Review of Educational Research
Fall 1996, Vol. 66, No. 3, pp. 341–359

Human Capital Theory: Foundations of a Field of Inquiry

Scott R. Sweetland
State University of New York at Buffalo

This review of human capital theory begins in 1776 and ends in the 1960s, when the theoretical and empirical foundations of the field were articulated and established. The review is organized to provide a general reference to human capital theory, its historical development, and its major methodological approaches. While human capital research has not been limited to education, it usually includes empirical measures of education and produces results that affect educators and education policy. Review of the foundation studies that were conceived by Nobel prize laureates and historically prominent economists supports the position that educators should draw their own informed conclusions and define the agenda of future human capital research.

Human capital theory suggests that individuals and society derive economic benefits from investments in people. The investment feature of this suggestion significantly differentiates human capital expenditures from consumptive expenditures—those providing few benefits beyond immediate gratification (Vaizey, 1962). Although types of human capital investment generally include health and nutrition (Schultz, 1981), education consistently emerges as the prime human capital investment for empirical analysis. One main reason for this is that education is perceived to contribute to health and nutritional improvements (Schultz, 1963); a second and more empirically important reason is that education may be measured in quantitative dollar costs and years of tenure (Johnes, 1993).

The literature relating to human capital theory distinguishes among several types and means of education. There is formalized education at primary, secondary, and higher levels (Cohn & Geske, 1990), informal education at home and at work (Schultz, 1981), on-the-job training and apprenticeships (Mincer, 1974), and specialized vocational education at secondary and higher levels (Corazzini, 1967). As scholarship in the field is surveyed, it becomes apparent that the types and means of education greatly affect the research design of each human capital study. In most instances, however, it is appropriate to assume that education increases or improves the economic capabilities of people (Schultz, 1971).

While the types and means of education are diverse, so too are the benefits derived from education. As already noted, education makes a perceived contribution to improvements in health and nutrition. In addition, education tends to effect a control on population growth and to increase overall quality of life (Becker, 1993). Education also provides the means to an enlightened citizenry able to participate in democratic and legal due process and to pursue values such as equality, fraternity, and liberty at both private and social levels (Swanson & King,

1991). While these qualitative benefits may represent the most important contributions made by education, each is difficult to measure quantitatively. Perhaps this explains why economic growth has become the benefit of choice for empirical analysis (Woodhall, 1987).

Given that investments, benefits, and economic growth are staples of economic thought, it is understandable that the conceptualization and advancement of human capital theory result primarily from the efforts of economists. Human capital analyses have evolved from research in specialized areas of economics such as "labour economics, public sector economics, welfare economics, growth theory and development economics" (Blaug, 1970b, p. xvii). Eventually the common body of literature grew large enough to warrant a branch of economics concerned specifically with education. Because most economics of education studies incorporate principles of human capital theory (Blaug, 1970b), some scholars believe that human capital is the branch of economics concerned with education rather than a specialty within the economics of education. Psacharopoulos (1973) supported this view by pronouncing the existence of "a new field in economics known as the economics of human capital, or more narrowly, the economics of education" (p. 1). Placement of human capital theory within the discipline of economics is less important than the problem of categorical organization that is illuminated by the different perspectives: It is difficult, if not impossible, to separate a body of human capital theory literature from a body of economics of education literature.

Why Is Human Capital Theory Important?

The importance of human capital theory is succinctly implied by its impressive record of scholarship. Liberally including the economics of education, Blaug (1966) bibliographically organized 792 journal articles, books, and research studies. Less than four years later, this number had grown to 1,350 (Blaug, 1970a). In 1976, it exceeded 2,000 (Blaug, 1978). This represents a growth rate exceeding 120 publications per year. The connectivity between human capital theory and Nobel prize awards is perhaps more impressive than the formal publications record. Since 1971, five Nobel prizes have been awarded to scholars in, or affiliated with, the field of human capital theory (Becker, 1993; Wright, 1992). The Nobel distinction belongs to Theodore W. Schultz and Gary S. Becker, the two most pronounced scholars of human capital theory; Milton Friedman and Simon Kuznets (1945), who collaborated to publish an important article linking medical profession incomes to investments in education; and Robert M. Solow (1957), who helped to identify the relatedness of education to the aggregate production function.

