

## Education Policy Research—An Industry Perspective

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Education research has suffered from the lack of any coherent model of the education system. Traditional areas of research have developed largely along disciplinary lines, and, as a result, many important behavioral linkages have been neglected. From this, there has been little accumulation of knowledge useful to the development of education policy. This paper takes the perspective of an industry analysis and relates existing research to the natural questions about industry performance that arise from such a model. An important consideration is the issues that are neglected by traditional research lines.

Why is it that we know so little about the functioning of the education system? Or, to put the question slightly differently, why do we continually seem ill prepared to answer fundamental education policy questions in a timely and knowledgeable way? The answer cannot be that the sector is unimportant either in its resource usage or its impact on society. Nor can it be that insufficient resources have been devoted to education research. Instead the answer must relate to the direction and quality of this research effort.

A fundamental problem seems to be lack of a comprehensive model of the education system that can give coherence and direction to research efforts focusing upon particular aspects of education. Lacking such a structure, investigators in the separate disciplines concerned with education have worked in isolation from each other, and the research remains largely unintegrated. As a result, policy-oriented research has been reactive, focusing on the immediate concerns of the day and shifting quickly as these concerns change. These efforts

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are seldom timely and provide little guidance in addressing subsequent policy issues.

This paper outlines one possible framework for studying the education system and then assesses the current state of knowledge in policy-related research.<sup>1</sup> The overall perspective is that of education as an industry, albeit a somewhat distinctive one. The utility of this framework, which borrows heavily from traditional economic studies, comes largely from the organization of the basic questions to be addressed. Even though analysis of the education industry differs significantly from traditional analyses of private, profitmaking industries, there is much to be gained from exploiting this conceptual framework.

Throughout several themes repeatedly emerge. A preponderance of the research that is generally characterized as "policy research" is only loosely related to real policy goals. Although the goals of education policy generally relate to outcomes of the education process, much of the existing research either ignores this fact or assumes some relationship between what is studied and such outcomes—an assumption that is often not documented or impossible to document. Additionally, much of the research fails to consider adequately the implications of behavior on the part of individuals and institutions in response to incentives created by the organization of the industry. And, finally, even though the feasibility of research efforts dictates looking at small, well-defined issues, the research cannot ignore the implications of the overall industry characteristics on specific behavior.

The next section provides an overview of the key issues. Following that, the major segments of education research are reviewed with respect to the overall framework of the first section.

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1. The discussion focuses upon research in areas where governmental actions might directly affect education goals or outcomes. This focus excludes a wide range of basic research areas that, although perhaps intrinsically interesting, are unlikely to provide immediate policy guidance; examples in the latter category would include such investigations as neurological responses to various stimuli, much of traditional, individual-level learning theory, etc. This does not prejudice the potential long-run benefits of such research. It merely focuses attention on areas where policy is likely to be made in the near future and where research is likely to have its largest current impact. Clearly, a diversified portfolio of research is needed. Second, the primary concern is not the details of how specific studies in specific areas should be conducted, but is instead the general direction of different types of studies and how they interrelate. As such the detailed analytical issues and findings in each area are not reviewed systematically. Indeed, most of the major areas considered have been subjected to detailed reviews elsewhere, and these are referenced throughout. Finally, emphasis is placed on the conduct of empirical research designed to illuminate behavior within the education industry.

## **CENTRAL CONCERNS IN THE OPERATION OF THE EDUCATION INDUSTRY**

Let us consider a private profitmaking industry. A microeconomic study of industry performance would concentrate upon the determination of prices and outputs of the industry, which in turn reflect the interaction of supply and demand for the industry's output. The supply of output depends upon the production technology, the prices of inputs, and the competitiveness of the industry at any point in time and upon technological change over time. The demand for output depends upon the prices of the industry's output and those in competing industries and characteristics of the consumers (such as income in the case of consumption goods). Analysis of a given industry would use data about the observed outputs and prices to infer how characteristics of the industry affect supply and demand behavior.

Now consider the education industry. The basic issues are the same—the performance of the industry with respect to prices and outputs—and these again reflect supply and demand conditions. The differences come when one goes behind the supply and demand functions for the industry. In particular, many simplifications owing to the assumed behavior of suppliers and demanders in a profitmaking industry are less tenable in education. For example, profit-maximizing behavior by firms, which appears to be a reasonable characterization in a wide range of circumstances, provides a straightforward model of supplier behavior and greatly facilitates the interpretation of observed data. From this an assumption that observed production reflects cost-minimizing resource usage for the level of production is entirely plausible. Further, explicit markets for output greatly facilitate the valuation and measurement of output and the consideration of demand relationships. Such simplifications are not found in the education industry.

As a prelude to consideration of existing education research, it is helpful to sketch some of the structural features of the education industry that are important analytically and that dictate different analyses that would be conducted in typical industry studies.

Most education is provided by government suppliers (88 percent at the elementary and secondary level and 79 percent at the post-secondary level). Particularly for public institutions, one must question whether production is guided by cost minimization principles. Further, at the elementary and secondary level, education is provided by local monopolists who raise revenues from general taxes. Impor-

tantly, the demand for education is observed only indirectly and is mediated by the political process. Institutions generally offer fixed levels, or "quality," of education, and although individuals can have some influence on the quality of education in a given school, much of the choice of education comes through locational choice. Yet many other factors also enter into locational choice. Analyzing the demand for education is even more complicated by difficulties in measuring output and observing quality differences.

The structure of demand and supply relationships within the industry also has important ramifications. Because students must complete earlier levels of schooling before continuing to more advanced levels, there is a direct relationship among performances at various levels. Also a significant portion of the demand for postsecondary education is derived from the demand for teachers in lower levels of schooling. This has implications for the choice of production technologies.

Finally, education is not a purely private good. Not only does an individual's education affect his or her own opportunities, but also the aggregate amount of education affects society in general and the operations of aggregate labor markets. Moreover, education is often viewed as a policy instrument that is useful in improving social mobility and altering the distribution of income. Thus, concerns about externalities and the distribution of output receive more prominence here than elsewhere.

