may be more difficult than those treated previously. Whereas past efforts have

sought to elicit unconditional probabilities from adult respondents, the present analysis requires elicitation of conditional probabilities from adolescent respondents.

ANALYSIS USING INTENTIONS DATA: The foregoing approach to estimation of school-completion probabilities combines subjective data on expectations with data on actual schooling choices. To implement the approach requires the researcher to draw a sample that includes high school completers and dropouts. As a practical matter, it may be easier to sample students in school than to sample youth who have dropped out. This leads one to ask whether the school-completion probabilities can be estimated using data obtained from youth aged younger than sixteen; that is, while schooling is still mandatory. These youth have not yet made their school-completion choices but we could question them about their intentions.

Suppose that we sample students at age fifteen. Analysis of schooling intentions data is straightforward if, at this age, students already know what (p_1, p_0) and u will be when they turn sixteen. If so, students aged fifteen can forecast with certainty whether they will, a year later, decide to complete school or drop out. In this case, subjective data on schooling intentions is equivalent to objective data on schooling choices. The choice probabilities $\Pr(d=1 \mid p_1, p_0, x)$ can be estimated as before.

Analysis of schooling intentions data is a more subtle problem if students aged fifteen do not yet possess all the information they will have when they actually make their schooling-completion decisions a year later. In this case, students aged fifteen cannot forecast their future schooling behavior with certainty. At most, they can provide a subjective probability that they will complete school. An Appendix to this article shows how, given certain assumptions, probabilistic intentions data can be used to estimate the choice probabilities.

4.2. THE INFLUENCE OF EXPECTATIONS ON BEHAVIOR

Suppose that, after implementation of an information or incentive program, a youth changes his or her subjective returns to schooling from (p_1, p_0) to (q_1, q_0) . The decision model (equation 1) predicts that the youth's schooling behavior changes from dropout to completion if $f(p_1, p_0, u) \leq 0 < f(q_1, q_0, u)$; from completion to dropout if $f(q_1, q_0, u) \leq 0 < f(p_1, p_0, u)$; and remains unchanged otherwise.

Not knowing the youth's value of u or the decision function $f(\dots)$, a researcher cannot definitively predict the effect of the program on this youth's schooling behavior. Assume, however, that, conditional on the observed attributes x , the unobserved factors u are statistically independent of youths' returns-to-schooling expectations. Then one can use the estimated school-completion probabilities (equation 3) to make probabilistic predictions of behavior. In the absence of the program, the probability that this youth will complete school is $P(d=1 \mid p_1, p_0, x)$. In the presence of the program, the school-completion probability is $P(d=1 \mid q_1, q_0, x)$.⁵

Thus, the statistical independence assumption suffices for one to characterize probabilistically how expectations influence behavior. It is important to recognize that the school-completion probabilities (equation 3) are estimable nonparametrically. The researcher need not know either $f(\dots)$ or the distribution of u conditional on x . Thus, one need not assume that youth act in accordance with any specific decision model, such as expected utility maximization.

5. Understanding Expectations Formation

From a policy perspective, it makes sense to confront the highly complex question of expectations formation only after one has determined the influence of expectations on behavior. An analysis of the type outlined in Section 4 might reveal that behavior is relatively insensitive to subjective returns to schooling; that is, $P(d=1 \mid p_1, p_0, x)$ might vary only weakly with (p_1, p_0) . If so, a crude understanding of expectations formation may suffice for policy analysis. The more sharply $P(d=1 \mid p_1, p_0, x)$ varies with (p_1, p_0) , the more important it is to understand how expectations are formed.

I cannot now present a fully developed strategy for the analysis of expectations formation; our present understanding of the phenomenon is too fragmentary to permit this. I shall only propose two elements of such a strategy. Section 5.1 calls for investigation of the empirical relationship between youths' perceptions of the returns to schooling and expert opinion on the matter. Section 5.2 recommends study of the problem of rational learning from the experiences of others.