Although the abbreviated record of scholarship is impressive, the purpose of this article is not to elaborate the historical importance of human capital theory; rather, it is to present the contextual and empirical aspects of the theory which are central to future research applications. A research agenda including human capital theory applications may prove essential to supporting the education policy process. In recent years, national and state education initiatives have increasingly relied on economic reasoning to gain popular support for educational programs (Danzberger, Kirst, & Usdan, 1992). While such economic reasoning has been logical and politically appealing, it has been simultaneously devoid of empirical

economic analysis (Levin, 1989). The analytical framework supporting human capital theory includes alternative economic approaches that may be used to empirically inform and support education policymakers. In this regard, the potential value of the theory—as a means to inform and support education policy—represents the underlying assumption supporting the importance of this field of inquiry.

Development of Human Capital Theory

Early Economic Viewpoints

Human capital theory formally evolved in this century, but its bona fide conceptualization was articulated centuries ago (Kiker, 1968). The most prominent economists to address issues of human capital were Adam Smith, John Stuart Mill, and Alfred Marshall. Irving Fisher, prominent in his own right, expressed the pivotal arguments connecting early economic thought to contemporary human capital methodologies.

In 1776, Smith published his "Inquiry" concerning national wealth. His opening paragraphs prescribed that human effort lies at the root of all wealth:

> The annual labour of every nation is the fund which originally supplies it with all the necessaries and conveniences of life which it annually consumes, and which consist always either in the immediate produce of that labour, or in what is purchased with that produce from other nations. . . . The number of useful and productive labourers, it will hereafter appear, is everywhere in proportion to the quantity of capital stock which is employed in setting them to work, and to the particular way in which it is so employed. (1776/1952, p. 1)

What "hereafter appeared" were Smith's two principal components, which serve as the foundation of all productive human capital frameworks:

(1) Labor inputs are not merely quantitative. They qualitatively include "the acquired and useful abilities of all the inhabitants or members of the society" (p. 119) as well as "the state of the skill, dexterity, and judgement with which labour is applied" (p. 1).

(2) Ability acquired through "education, study, or apprenticeship, always costs a real expense, which is a capital fixed and realized, as it were, in . . . person" (p. 119).

Around 1848, Mill pronounced that human abilities, inseparably fixed in person, could not be reasonably counted as wealth per se:

> A country would hardly be said to be richer, except by metaphor, however precious a possession it might have in the genius, the virtues, or the accomplishments of its inhabitants; unless indeed these were looked upon as marketable articles, by which it could attract the material wealth of other countries. (1926, p. 48)

Statements such as this have been periodically misinterpreted to debase human capital theory. Therefore, it is critical to understand that Mill required a market exchange for determining value before including anything in his definitions of wealth. This does not mean, however, that Mill did not value human abilities, or that he felt they should be ignored by economists. Quite to the contrary, Mill

considered human abilities as economic utilities—means to wealth—liberally acknowledging all activities which lead to their improvement. Mill's true intent may be gleaned from the following passage:

> Utilities fixed and embodied in human beings . . . the labour being in this case employed in conferring on human beings qualities which render them serviceable to themselves and others. To this class belongs the labour of all concerned in education; not only schoolmasters, tutors, and professors, but governments, so far as they aim successfully at the improvement of the people; moralists, and clergymen, as far as productive of benefit; the labour of physicians, as far as instrumental in preserving life and physical or mental efficiency; of the teachers of bodily exercises, and of the various trades, sciences, and arts, together with the labour of the learners in acquiring them; and all labour bestowed by any persons, throughout life, in improving the knowledge or cultivating the bodily or mental faculties of themselves or others. (1926, p. 46)

Around 1890, Marshall decreed a pluralist conception of human capital. In the Smithian tradition, Marshall stated, "We may define *personal wealth* so as to include all those energies, faculties, and habits which directly contribute to making people industrially efficient" (1948, p. 58). Further acknowledging the views of Smith, Marshall defined capital so broadly that personal wealth could be interpreted as capital:

> By capital is meant all stored-up provision for the production of material goods, and for the attainment of those benefits which are commonly reckoned as part of income. It is the main stock of wealth regarded as an agent of production rather than as a direct source of gratification. (1948, p. 138)

Despite converging with the views of Smith, Marshall cleverly, perhaps purposefully, centered his economic discussions of human abilities on the premise that they were agents of producing wealth—similar to the economic utilities defined by Mill. This enabled Marshall to empirically dismiss inclusion of human capital because it lacked a market exchange for determining value.