Most past research has been conducted in a fragmented manner with little sense of how the pieces fit together and how the behavior that is studied is conditioned by fundamental characteristics of the industry structure. At best, much of past educational research is very partial; at worst, it might be misleading to the extent that it neglects important structural aspects and leads to misinterpretations of the fundamental behavior relationships. The remainder of this paper describes major strands of educational research and relates them to basic issues essential to understanding the education industry and to providing guidance for education policy.

## **THE MAJOR PIECES OF EDUCATION RESEARCH**

The fundamental considerations are the behavioral information needed for understanding the workings of the education industry, what has been learned from past research, and how future research could provide the needed information. Much of the relevant research

has not been motivated by understanding the education industry *per se*. This discussion, on the other hand, concentrates exclusively on understanding industry operations and from this perspective is quite critical of much existing work. However, a major element of the review is indicating how refocusing these various research efforts can lead to improved understanding of the education sector.

### **The Nature and Measurement of Education Outputs**

Measuring the output of schools is essential; yet, conceptual and measurement problems are severe. Interest in education results primarily from its perceived importance in affecting the performance and behavior of students throughout their lifetimes. For the individual, the primary returns to schooling come through enhanced earnings opportunities, although impacts on health (Grossman 1972; Manheim 1975) and on home productivity (Hill and Stafford 1974; Liebowitz 1974; Lindert 1977) may also be important. For society, the levels and distribution of schooling are seen as influencing not only the level and distribution of income but also the political and social behavior of the population (e.g., Campbell et al. 1976 or Niemi and Sobiezek (1977)).

Consideration of this limited list of expected outcomes suggests some of the difficulties. The outcomes of schooling are not directly observed during the schooling period but must be inferred from post-schooling outcomes. However, many other factors in addition to schooling affect performance of an individual in the various areas and, moreover, may affect schooling decisions of individuals. Also, because the results of schooling may be reflected in a variety of areas, some attention must be given to how effects should be aggregated across them.

Research into labor market effects of schooling has been more extensive than that into other areas and illustrates the problems well. Both economists (e.g., see reviews by Mincer 1970 or Rosen 1977) and sociologists (e.g., Jencks et al. 1972; Sewell and Hauser 1975, or Duncan, Featherman, and Duncan 1972) have investigated how schooling affects earnings and occupational status. The bulk of these studies relate differences in incomes to differences in years, or quantity, of schooling, along with other observed characteristics of individuals.

The common conceptual framework underlying these estimates is that schooling alters the skills of the individual; the analysis of earnings differences then reflects the market valuation of differences in

skills.<sup>2</sup> However, there are really two unknowns: the magnitude of "real" skill differences and the market prices for different skills. Without additional information, or structure, on the earnings relationships, it is not possible to identify the separate components of earnings differences. Implicitly, these studies assume that the largest differences in skill levels are captured by differences in years of schooling, and the estimated earnings relationships yield "average" market valuations of these skill differences. When the focus of analysis involves such things as explaining aggregate income differences or the impact of schooling on aggregate economic growth, such simplifications are quite reasonable.<sup>3</sup>

However, when the focus is the education industry and micro-policy concerns, this framework has serious problems. Most policy questions relate to variations in output of schools related to financing decisions, the structure of incentives faced by individual school systems, and so forth. In other words, although not independent of quantity differences, the central concern is quality differences within levels of schooling and the differences in income associated with these.

Earnings analyses have been extended to incorporate qualitative differences among individuals through inclusion of measures of achievement or cognitive performance, in addition to quantity of schooling and other individual attributes.<sup>4</sup> Usually this is interpreted as a measure of "ability" and considered exogenously determined, but it does provide a direct linkage to models of school production that consider achievement to be partially determined by schools and

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2. Not all earnings analyses presume that schooling causes individual skill differences. Recent work on screening models consider, in the extreme, that schooling does nothing to change the skills of the individual but instead merely identifies those with more or less skills (e.g., Spence 1973, Stiglitz 1975, or Wolpin 1977). This interpretation has serious implications for analyses of many education policies; however, in terms of earnings functions, this view appears indistinguishable from the "production" notion. As noted below, this alternative model is conceptually distinguishable in the analysis of school production activities.

3. This analysis, of course, does not imply that researchers are unaware of any quality differences in schooling. It reflects more that suitable data are generally unavailable and that for many purposes this unavailability is unlikely to alter conclusions radically. See also the discussion of "ability."

4. Two other strategies have been followed to consider qualitative differences in schooling. Johnson and Stafford (1973) and Wachtel (1976) introduce measures of per-pupil educational expenditures into earnings functions. This procedure assumes that schools are efficient in production, a dubious assumption, in order to interpret the results as reflecting qualitative differences in schooling. Alternatively, Welch (1973) reinterprets age effects on earnings as reflecting "vintage" of schooling, or changes in school quality over time. Nevertheless, school quality for a given cohort is assumed constant within schooling levels as was done in previous earnings analyses.

families.<sup>5</sup> Although these studies—generally based on small, non-representative samples—are difficult to compare, they consistently indicate positive, although fairly small, impacts of achievement differences on income. With the exception of Hansen, Weisbrod, and Scanlon (1970), they also find that quantity differences in schooling are still important when qualitative differences in achievement are considered, indicating that test scores do not adequately measure the entire range of skill differences caused by schooling.<sup>6</sup>

Measures of cognitive ability, if related to differences in subsequent performance, have a tremendous advantage as output measures of schools because they are observed routinely and contemporaneously with the schooling process. Their availability and timeliness have led to their frequent use in production studies. However, the evidence on labor market performance suggests that they are but partial measures of performance. Two other arguments support the use of test score measures. First, educators and parents appear to value higher test performance. Second, and more persuasive, there is evidence that test scores are important in selection to further schooling (see, for example, Wirtz et al. 1977 or Dugan 1976). Given that earnings analyses consistently show net impacts of quantity of schooling after controlling for achievement differences, the selection mechanism implies that test scores have (in addition to their direct effects) an indirect effect through affecting amount of schooling obtained.