5.1. YOUTHS' PERCEPTIONS AND EXPERT OPINION

Proponents of information and incentive policies often presume that they, as experts, are well informed about the returns to schooling. Let (r_1, r_0) be an expert's opinion of the returns to schooling facing a given youth; I shall refer to (r_1, r_0) as the youth's "attributed" returns to schooling. Examination of the empirical relationship between attributed returns (r_1, r_0) and youths' subjective returns (p_1, p_0) makes it possible to reach some conclusions about the effectiveness of information and incentive programs.⁶

INFORMATION PROGRAMS: Define an "honest" information program to be one that does not seek to misinform youths about the returns to schooling. The most one can accomplish with an honest program is to persuade youth with subjective returns (p_1, p_0) that the returns to schooling really are (r_1, r_0) . Suppose that one examines the empirical relationship between (r_1, r_0) and (p_1, p_0) and finds that subjective and attributed returns to schooling coincide. Then one may conclude that information programs are unnecessary. On the other hand, if one finds that (p_1, p_0) and (r_1, r_0) differ substantially, then information programs warrant further scrutiny.⁷

INCENTIVE PROGRAMS: Incentive programs change objective returns to schooling, in the hope of inducing changes in expectations. Suppose one finds that there is no empirical relationship between (r_1, r_0) and (p_1, p_0) . Then, given the premise that expert opinion is accurate, one may conclude that incentive programs are ineffective; changes in objective returns to schooling will not translate into changes in expectations. On the other hand, if one finds a systematic empirical relationship between (r_1, r_0) and (p_1, p_0) , then incentive programs warrant further scrutiny.⁸

ON EXPERT OPINION: The foregoing discussion relies critically on the premise that expert opinion of the returns to schooling is accurate. This premise should not be accepted lightly. Advocates of information programs presume that remaining in school is more advantageous than youth think it to be. Advocates of incentive programs presume that remaining in school is not, at present, advantageous to youth at risk. Thus, the experts differ in their opinions.

Lack of agreement among the experts may be disheartening but is not surprising. Over the past twenty years, a series of econometric studies has revealed that any attempt to learn the objective returns to schooling faces an inescapable difficulty, known as the "selection problem" (see, for example, Griliches, 1977; Heckman and Robb, 1985; and Manski, 1989). The problem is that the

youth who choose to complete school are those who expect schooling to have favorable outcomes for them. It follows that, if expected outcomes are at all related to actual ones, then the life outcomes experienced by youth who complete school differ from those that dropouts would experience if they were to remain in school. Likewise, the outcomes experienced by dropouts differ from those that school completers would experience if they were to drop out. Analysis of the selection problem leads to the following stark conclusions: Any effort to infer the returns to schooling from observations of actual outcomes requires assumptions about the relationship between schooling behavior and the returns to schooling. Different behavioral assumptions may yield different opinions about the returns to schooling.

5.2. RATIONAL LEARNING FROM THE EXPERIENCES OF OTHERS

The idea that youth learn about their own prospects by observing the experiences of others is the central contribution of the social-psychology literature on expectations formation. However, the failure of this literature to formalize its thinking prevents progress. A constructive first step would be to adopt the economist's traditional assumption of rationality and ask how youth might rationally learn from others. Addressing this question would not reveal how youth actually learn from others but would anchor the study of expectations formation by providing a "best-case analysis."⁹

Consideration of the problem of rational learning from others yields an insight that has escaped social-psychology thinking. That is, a youth seeking to infer the returns to schooling by observing the outcomes experienced by others faces the selection problem described in the preceding section. Hence, the way a youth interprets observed outcomes depends on how he or she thinks other youth make their schooling decisions. If experts vary in their assumptions about schooling behavior, it is

reasonable to suspect that youth do as well. But then there can be no universally applicable model of learning from others.