Whereas Mill and Marshall characteristically pursued strict, empirically correct definitions of wealth—and therefore capital—Fisher (1906) relaxed the requirements of definition to include qualities he argued were more important than their market-determined values. Accordingly, Fisher acknowledged empirical problems of valuating human abilities while encouraging economists to search for plausible solutions:

> Where a sale of the article is scarcely conceivable, an appraisement is almost out of the question. To estimate the value of the Yellowstone Park is impossible, unless we allow ourselves a range of several hundred per cent. Similar wide limits must be allowed when we try to value free human beings. We can often give a lower limit, but seldom an upper one. . . . It would be wrong, however, to conclude, as some writers have, that because we cannot value them accurately, public parks or freemen cannot be called wealth. (p. 17)

Allowing for no mistake in his interpretation, Fisher expressly stated "that wealth in its broadest sense includes human beings" (p. 51). He also implied that human participation in production processes constituted a form of capital: "In a complete

view of productive processes, the human machine is no more to be left out of consideration than machines which handle the wheat in its prior stages" (p. 168). Many decades later, perhaps resulting from Fisher's documented views, human capital analysis transcended philosophical discussions through utilization of the same empirical methods that were traditionally applied to capital machinery.

Economic Foundation Studies

Whereas the field of human capital theory was officially established in 1960 (Blaug, 1976), significant research supporting the field had been conducted throughout the previous decade (Blaug, 1966; Kiker, 1968). While full disclosure of the supporting literature would exhaust many presentations, four studies of particular relevance to the development of the field bear discussion. The first two are not frequently cited in human capital theory literature; nonetheless, they merit considerable attention because they revealed important relationships which thereafter became primary assumptions within the field. The other two are occasionally cited, though more in reverence to their authors, who subsequently published far more expansive human capital theory research. Considerate review of these "economic foundation studies" provides insights into the contextual environments surrounding human capital research, the broad spectrum of potential human capital research questions, the numerous applications of supportive analytic techniques, and the overall significance of human capital theory as a field of inquiry. To improve clarity of presentation, the remaining sections concentrate on those aspects of studies that are confined to higher education in the United States.

Jacob Mincer (1958) developed a model for examining the nature and causes of inequality in personal incomes—noting that contemporary research had emphasized the unequal facts rather than the statistical constructs behind the facts. Mincer maintained that training and skill—human capital—importantly affected personal income dispersions. He further asserted that "as with non-human capital, some industries have high capital ratios" (p. 299), requiring that they provide economic remuneration for investments in training. Based on positions expressed by Smith (1776/1952) and Friedman (1953), Mincer's model was designed to accommodate the following rationale:

> The implications for income distributions of individual differences in investment in human capital have been derived in a theoretical model in which the process of investment is subject to free choice. The choice refers to training differing primarily in the length of time it requires. (p. 301)

To measure two major types of training, formal and informal, the model incorporated years of education and years of work experience. Worker age was used to surrogate work experience.

Through using these constructive measures, Mincer found that years of work foregone to pursue education were rationally compensated with higher earnings. Occupations demanding high levels of education afforded higher compensation, at least sufficient to ensure that lifelong receipts equalized the present value of compensation received by workers with less education. Mincer also found that age-earnings profiles revealed two distinct correlations: "As more skill and experience are acquired with the passage of time, earnings rise" (p. 287), and "in later years aging often brings about a deterioration of productive performance and

hence a decline in earnings" (p. 287).

Conjunctive to the distinct correlations he found, Mincer also observed less decline in later years for high earners, suggesting "that patterns of age-changes in productive performance differ among occupations as well as among individuals" (p. 287). To explore the effects of occupation on the correlations, Mincer enhanced the model to account for income dispersions across several occupational groupings. This accounting supported the following conclusion:

> Differences in training result in differences in levels of earnings among occupations as well as in differences in slopes of life-paths of earnings among occupations. The differences are systematic: the higher the occupational rank, the higher the level of earnings and the steeper the life-path of earnings. (p. 288)

A steep life path of earnings may be exemplified by considering a high-skill profession, such as medical surgery, wherein earnings reflect remuneration for formal educative training and compensation for value-additive work experience.