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5. In the direct analysis of "ability" through the use of test scores, little is generally said about the possibility that test scores may be affected by schooling. Although this may affect the estimation of rates of return to schooling (cf. Griliches and Mason 1972), one can think of these as recursive models, and the single equation procedures are appropriate. On the other hand, some of the instrumental estimation techniques (Griliches 1977) are affected by assumptions about the underlying structure.

6. A basic source of difficulty arises from the nature of the market for education outcomes and the data generated by the operation of this market. All that is observed is the total earnings of individuals, and not the payments to any specific skills or characteristics. It is possible to conceptualize the total earnings of individuals as reflecting the aggregate payments to a series of underlying factors for which implicit markets exist, and to estimate the value of specific skills with a "hedonic" wage equation (see, for example, Griliches 1971 or Rosen 1977). This is an interpretation of earnings models that measure individual differences by years of schooling or by cognitive ability. However, such estimation assumes that all the important dimensions of "skill differences" are measured. When relevant skill dimensions are inadequately measured, potentially severe selection problems are introduced. If at least partially known to individuals and/or employers, these unmeasured characteristics will be related to the distribution of individuals across schooling levels and jobs and will affect the earnings of individuals. These "selection" effects may seriously affect the estimation of education outcomes. One preliminary attempt to analyze this issue is found in Rosen and Willis (1979). Importantly, their analysis indicates more than one dimension to unmeasured individual differences.

There is, at the same time, a need to analyze further the range of test information available and to extend the measurement of output. It is not particularly surprising that commonly used test measures are more highly related to school performance than to nonschool performance; that is, after all, the primary purpose behind most of the test development. There do currently exist a variety of different tests, including many "competency" tests, that are intended to relate more directly to subsequent performance, but analysis of their validity remains to be done.<sup>7</sup>

The analysis of test performance attempts to capitalize upon a fortuitous linkage between skills demanded and test performance. There are, however, alternative ways of proceeding, even though currently available data complicates the task. For most analyses of production relationships, of supplier behavior, and of individual choices, a measure of qualitative differences among individuals that relates to schooling factors is needed. One approach is organized on the basis of specific schooling of individuals, the other on the basis of jobs and specific skills. The first follows in the tradition of previous labor market studies by looking at labor market earnings and experiences. If data on specific schooling of individuals are available, one could introduce this information (either for individual school experience or aggregates of "similar" institutions) directly into an earnings function to estimate the gross output of different institutions.<sup>8</sup>

The second alternative would involve direct analysis of the skills required for different jobs with the ultimate objective of developing

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7. A major problem in this entire area has simply been lack of suitable and representative data. Virtually all of the studies of test relationships to earnings (footnote 5) have been based upon unusual samples that, by some coincidence, have both test data and earnings data. A wide variety of alternative tests have been available (e.g., those in the National Assessment of Educational Progress), but no attempt has been made to relate these to observed performance, either in the labor market or elsewhere.

8. Although data sets with both labor market experiences and specific source of schooling are not plentiful, some currently exist (e.g., the NBER-TH sample of Wachtel 1976 or the Wisconsin high school sample of Sewell and Hauser 1975), and minor expansions of data collection efforts such as with the Current Population Survey could readily provide similar information for large, representative samples. If the sampling design leads to clustering of individuals from the same institution (cf. the Wisconsin sample), it is possible to estimate mean earnings differences related to specific schools. If the sampling scheme does not have clusters of individuals from the same institution, it would be necessary to aggregate across schools (such as, for colleges, aggregated by "quality rating," college/university, research orientation, and geography). Note that this is essentially a simple parameterization of differences but relies upon weaker assumptions about school operation than do such previous analyses as parameterizing schools by expenditures. Finally, as discussed in the next section, this yields gross outputs, some of which are attributable to school factors and some to non-school factors. For most purposes the relevant factor is net output (or "value-added"); ascertaining net output requires further analysis.



contemporaneous measurement of skills of individuals in different schools. A basic problem, say in the use of test measures, is that little attention has been given to the specific kinds of skills demanded so that there is no a priori way of judging whether or not various tests might be appropriate. This type of measurement has not been considered by economists, and therefore there is little guidance on how to proceed.<sup>9</sup> Nevertheless, if the kinds of different skills required were known, the development of tests based upon these external criteria can potentially provide direct output measures.

The importance of measuring qualitative dimensions of the education received by students is inescapable. In order to analyze the behavior of both producers and consumers of education—and thus to understand the operation of the education industry—information on output is essential. Previous studies of income determination have developed a useful framework for considering the subsequent impact of schooling. They have also provided some support for the prevalent reliance upon test score measures. Nevertheless, they have also demonstrated that other dimensions of schooling are important. This suggests that further investigations, motivated and guided by the specific focus of education industry analysis, would be useful and profitable.

### **Production Relationships and Education Techniques**

Education outcomes can, in general, be affected only indirectly through the use of policy instruments. The effect of a policy on education outcomes (indeed whether there is any change at all) depends directly upon the underlying production relationships. The policy instruments generally considered involve (1) affecting real inputs such as hiring remedial reading teachers or building a new physics laboratory at a university; (2) restructuring organizations such as developing a state postsecondary school or mandating busing of students to achieve racial integration; (3) mandating certain processes such as affirmative action plans for admissions or “mainstreaming” of the handicapped; or (4) changing financing arrangements such as

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9. This is perhaps an area in which industrial engineers can be useful. Some related work has been done where job requirements from the Dictionary of Occupational Titles are merged with individual information about occupational choices (cf. Lucas 1974). There are three major problems with that approach: (1) “job requirements” are specified without much notion of qualitative aspects (for example, how repetitive are “repetitive” jobs?); (2) are there tradeoffs among job attributes?; and, (3) although these represent desired attributes, how do they match with the actual attributes of people in the occupations? Some use of job characteristics has also been found in attempts to estimate compensating differentials, such as wage differences that go with hazardous occupations; these, however, share many of the problems with the more general skill demand considerations.

state property tax equalization schemes or public support to educational institutions. This section considers research on the relationship between real inputs and outcomes; the other issues are discussed in subsequent sections.