This conclusion is disturbing. It does not, however, imply that the study of rational learning from others is impossible. It simply means that any analysis must be conditional on specified assumptions about schooling behavior. For example, in recent work, I have examined a class of situations in which substantial learning from others is possible (see Manski, 1990a). There I present a "Social Learning Proposition," a set of assumptions which permit a youth to learn the returns to schooling by observing the life outcomes realized by earlier cohorts.

6. Conclusion

This article has criticized social science research practices in the analysis of schooling behavior and has offered some ideas for improving matters. The ideas presented here go only a small way toward the development of a coherent, policy-relevant perspective on expectations formation and schooling behavior. Progress will require much further thinking and also new data. In the major datasets presently available for the analysis of schooling behavior, respondents are probed only vaguely if at all regarding their returns to schooling expectations.¹⁰

The social science deficiencies diagnosed here are not limited to empirical research on schooling behavior. The generic unwillingness of economists to exploit subjective data and the failure of social psychologists to formalize their ideas have combined to limit our understanding of human behavior. Some departures from the usual disciplinary practices can, of course, be found. Decision-theoretic analysis of subjective data is found in studies analyzing responses to forced-choice and ranking questions (see, for example, Fischer and Nagin, 1981; and Manski and Salomon, 1987). Researchers

have occasionally used formal decision models to interpret intentions data (see Juster, 1966; Jamieson and Bass, 1989; and Manski, 1990b). The Bayesian learning model has been used to study the impact of information policies on risk perceptions (see Viscusi and O'Connor, 1984; and Smith et al., 1990). Nevertheless, these discipline-crossing studies remain the exception rather than the rule.

APPENDIX: ESTIMATION OF SCHOOL-COMPLETION PROBABILITIES FROM INTENTIONS DATA

Let s be the information a youth possesses at age fifteen. Let $\pi(p_1, p_0, u \mid s)$ be the fifteen-year-old youth's subjective probability distribution on (p_1, p_0, u) . Thus, $\pi(p_1, p_0, u \mid s)$ expresses the youth's uncertainty about what he will, a year later, perceive the returns to schooling and other relevant factors to be. Now suppose that the fifteen-year-old youth is asked to forecast his future schooling behavior. He should respond by stating his subjective probability ϕ that he will complete high school, where

$$(5) \quad \phi = \pi[f(p_1, p_0, u) > 0 \mid s].$$

That is, at age fifteen, the student's subjective probability that he will complete high school is his subjective probability that, a year later, he will decide that the benefits of schooling outweigh the costs (see Manski, 1990b).

Equation (5) requires some simplification if it is to provide a usable basis for the analysis of actual schooling behavior. Assume that, between age fifteen and sixteen, students may obtain new information about u but do not obtain new information about the returns to schooling. Thus, assume that $s = (p_1, p_0, u_0)$, where u_0 is the information about u available at age fifteen. Also assume that students' subjective expectations for u are fulfilled; that is, the subjective distribution $\pi(u \mid p_1, p_0, u_0)$ equals the objective distribution $P(u \mid p_1, p_0, u_0)$. Then equation (5) reduces to

$$(6) \quad \phi = P[f(p_1, p_0, u) > 0 \mid p_1, p_0, u_0] = P(d=1 \mid p_1, p_0, u_0).$$

That is, the subjective probability that a fifteen-year-old youth with attributes (p_1, p_0, u_0) will complete school equals the objective probability that he will do so.

The foregoing discussion takes the perspective of the student. Now consider the researcher's problem. Suppose that each fifteen-year-old respondent reports his subjective probability ϕ of school completion and his subjective returns to schooling (p_1, p_0) . The researcher does not observe u_0 but does observe a vector of attributes x , as before. Then the objective probability that a person with subjective returns to schooling (p_1, p_0) and attributes x completes high school equals the objective expected value of $\phi(p_1, p_0, u)$ over those students characterized by (p_1, p_0, x) . That is,

$$(7) \quad E(\phi \mid p_1, p_0, x) = P(d=1 \mid p_1, p_0, x).$$

Given a sample of observations of (ϕ, p_1, p_0, x) , the school-completion probabilities $\Pr(d=1 \mid p_1, p_0, x)$ can be estimated by nonparametric regression of ϕ on (p_1, p_0, x) .