Mincer's summary concluded that "interoccupational differentials are therefore a function of differences in training. . . . Intra-occupational differences arise when the concept of investment in human capital is extended to include experience on the job" (p. 301). Returning to the issue of income inequality, Mincer acknowledged the potentiality of restrictive income dispersions while asserting "that even perfect equality of ability and opportunity implies neither income equality nor symmetry in the income distribution" (p. 302).

Solomon Fabricant (1959) studied United States productivity from 1889 to 1957. His stated purpose was to clarify the technical causes of discrepant statistical results. Through his technical analysis, however, Fabricant discovered that the methods and assumptions underlying productivity figures frequently promoted underestimation of intangible capital investment and, consequently, overstatement of productivity. This discovery prompted him to emphasize the importance of intangible capital—human capital—throughout his presentation:

> In an important sense, society's intangible capital includes all the improvements in basic science, technology, business administration, and education and training, that aid in production—whether these result from deliberate individual or collective investments for economic gain or are incidental by-products of efforts to reach other goals. (p. 22)

Fabricant addressed statistical discrepancies by detailing alternative labor and capital indexes as well as the effects that each had on measures of productivity. His resultant recommendation was to create a new index including weighted labor and capital inputs, which could be analyzed as follows:

> The index of output per unit of labor and capital combined—which rose at the rate of 1.7 per cent per annum in the private economy—is thus, in effect a weighted average of the index of output per unit of labor—2.0 per cent per annum—and of the index of output per unit of capital—1.0 per cent. (p. 9)

In addition to recommending the use of combined indexes, Fabricant argued that a portion of intangible capital could be accounted for by weighting the labor index to reflect qualities beyond given quantities.

The importance of accounting for intangible capital inputs stemmed largely from the work of Abramovitz (1956). He had revealed that national output increased at a greater rate than traditional inputs could explain. Abramovitz named the difference between output and explained inputs a statistical "measure of our ignorance" (p. 11). Fabricant (1959) asserted that this disturbing measure of our ignorance had grown at an increasing rate throughout the 1889–1957 period. To illustrate, he cited the unweighted average annual labor productivity rates of change reported by Kendrick (1958). Kendrick's calculations revealed a 2.4% average annual increase over the entire period; a 2.6% increase during the 1919–1957 period; and a 3.3% increase during the 1945–1957 period. By drawing increased attention to the measure of our ignorance, Fabricant may have been responsible for generating volumes of macroeconomic interest in the viability of human capital theory.

Gary Becker (1960) studied differentials in personal incomes that had accrued to college graduates in the United States. His opening remarks appealed to the environment of cold war panic brought on by Soviet advancement in areas of economic growth and military technology. Relative to the contextual environment, Becker attempted to determine if national expenditure on higher education was adequate and if American college student quality could be improved. The methodology developed by Becker compared personal incomes of college graduates with those of high school graduates. Income differences between the two groups were then related to costs of attending college in such a way that Becker was able to mathematically derive a rate of return on investments in college education. His research hypothesis stated, "If this rate of return was significantly higher than the rate earned on tangible capital, there would be evidence of underinvestment in college education" (p. 347). Conversely, if the rate of return were lower than the rate of return on investments in tangible capital, there would be evidence of overinvestment in college education.

After adjusting for background variables, Becker derived a rate of return on college education that ranged from 7% to 9% (p. 348). In comparison, he estimated an 8% average rate of return on business capital (p. 349). According to his research hypothesis, Becker was compelled to report that the "direct returns alone do not seem to justify increased college expenditures" (p. 354). He immediately qualified this statement by asserting that investments in college education provided indirect returns in addition to direct returns; therefore, he concluded, "a firm judgement about the extent of underinvestment in college education is not possible" (p. 354).

Addressing American college student quality—in terms of intelligence quotients and grades—Becker theorized that many exceptional students did not attend college because of personal financial circumstances. Supported by shorthand calculations, he stated, "It appears that an increase in the fraction of able persons going to college would raise the average return from college" (p. 354). Although Becker was unable to directly support his hypothesis—that there was evidence of underinvestment in college education—the design of his study provided an important methodology for analyzing human capital investments. Four years later, the first edition of his expansive human capital theory monograph was published (Becker, 1964). It, and the two editions that followed (Becker, 1975, 1993), specifically featured the application of this methodology.