In addition to predicting the effects of alternative policies, knowledge of the production function for education is useful for assessing the efficiency of operation of education institutions. The production function indicates the maximum output that can be achieved for a given set of inputs. This information, when used in conjunction with the costs of various inputs, indicates directly whether or not education institutions are making the correct choices in the use of different inputs and methods. Unfortunately, the production function is known neither to analysts nor, apparently, to education decisionmakers, and must be inferred from observations about school operations.

Analyses of technological relationships between inputs and outputs have received serious attention only in the area of elementary and secondary education (an exception is Astin 1968). The most important inquiry has been direct estimation of input-output relationships. These studies, beginning with the Coleman Report (Coleman et al. 1966), have relied upon observed data about outputs (most commonly test scores) and inputs (school factors plus family background and student body characteristics) to make inferences about production relationships in education.

There are two major thrusts to this work. The majority of such analyses have attempted to identify a small set of characteristics of schools and teachers that relate to "school quality" in the sense that they are systematically related to student performance. An important component of these studies has been consideration of characteristics that determine education costs: teacher-pupil ratios, amount of teacher experience, amount of teacher graduate education, and, as a summary measure, expenditures per pupil. These studies have also investigated a variety of other factors such as measures of facilities, other objective and subjective teacher background measures, and characteristics of principals and administrators, but the precise set of such factors has differed across studies.

The second major thrust has been the estimation of differential effectiveness of schools and teachers without regard to the measurement of specific components of "effectiveness." These studies have taken a more agnostic view about the measurement of relevant characteristics of schools and have asked a prior question of whether or not there are any differences among schools that are important.

There have been a fairly large number of studies of the first type, and these present a quite comprehensive picture of school operations. Whereas individual studies tend to look at specific grade levels and are frequently based upon relatively small samples, the combined set covers school achievement across virtually all grades, considers a variety of measures of achievement, and, as a whole, represents a sophisticated inquiry into the determinants of scholastic achievement. And the results are dramatic. Table 1 presents a summary of the estimated impacts of each of the major "cost determinants" of schooling for 130 separate investigations.<sup>10</sup> This table summarizes the estimated regression coefficients across all studies that consider a particular factor. It presents two pieces of summary information: how many of the estimated regression coefficients were statistically significant at the 5 percent level, and the signs of the estimated coefficients. For example, 109 of the 130 studies considered the possible effects of pupil-teacher ratios on achievement; 87 did not find a statistically significant relationship at the 5 percent level, 13 found a statistically significant positive relationship, and 9 found a statistically significant negative relationship. But the common presumption

TABLE 1. ESTIMATED EFFECTS OF SCHOOL AND TEACHER INPUTS ON ACHIEVEMENT (*N* = 130)

<i>Input</i>	<i>Studies</i>	<i>Statistically Significant at 5% Level</i>		<i>Statistically Insignificant</i>
		<i>Positive</i>	<i>Negative</i>	
Pupil-teacher ratio	109	13	9	87
Teacher education	101	6	4	90
Teacher experience	104	30	6	68
Expenditures per pupil	55	5	3	47

Source: Hanushek (1981).

10. See Hanushek (1981). The 130 studies represent an attempt to compile the results from a comprehensive set of studies that present statistical estimates of achievement relationships. Each of these studies presents regression estimates of the effect of various school and teacher attributes on achievement, after allowing for individual student differences in family background and other characteristics. The studies differ in measures of achievement (about two-thirds use standardized test scores and the remainder use other measures such as grades, drop-out rates, etc.), in grade level (about half consider grades 1-6), in level of aggregation (about 60 percent consider individual achievement and 40 percent consider school or district average achievement). Each of the studies indicates that family background has a significant effect on achievement, but this finding is not too relevant for consideration of school policy (i.e., which inputs to choose).

is that increasing class size reduces achievement—i.e., a negative relationship would be expected.

The evidence on the other factors is similar. A majority of the investigations of each factor find no statistically significant relationship, and those finding a significant relationship are frequently of the “wrong” sign. The possible exception is teacher experience, where one finds more significant coefficients with the expected signs, but the evidence is hardly overwhelming.<sup>11</sup>

The conclusion is simple. Schools appear to operate quite inefficiently in that they spend money on factors that do not consistently raise achievement. Moreover, this conclusion holds across different measures of achievement, across grade levels, and across different ways of specifying and estimating the relationships.

These analyses have also been extended to consider other school and teacher inputs. Other measures of expenditure patterns (teacher salaries, facilities, and administration) show the same lack of relationship with student achievement. The descriptors of teachers and schools have also been expanded to cover more than explicitly purchased factors (e.g., quality of teachers’ schools, undergraduate majors of teachers, interactions of teachers, and classroom composition). Again, these studies provide little confidence that any specific factor is consistently related to student performance. A possible exception is teacher verbal ability. A few studies have utilized test information for teachers and have found that “smarter” teachers produce higher performance in students, although uncertainty about these results still remains. At the same time, it is found that “smart” teachers are not the best paid, the most experienced, or the most educated.

This research does not, however, imply a lack of difference among schools. The second major category of school production studies shows dramatic differences among teachers and schools. These studies, although less numerous than the first set, have attempted to estimate “total” teacher effects without regard to the specific characteristics of teachers that dictate these differences.<sup>12</sup> This work shows what parents have long believed: Teachers vary dramatically in their effectiveness. At the same time, the best teachers—who are estimated to produce a full grade level equivalent difference in standardized performance above the worst within a single year—are neither

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11. If one neglects “statistical significance” and looks only at the estimated sign of the relationship, the picture is unchanged. There is little if any reason to expect conventionally identified factors to have even the expected sign.

12. Hanushek (1972, 1979b), Murnane (1975), and Armor et al. (1976).

the most experienced, the highest paid, the ones with the "best" classes, or the ones with the smallest classes. Thus, characteristics of teachers that are simply measured (including "smartness" of teachers) explain only a fraction of total performance.