Notes

1. If youth do not perform well because they correctly perceive that the returns to schooling are low, then it must be asked why society should seek to induce them to change their behavior. Proponents of incentive strategies either argue explicitly or assume implicitly that the social returns to schooling exceed the private returns; hence they deem efforts to change behavior to be warranted.

2. Before the 1970s, empirical economic research on schooling outcomes was limited to efforts to describe aggregate enrollment patterns as functions of macroeconomic conditions and population composition. Regressions were loosely motivated by microeconomic ideas but were not derived from explicit models of schooling behavior (see, for example, Campbell and Siegal, 1967). Even today, college enrollment remains the focus of the empirical economic literature. Pre-college schooling behavior has received little attention from economists.

3. Economists often assert that respondents to surveys have no incentive to answer questions carefully or honestly; hence, they conclude, there is no reason to think that subjective responses reliably reflect respondents' thinking. But economists do not apply this reasoning consistently. Empirical economic analyses of schooling behavior routinely use respondents' self-reports of their backgrounds, choices, and outcomes. Many analyses use scores on tests administered with surveys to measure respondents' ability. But survey respondents may have no more incentive to provide reliable data on these items than they have when answering subjective questions.

4. During the 1980s, the assumption that expectations are fulfilled dominated economic thinking about schooling behavior. At the same time, ironically, economists and sociologists struggled to explain

recent unanticipated changes in the realized earnings of persons with different levels of schooling (see, for example, Blackburn et al., 1989; Murphy and Welch, 1989; Olneck and Kim, 1989).

5. The effect an information or incentive program has on expectations can be represented by a function $q(.,.)$ transforming pre-program expectations (p_1, p_0) into post-program expectations (q_1, q_0) ; a program does not change youths' values of (u, x) . In the post-program world, the probability that a youth with pre-program expectations (p_1, p_0) and attributes x chooses to complete school is $P[u: f\{q(p_1, p_0), u\} > 0 \mid p_1, p_0, x]$. In the absence of assumptions on the distribution of u conditional on (p_1, p_0, x) , this post-program completion probability cannot be estimated from pre-program data. On the other hand, this probability is estimable if u is distributed independent of expectations, conditional on x . Then

$$\begin{aligned} P[u: f\{q(p_1, p_0), u\} > 0 \mid p_1, p_0, x] &= P[u: f(q_1, q_0, u) > 0 \mid q_1, q_0, x] \\ &= P(d=1 \mid q_1, q_0, x). \end{aligned}$$

The quantity $P(d=1 \mid q_1, q_0, x)$ is the pre-program probability that a youth with pre-program expectations (q_1, q_0) completes school; this is estimable from pre-program data.

6. Freeman (1971, Chapter 11) and Smith and Powell (1990) compare college seniors' subjective returns to schooling with the authors' attributed returns. I am not aware of any other work along these lines.

7. If one finds that subjective and attributed returns to schooling do differ, one cannot conclude that information programs should be initiated. The premise that experts are well informed about the

returns to schooling may be incorrect; youth might be better informed. Even if expert opinion is correct, cost-effective information programs capable of modifying youths' perceptions may not be feasible.

8. An incentives program can be effective even if subjective and objective returns to schooling differ substantially. What is required is that changes in objective returns yield predictable changes in subjective returns.

9. There is value in performing best-case analyses of a host of subjective phenomena. In Manski (1990b), I found that such an analysis sheds light on the information content of intentions data.

10. The major available datasets include the National Longitudinal Study of the High School Class of 1972, the High School and Beyond survey, the National Education Longitudinal Study, the National Longitudinal Study of Youth, and the Current Population Surveys.

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