Theodore Schultz (1961) synthesized his analysis, which was substantially based on his experience in the field of agricultural economics, with other foundational studies to convincingly support human capital theory and its numerous methodologies. This article was, in substance, a transcription of Schultz's 1960 presidential address to the American Economic Association. It began as follows:

> Although it is obvious that people acquire useful skills and knowledge, it is not obvious that these skills and knowledge are a form of capital, that this capital is in substantial part a product of deliberate investment, that it has grown in Western societies at a much faster rate than conventional (nonhuman) capital, and that its growth may well be the most distinctive feature of the economic system. (p. 1)

Supporting this statement, Schultz explained that national income had risen significantly during the 1900–1956 period. Furthermore, of the factors contributing to national income growth, the estimated stock of education in the work force had grown at nearly twice the rate of reproducible capital.

Reviewing the analytical constructs of human capital methodology, Schultz discussed the inescapable problem of "how to distinguish between expenditures for consumption and for investment" (p. 8). To clarify this problem, he suggested that analysts categorize expenditures by three types: pure consumption, pure investment, and expenditures exhibiting both characteristics. While Schultz asserted that expenditures for education belonged to the third category, he emphatically discussed the logistical difficulties which preceded their allocation. Perhaps influenced by these difficulties, Schultz's research usually disclosed "the contribution that education makes to earnings and to national income because a change in allocation only alters the rate of return, not the total return" (p. 13). Schultz expanded this discussion by noting that the Mincer and Fabricant methodologies were similarly based on total return, whereas Becker's methodology specifically derived a rate of return—thereby requiring the allocation of education expenditures among consumption and investment categories. He cited Becker's results to exemplify this point as follows:

> If one were to allocate a substantial fraction of the total costs of this education to consumption, say one half, this would, of course, double the observed rate of return to what would then become the investment component in education that enhances the productivity of man. (p. 13)

While Schultz predominantly asserted the prime relationship of education to human capital formation, the breadth of intellectual understanding he brought to the field encompassed many other types of human capital investment. As an example, he briefly listed five major categories of human activity—investments—which lead to improved human capabilities:

> 1. Health facilities and services, broadly conceived to include all expenditures that affect the life expectancy, strength and stamina, and the vigor and vitality of a people;
> 2. on-the-job training, including old-style apprenticeship organized by firms;
> 3. formally organized education at the elementary, secondary, and higher levels;
> 4. study programs for adults that are not organized by firms, including extension programs notably in agriculture;

5. migration of individuals and families to adjust to changing job opportunities. (p. 9)

While tempering his expansive conception of human capital theory, Schultz forcefully presented the topic using an editorial format which appealed to the interests of economists: "The income of the United States has been increasing at a much higher rate than the combined amount of land, man-hours worked and the stock of reproducible capital used to produce the income" (p. 6). Subsequently, he matter-of-factly charged economists with the responsibility for discovering why *they* could not account for total growth in national income. Schultz's sound economic reasoning, clarity of presentation, and corroborative support of the research of other economists was so convincing that he became the quintessential human capital protagonist, and earned the 1979 Nobel Prize in Economic Sciences for his contributions.

Benchmark Human Capital Theory Studies

In the absence of the full account crediting Schultz, two profound observations became reasons why human capital theory was established as a field of inquiry in the early 1960s. First, a significant portion of United States economic growth was unaccounted for by conventional economic means of measurement. Second, a significant portion of personal income growth was accounted for by increased levels of education.

In the three years following Schultz's (1961) published address, three expansive human capital studies emerged. These studies, depending on one's research orientation and particular interpretation, are benchmark human capital theory references.

Denison (1962) attempted to explain United States economic growth by using the aggregate production function model. Following economic tradition, Denison began with land, labor, and tangible capital inputs. He further adjusted labor inputs to reflect different wage rates by using index construction techniques employed by other economists (Abramovitz, 1956; Fabricant, 1959; Kendrick, 1961). In addition, Denison's indexes uniquely detailed the effects that education levels had on wage rates, thereby explaining a significant portion of unexplained economic growth. While the overall purpose of his study was to identify sources of economic growth, Denison intrigued the research community by attempting to account for total economic growth (Abramovitz, 1962), thus defying the measure of our ignorance. Reference to our ignorance was no longer in vogue at the time, though it was perhaps necessary, historically, to draw attention to problems in economic methodology and the importance of a proposed human capital research agenda. The statistic was less dramatically, and more accurately, described as the *residual*—that portion of economic growth which was unexplained by traditional economic inputs.