This research has, among other things, suggested a new perspective on the consideration of input-output relationships. Much of this research has been motivated by a simple analogy to production functions that trace out the maximum output to be expected from varying combinations of inputs. However, the research indicates that it is not possible to identify and measure a set of homogeneous input factors that enter into the production process, even though differences in teacher inputs are very important. The reason seems to be that teaching is a very complicated process. Teachers not only come to classrooms with varying background and training but also make a variety of choices about presentational styles, curricular materials, and so forth; this combining of various inputs goes into "teacher skill." Because of the complexity of the task and an incomplete understanding of the separate elements of effective teaching, it is not possible to single out a small set of factors that uniformly contribute to good performance. (This, as noted below, also has direct implications for a variety of "process" studies of education).

The policy implications flowing from this research are tempered by the inability to identify a specific set of teacher and school characteristics. In particular, this research gives little guidance in initial hiring and resource allocation decisions. There are no simple rules such as to hire brown-eyed teachers because they are systematically better. However, for many purposes it is almost as good to be able to identify *ex post* who are the better teachers. These studies have demonstrated that it is possible to evaluate teacher performance that is independent of student background and entering achievement level. Further, there is some evidence that this measured performance is known to principals (see, for example, Murnane 1975; Armor et al. 1976). If school departments were willing to use this information in promotion and salary decisions, there is room for clear improvement in school operations.

The prevalent focus of research into input-output relationships has been either the prediction of what kind of teachers are likely to be good or the consideration of hiring or training policies. On this score, the research has not been very helpful. Yet, the research has indicated that performance, or "accountability," standards can be applied. Further, the efficiency considerations are not impaired by the lack of identification of specific attributes. To the extent that

current operations dictate paying for attributes that are unproductive, there is a clear message of inefficiency in operations.<sup>13</sup>

With the revised focus of this research, uncertainties and ambiguities still remain. All this research has taken a production view of schools, whereas some recent conceptual work has suggested a screening role of schools.<sup>14</sup>

The data have been far from ideal. Most have relied upon data generated by the normal operations of schools. This has led to concentration upon test scores and other immediate measures of schooling outcomes. And individual studies have been limited to specific grade levels, time periods, and school characteristics. Therefore, the generalizability of previous findings needs further research.<sup>15</sup> The appeal and usefulness of this research derives from its consideration of the many factors that go into student achievement. It thus isolates the independent contribution of schools and teachers to student performance. This type of inquiry has come closer to addressing central policy concerns than almost any other education-related research.

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13. Past discussion of efficiency in schools have been somewhat confused. Efficiency here refers to economic efficiency; that is, purchasing the best mix of inputs given input prices and input effectiveness. Some have also considered technical efficiency; that is, whether or not schools operate on the production frontier (e.g., Levin 1976). Technical efficiency has meaning when one can define a production function in terms of identifiable school inputs, but, when one allows for "skill" differences, homogeneous inputs cannot be readily defined and technical efficiency loses much of its meaning. See Hanushek (1979a) for a more extended discussion of efficiency concepts.

14. Recent conceptual discussions have considered the possibility that schools do not change the skills of individuals but instead merely select or "screen" the more able. See, for example, Spence (1973); Taubman and Wales (1974); Berg (1970); Thurow (1975); Riley (1975); Arrow (1973); Stiglitz (1975); Wolpin (1977); Layard and Psacharopoulos (1974). Most of these discussions have focused on interpretation of labor market earnings differentials. However, with such data it is not possible to distinguish among the competing explanations. The finding that gains in achievement are related to teachers and schools lends some support to the production view. A related hypothesis by Bowles and Gintis (1976) is that schools are attempting to change the attitudes or affective characteristics of students and not the cognitive abilities of students. It is difficult, on the basis of current information, to assess this hypothesis. Clearly, if these traits are measured by such characteristics as school attendance or deportment grades, schools are no more efficient at this than at producing achievement. That is, the relationship between expenditures or measured teacher characteristics and these measures of output looks little different from that in Table 1 for all output measures. However, it is unclear how one would conduct a complete test of the Bowles and Gintis hypothesis.

15. A few studies have related school factors to earnings after schooling (see footnote 4). Most, however, have related expenditures on schooling to earnings; this implicitly assumes efficiency in expenditures. Alternative output measures seem especially important for the evaluation of postsecondary education. Important future research would consider the time path of achievement development, the consistency of teacher effects across different academic years, and the accuracy of principal evaluations across different sites. There is some, although limited, evidence that teacher skill effects are relatively constant for a given teacher across different years (see Hanushek 1979a).

Nevertheless, it does have some serious limitations. In particular, the input-output methodology takes a "black box" view of schools. Essentially, these studies indicate crudely the relationship between inputs and measured outputs without regard to the mechanisms and processes employed and without regard to the institutional structures and constraints that are operating (see Good, Biddle, and Brophy 1975). This can be a serious problem for a number of reasons. First, policies based upon such studies may fail because they do not recognize the institutional factors that are important in implementing any change (Berman and McLaughlin 1974). Second, variations in these other factors such as process choices or legal requirements may dominate the input-output relationship, thus obscuring the very input-output relationships that are sought. This suggests that other, complementary lines of inquiry into process and organization should also be considered.

### **Process and Organization**

Perhaps the bulk of school research has been devoted to understanding better more detailed aspects of the education process (presentational styles, curriculum, etc.) and of the organization of different education institutions.<sup>16</sup> The previously discussed input-output studies do not identify who the decisionmakers are or how particular organizational patterns or decision processes affect education outcomes. Further, there is no consideration of the constraints on actions implied by legislative policies, legal decisions, or institutional patterns such as unionization of teachers. Indeed, a large number of decisions are made by individuals not directly responsible for providing schooling, such as state and federal agencies. These "outside" influences are most apparent in the financing of schools, but they also go deeply into the actual structure and organization of schools. For example the recent rise in special education has been propelled by legislative action that mandates how "special" education needs must be identified and handled. These requirements have virtually created a second school system with its own staffing of psychologists, learning disability specialists, and the like, and the laws even detail how education should be conducted (e.g., "mainstreaming").

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16. In traditional production function studies, little attention is given to the choice of production processes. If firms are maximizing profits, they are assumed to choose the cost-minimizing production process for the given bundle of inputs employed, and therefore there is little interest in the process chosen. When there is less clear motivation for cost-minimizing behavior (such as is frequently assumed in the case of schools) or when outside regulation or institutional structure may constrain the process choices, explicit consideration of process appears more important.

Organizational process changes are also the most frequently used policy prescriptions, simply because they are the easiest ways to indicate actual changes that should be introduced. Admissions policies, processing of special students, constraints on school boundaries, and so forth can be changed by fiat; outcomes cannot.

Process and organizational studies have been quite varied. The largest number of studies have considered "process-product" relationships. Although these are frequently small scale case studies, they have had a focus similar to that of the input-output studies. They have attempted to relate aspects of schools and classrooms to outcomes. However, instead of concentrating upon real inputs, they have devoted most attention to such things as presentational styles, classroom organization, interactions of teachers and particular types of students, and so forth. Although they are more difficult to catalogue than the input-output studies, their findings appear qualitatively similar to considerations of specific teacher attributes. In specific samples and settings, certain process factors seem important, but the findings of individual studies seldom can be replicated. Again, the education process is simply more complex than what can be included in current analytical designs, and, indeed, it is likely that there is no "best practice" that uniformly produces high achievement. Without a detailed understanding of the entire education process, it is not possible to understand why, for example, a particular technique works in one setting and not in another.

A second type of study has concentrated upon organizational and process outcomes per se. Such research, conducted primarily by political scientists and sociologists, has led to a better understanding of the importance of historical and institutional factors in influencing the schooling process. For example, Lortie's study (1975) of the teaching profession traces the use of teacher unions and provides a historical explanation for the attitudes and priorities of today's teachers. Lipsky's study (1976) of "street level bureaucrats" points out the importance of the job environment in influencing teacher behavior. Research by Berman, Pauly, and others (Berman and McLaughlin 1974; Berman and Pauly 1975) has examined the process by which educational innovations are introduced and the relationship between the implementation of the innovations and the characteristics of school districts and administrators.

Nevertheless, the interests of and questions asked in this basic line of research have seldom had much impact on our understanding of education output. Most of this research has not considered the relationship between process or organization and student output. Politi-



cal science research has generally been dominated by analysis of the decision process—for example, with a consideration of the background of school finance decisions or the actions of school boards (Kirst and Wirt 1970)—without regard to the effects of different decisions. Similarly, education process research seldom provides guidance for policies with particular outcome goals. Most legal analyses have concentrated upon the decisionmaking of the courts and not on the aftereffects of these decisions (Kirp and Yudof 1974).

These analyses include some notion that education is conducted within the framework of a “system,” but they seldom go beyond simply describing the system. An obvious consideration in the design of research into productivity is how these rich institutional notions can be integrated into research and policy that are directed at the goals of education—i.e., student outcomes.

In several areas, process and organizational studies of this type can be quite illuminating and useful for policy. The previous section indicates that variations in pupil–teacher ratios, teacher degrees, and the like bear little if any relationship to variations in student achievement. Yet, for example, between 1960 and 1975, there were large and steady decreases in average class sizes (from 27 students per teacher in 1960 to 20 in 1975), and increases in teachers with graduate training (from 23 percent in 1965 to 37 percent in 1975). Why, if these various factors have no impact on outcomes, did schools expand in these directions?

Casual empiricism would suggest a variety of explanations. The arguments behind the conventional wisdom of how to improve schools seem, at least on the surface, to be plausible. For example, would we not expect discipline problems to be less severe and individualized instruction to be more possible in smaller classes? Additionally, determining the independent influences of different inputs is difficult, particularly when resources in schools tend to be related to family backgrounds of students. Most school systems appear either incapable of or unwilling to do such studies. Perhaps more important, however, is the set of incentives facing schools and school personnel. Teacher training institutions, the chief purveyors of conventional wisdom on best practice, have an obvious interest in smaller classes (which imply more teachers being employed) and in graduate training of teachers. Teacher unions also recognize the employment aspects of smaller classes and the traditional advantages to seniority-based promotion and pay systems. As Niskanen (1975) has pointed out, in bureaucracies—where cost minimization pressures may be quite small—one cannot neglect the incentives operating on individ-

ual decisionmakers. These are, nevertheless, just hypotheses that are yet to be subjected to detailed analysis.

It is also important to note that the preceding discussion made no mention of the behavior of consumers. Apparently, parents who have a choice among school districts are willing to locate in high spending districts even though the expenditures have no impact on student performance. Are parents just bad consumers? Or are they interested in other aspects of schools, such as characteristics of other students or pleasant surroundings? Currently we have little way of choosing among alternative explanations of consumer behavior. Nevertheless, this does suggest that efforts to strengthen "market forces," for example, through the introduction of school vouchers, might not have much impact on the performance of schools (Hanushek 1981).

A second area where organizational studies would be helpful is understanding the objective functions of schools. One key area is the choice among different outputs. Most of the studies of input-output relationships have concentrated upon a single measure of output such as reading achievement. Yet no single measure can capture entirely the range of outputs that schools explicitly attempt to affect. In some circumstances, consideration of separate outputs will not affect the results (see Hanushek 1979a), but this is not generally true. Some researchers have also considered simultaneously determined outputs (e.g., Levin 1970 or Boardman, Davis, and Sanday 1977). However, only Brown and Saks (1975) have explicitly considered the implication of tradeoffs among outputs by decisionmakers. That latter analysis incorporates a specific objective function as a maintained hypothesis but it does not address issues of the character of such underlying decisions or possible differences across school districts.

Each of these areas distinguishes the study of education from study of other industries, and particularly profitmaking industries. Organizational and process choices, which are often institutionalized, can have a direct bearing on the analysis of industry performance. Understanding the incentives and decisionmaking processes in education also provides key information about how any changes can be instituted. Although analysis of these facets is often difficult, the largest shortcoming of existing research seems to be the lack of linkage to performance of the education system.