Summarily denoting relevance to human capital investment, Denison found that the average annual growth rate, measured by real national income, was 2.93% during the 1929–1957 period (p. 266). He estimated that 2.0% of this growth was accounted for by an increase in total inputs, including 0.67% attributable to education. Reconciling the 0.93% residual, Denison created seven attribute categories and allocated 0.59% to those of knowledge. Assuming an inseparable

relationship between education and knowledge, Denison's estimates suggested that human capital investment accounted for at least 43% of national income growth. After refining many calculations, Denison performed a similar accounting in 1974, but the measured contribution of education to economic growth remained "substantially what it was before" (Blaug, 1978, p. 31).

Schultz (1963) addressed the economic growth residual, as well. However, his commentary and survey of literature predicated the economic function of education as human capital forming and in this way contributing to economic growth. Similar to Denison, Schultz also asserted that knowledge was a contributing factor; but he more directly associated knowledge with schooling and the research function of the "educational establishment" (p. 39):

> Schooling and advance in knowledge are both major sources of economic growth. It is obvious that they are not natural resources; they are essentially man-made, which means that they entail savings and investment. Investment in schooling is presently, in the United States, a major source of human capital. (p. 46)

Dissecting the costs of schooling, Schultz asserted that the largest portion was borne by students, because of earnings foregone while they attended school. In relative contrast, he reasoned that private returns to students would be greater than social returns on total investment:

> Students may earn on their outlay what is in fact an attractive rate compared to the rate of return to be had on alternative investment opportunities, while for the economy as a whole it may be an unattractive investment by the same criterion, that is, measured by the rate of return on alternative investments. (p. 22)

Reinforcing his 1960 discussion of rate of return, Schultz emphasized the following caveat: "It is essential to distinguish between the return and the rate of return for reasons already presented. It must be borne in mind that the measured return to schooling is simply that part of earnings attributed to education" (p. 58). Providing further illustration, he noted that Denison's (1962) study considered total return, while Becker's (1960) study considered rates of return: "When the aim is to estimate the rate of return, the important unsettled question is: What part of the costs of schooling is being invested in producer capabilities?" (Schultz, 1963, pp. 58–59). Signifying the critical importance of this question, Schultz repetitiously discussed the need to parlay the pure consumption portion of costs.

Becker (1964) diverged from the total returns approach to explore rates of return on human capital investments in education and training. The fundamental basis of his exploration was stated as follows:

> Probably the most impressive piece of evidence is that more highly educated and skilled persons almost always tend to earn more than others. This is true of developed countries as different as the United States and the Soviet Union, of underdeveloped countries as different as India and Cuba, and of the United States one hundred years ago as well as today. Moreover, few, if any, countries have achieved a sustained period of economic development without having invested substantial amounts in their labor force, and most studies that have attempted quantitative assessments of contributions to growth have assigned an important role to investment in human capital. (p. 2)

Building on this foundation, Becker devised a methodology for using costs of education and economic returns on education investment as input to derive an internal rate of return on the costs. Using 1950 census data, this methodology produced a 13% "best single estimate" (p. 78) of the private rate of return on investments in education. Addressing native ability effects on this rate, Becker detailed literature correlating ability and education to maintain that the rate of return would be "more than 10 per cent" (p. 88) after statistically controlling for ability.

Differentiating social from private rates of return, Becker made the following comment:

> Economists (and others) have generally had little success in estimating the social effects of different investments, and, unfortunately, education is no exception. One can, however, develop some lower and upper limits that effectively rule out many of the more fanciful assertions about the effects of education. (p. 117)

Becker's calculations suggested a 12.5% lower limit (p. 118) and a 25% upper limit (p. 120). The upper limit incorporated some of Denison's estimates and presumably included the effects of indirect returns.