### **Financial Aspects of Education**

In private industries, pricing and output determination reflects production costs (as given by the production function and input prices), the character of competition among suppliers, and consumer

demand for the product. In the education industry public provision is dominant, and much of the costs of education are not borne by the consumer at the time of consumption. By breaking the direct linkage between consumption and payments for services, analysis of demands for education is more complicated (and necessarily more indirect), and the implications of demand considerations for pricing and output determination are less straightforward than in private industry. This section considers the financing of different levels of education along with the impacts of both policies and individual behavior on the distribution of educational institutions and on educational output. The next section considers the demand by individuals of different kinds, or qualities, of schooling.

Almost all studies of educational finance have focused upon the flow of dollars to particular institutions or particular types of individuals; virtually none has considered how expenditure flows influence the operation of the educational system and ultimately the nature and quality of educational outcomes (see, however, Cohn 1975, 1979). At the same time, expenditure analyses generally neglect the reaction of individuals to differing expenditure-tax-quality bundles. Because of the divorce from productivity analysis, education finance research has provided knowledge about who pays for education and who receives the education services purchased by the expenditures but little about the benefits of those expenditures—what the impact is on the education system and on education outcomes.<sup>17</sup>

Research into education finance has concentrated upon very specific issues that differ by level of education institution. At the elementary and secondary school level, the major topic has been the local property tax and its use in school finance. At the postsecondary level studies have, on the whole, been limited to descriptions of the financial conditions of all institutions or particular types of institutions.<sup>18</sup>

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17. The research by Berman and McLaughlin (1974) and by Pincus (1974) on effects of federal grant programs on educational innovation begins to approach the question of the relationship of financial flows to productivity. The financial considerations are, however, of interest in their own right because they represent the expenditure of real resources, and the financial arrangement determine to a large extent which groups in our society have access to particular education resources. If the financing of a community's education service is closely tied to its own income and wealth, the richer communities will tend to have better education opportunities than do poor communities—a distribution that might not be socially desirable.

18. There are exceptions, particularly in analysis of distributional effects; see, for example, Hansen and Weisbrod (1969); also, Cohn (1979), Chapter 10.

Since the Serrano ruling that the use of local property taxes to finance public education violated the California State Constitution, considerable research effort has been devoted to studying alternate financial arrangements (e.g., Kirst and Wirt 1970; Pincus 1974; Coons, Clune, and Sugarman 1970). The primary focus of this research has been assessing which school districts would gain and which would lose under various reform plans. Political scientists and lawyers have concentrated upon the decision to reform, whereas economists have looked at how the distribution of burdens in various school districts might change. The actual impact of these reforms depends, however, both on how spending behavior responds and how real resource use changes. The changes in state support for education are simply price changes to a district; these and other factors influence the aggregate level of spending. This point is demonstrated in the analyses of Stern (1973) and Feldstein (1975); it is also shown in the analysis of expenditures and subsidy scheme changes (Park and Carroll 1979). However, neither the determination of aggregate expenditure levels nor the effects of price changes on aggregate expenditures is well understood currently.

Moreover, analysis of school expenditures must consider a broader range of issues than simply legal changes in state funding. The influence of state and federal grant programs, legislative requirements, alternative expressions of demand such as moving one's residence to another school district, the relationships between educational expenditures and perceived outcomes, and changing relative costs of education all affect local spending (Oates 1972; Tiebout 1956). Focusing research simply on particular aspects of the finance system neglects many of the broader issues in expenditure determination.

For example, most studies have not taken into account the fact that families' residential location decisions are sensitive to the tax and public expenditure packages provided by different communities. Virtually all the research has used cross-sectional data on the distribution of property values and family incomes in different school districts to infer how reform plans will affect tax burdens and educational expenditure levels, while failing to take into account the fact that family residential choices are sensitive to local taxes and public services, particularly education services, provided by different communities (Edel and Sclar 1974). The changes in financial arrangements, by altering the tax-services packages, will alter family location decisions. This will in turn alter property values, which form the basis for computing the distribution of the burden of different reform plans. Thus, the use of cross-sectional data on property values

to study the incidence of tax burdens of school finance reform plans will provide very misleading estimates of the long-run impact of these plans.<sup>19</sup>

Again, the important point is that the underlying structure of the industry and its effects on behavior must be incorporated in analyses of educational finance. Demanders of public elementary and secondary education do not directly pay for education, but instead it is financed out of general tax revenues. This has implications for the behavior of suppliers, as noted above. Also, it implies that understanding demand relationships must be based upon indirect evidence found in mobility patterns, demands for private schooling, and choices of overall expenditure levels by communities at large.

Most of the research on the financing of higher education has been stimulated by three problems: (1) Education costs have been rising while institutional productivity appears (and might be expected to remain) relatively constant; (2) federal, state, and local subsidies have tended to level off and, in some cases, decline; and (3) private support for higher education institutions has not kept pace with rising costs. Concern over these problems has provoked a number of studies, and has also led to the institution of task forces to consider the implications of current systems for financing education and to compare the current system with alternative schemes (see, for example, the bibliography in Cohn 1979, Chapter 10).

Two aspects of this research have been attention to distributional questions (equality of access and freedom of choice by particular groups of individuals) and to the viability of particular institutions or types of institutions in the face of external changes in the economy and in the age structure of individuals. Much less attention has been given to the central question of how the structure of the postsecondary sector affects or is affected by alternative financial arrangements.<sup>20</sup>

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19. Inman (1978) has estimated the effect of alternative financing formulas on the decision of families to move, the choice between public and private schools, and the response of business firms to changing tax burdens, and thus has simulated the direct and indirect effects of the financing formulas on the levels of expenditures and the distribution of costs and education services after all of the adjustments have occurred. This analysis has not, however, been linked to consideration of education output; see also Rosen and Fullerton (1977).

20. To be sure, such study is more complicated than in elementary and secondary education because (1) there is more diversity in individual choice in terms of public and private alternatives; (2) the measurement of outputs is more difficult; and, (3) less is known about the production relationships. Nevertheless, existing research, which does not consider how financing arrangements affects sectoral output, provides virtually no guidance for post-secondary policy.

More recent educational finance studies, particularly at the elementary and secondary level, have begun to consider how schools and individuals react to alternative financing schemes. This is clearly what one needs to know if policies affecting finances are to be considered. Currently, however, a range of fundamental questions remain unanswered. How are aggregate demands for education expenditures formed and expressed? How does the system of fiscal federalism with decisionmakers at the national, state, and local levels influence the level or character of expenditures? How do public expenditures interact with private expenditures? And how do the resulting expenditure flows influence the education system and education outcomes?

### **Individual Demands for Schooling**

Economists and sociologists have devoted considerable attention to individual choices in levels of schooling with a particular focus on the effects of financial factors, personal characteristics, and, less frequently, economic conditions (e.g., Sewell and Hauser 1975; Dresch 1975; Freeman 1976). In addition, there has been some more detailed analysis of the choice of education programs and schools at the postsecondary level (e.g., Freeman 1971; Kohn, Manski, and Mundell 1976; Carroll et al. 1977). At the elementary and secondary level, there are studies of dropout behavior and private school choice (e.g., Katzman 1971; Clotfelter 1976). Finally, the relationship between career patterns and schooling decision throughout life has also been analyzed (Sarason 1977; Wirtz 1975).

The studies are an important starting point in considering basic factors affecting individual choices and are interesting in their own right. However, to understand the relationship between these individual decisions and the structure of the education industry more attention must be given to how the characteristics and operations of individual institutions condition these choices and how these choices affect education institutions. Three characteristics of demands for schooling deserve further consideration. First, individuals generally have imperfect information about quality differences among schools and face considerable uncertainty about the effects on subsequent outcomes of attending a given school. Second, there is quite pervasive rationing by schools on other than price grounds (although this may soon change as total enrollment declines). Third, all that can generally be observed is the actual choices of students. The options considered or available to individuals before actual enrollment decisions are not usually known; similarly, the prices faced by students

before this choice, which vary by both schools considered and the possibility of financial aid for individual students, are also generally unknown (Dresch, Hanushek, and Waldenberg 1979). These factors, if not considered, will generally lead to biased estimates of demand relationships (see Rosen and Willis 1979).

### **Internal Structure of the Education System**

A final area of interest in the study of the education industry is the special nature of intraindustry interactions. For example, demographic factors strongly influence the operations of schools through changes in student enrollment and thus changes in demand for teachers. The education industry supplies most of its own inputs, so that higher enrollments at the elementary level create demand for teachers and hence for graduates of the higher levels too. Teacher training institutions are also influenced by changes in school operations such as the increased demand for special education personnel. However, there has been little exploration of how such interactions affect education industry activities.<sup>21</sup> As pointed out above, the incentives created by this may seriously affect the performance of industry through organizational and process choices that are intensive in skilled labor. Almost all education research is divided into analyses of particular types or levels of education. Elementary and secondary education has been studied with little reference to effects on post-secondary education, and vice versa.

Another set of questions about the structure of the sector concerns the interaction between private and public institutions. For example, how do state universities influence private universities, or how do parochial schools influence public school operations? It is frequently held that financial problems will alter the distribution of college and university enrollment toward public schools and away from private schools; however, this particular impact on the post-secondary system has not been well documented.

Interactions within the education industry are important simply because any policies that affect one part of the industry are likely to have effects on other parts of the industry. For example, financial aid to private institutions may affect public institutions competing for the same students. Lack of knowledge about the nature of these

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21. An exception is Kehrer's (1972) analysis of the interdependency of curricula in each level of education and how curricula change in response to economic and demographic factors. Other exceptions are found in the analysis of education planning, chiefly for countries other than the United States; see, for example, Stone (1965), Bowles (1969); and the discussion in Cohn (1979).

interrelationships partly reflects the historic division of research into specific areas; this division neglects interaction among these areas.

## THE ISSUES OF EDUCATION POLICY RESEARCH

Perhaps because of historical accidents or the ways in which the separate academic disciplines have developed, education research has been compartmentalized and has tended to follow distinct, and disparate, research traditions. One result is that the boundaries among different research areas, as suggested by the previous discussion, have been rather arbitrarily set, even though many of the crucial issues for making education policy depend crucially upon effects that cross traditional boundaries. Further, and related, research in a distinct area has been largely independent of that in other areas so that it is difficult to combine them and to build upon each other. The previous discussion has provided many such examples: labor market studies have not been very much concerned with qualitative differences among schools; input-output analyses have tended to neglect organizational constraints and choices; school finance research has generally avoided consideration of effects on school performance.

The typical education policy involves setting either a rule or an incentive system to alter the behavior of individuals or institutions. But any evaluation of the effectiveness of a given policy comes through an assessment of how it affects the performance of the education industry—performance as typically measured in output or price terms. This linkage to performance is most frequently the information that has not been provided by existing research.

A central focus of this paper has been how the structure of the education industry affects observed behavior; education research, which by necessity relies upon data generated from the operation of the industry, must recognize the behavioral implications of the industrial structure. Yet, education research—and particularly “policy” research—has frequently concentrated upon quite specific questions without considering how the behavior of both suppliers and demanders is guided by incentive and constraints arising from structural features of the education sector. For example, data on school input-output relationships reflect not only technological relationships in education but also the choices of decisionmakers on what outputs to produce and how to produce them; but these choices are not made with thorough knowledge of the relationship between inputs and outputs and are not necessarily guided by any desires for efficient production. Any attempts to understand production rela-



tionships must recognize how such choices affect the observed data and alter the interpretations of input-output analyses. Or, as another example, consideration of financing policies must consider how expenditure incentives relate to resource usage and education outputs.

Even though available research has provided many interesting insights into the education process and the education system, much of it has not been very useful in setting education policies. And there is little evidence that available research has been used very much in policy decisions.<sup>22</sup>

The real puzzle, of course, is why no unifying treatment of the education sector exists. Many of the suggestions for research are quite natural extensions of existing research and indeed, once said, seem to be quite obvious things to do. Clearly some of the research is difficult, but the problems do not appear to be qualitatively different from those in other sectors, even though research on most other major sectors in the economy has produced a more coherent framework.

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22. Quite clearly much of the research into education has had motivations other than providing immediate policy advice, and therefore judging this research on these standards is perhaps unfair. On the other hand, a majority of the research has a section on "Policy Implications," thus suggesting that these standards are directly relevant.

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