Human Capital Theory Methodologies

Categorizing Human Capital Theory Studies

Each of the benchmark studies suggests that a specific type of human capital investment—education—provides economic benefits. Furthermore, all of the studies discussed collectively verify human capital theory: Individuals and society derive economic benefits from investments in people. While the general theory appears to prove consistent, the analytical techniques used to verify the theory vary significantly. In order to promote cogent understanding of human capital analysis, and to guide the design of future research inquiries, it may be worthwhile to categorize human capital methodologies. Two notable attempts have been made by Blaug (1966, 1970a, 1978) and Bowen (1964).

Primarily for the purpose of organizing his bibliography, Blaug (1966) established three useful categories under "The Economic Contribution of Education" (p. v): (a) production function approach, (b) human capital formation, and (c) measurement of the returns. In a way similar to the way this article is organized, Blaug included another category which addressed early economic viewpoints. The three emphasized here, however, appropriately reflect differences among methodological approaches.

According to Blaug, the production function approach adheres to the marginal productivity theory of distribution and, as indicated by name, the concept of a mathematical production function. Blaug proclaimed that the locus classicus of this category occurred in 1962 when "Denison introduced education explicitly into an aggregate production-function model of the American economy" (p. 9). Through his adaptation of the aggregate production function, Denison became the first economist to formally include education in the productivity equation. Concurring with annotated interpretations by Domar (1961), Blaug indicated that the production function approach is one of the major methodological attempts to

explain the residual of unexplained national output.

Blaug indicated that human capital formation studies attempt to estimate "the stock of education embodied in the labour force" (p. 12) by using the same analytical techniques used to measure the stock of physical capital in a nation. Referring to Schultz as "the father of the concept of human capital" (p. 12), Blaug carefully explained that the Schultz-type study considers the stock of education as an aggregate dollar and opportunity cost investment, which is an alternative to treating the level or last year of educational attainment as stock. While failing to acknowledge Fabricant's (1959) contribution throughout his publications, Blaug annotated similar comments and conclusions made by Johnson (1960).

Discussing measurement of the returns to education more thoroughly than the other categories, Blaug explained that this approach attempts to answer the question, "Is it a profitable investment compared to alternative investment options?" (p. 15). He indicated that to measure profitability, this approach either uses the yield on business capital to discount returns on investments in education or arrives at an internal rate of return on investments in education. As Blaug stated, "In either case, what we are doing is simply cost-benefit analysis, treating the purchase of education as perfectly analogous to the purchase of any capital asset" (p. 15). Referring to Mincer's (1958) study, Blaug asserted that "spelling out the implications of rising educational attainment on the distribution of income in the long run" (p. 15) provided the framework necessary for calculating rates of return on education. However, Blaug did pronounce that Becker's (1964) study was unequivocally "the leading theoretical work on this subject" (p. 16).

Whereas Blaug's categories were arranged descriptively on the contexts or results of studies, the categories suggested by Bowen (1964) were based more on computational methodology. The three most pertinent methodologies explained by Bowen include "(1) the simple correlation approach; (2) the residual approach; [and] (3) the returns-to-education approach" (p. 4). To support the objective of establishing an improved classification framework, Bowen's explanations are briefly summarized. He began by stating that the simple correlation approach "consists of correlating some overall index of educational activity with some index of the level of economic activity" (p. 4). Straightforward as the methodology may seem, Bowen discussed the disparate effects of correlative comparisons among and within specific sectors of economies. He also emphasized the nearly impossible task of establishing causality between correlated variables.

Bowen's discussion of the residual approach included an excellent methodological explanation:

> In general terms, this approach consists of taking the total increase in economic output of a country over a given period of time, identifying as much of the total increase as possible with measurable inputs (capital and labour being the two measurable inputs usually chosen), and then saying that the residual is attributable to the unspecified inputs. (p. 10)

Ignoring Schultz's total return approach to exploring the residual, Bowen discussed Denison's (1962) study within the context of residual analysis. Through this discussion he stated that "education and advances in knowledge are usually regarded as the most important of the unspecified inputs" (p. 10), suggesting that Denison's contribution was essentially the attempt to quantify a previously articu-

lated relationship.

Similar to Blaug, Bowen discussed the returns-to-education approach in more detail than the other approaches. He explained the overall methodology as follows:

> An obvious way of studying the economic consequences of education is by contrasting the lifetime earnings of people who have had more education with the lifetime earnings of people who have had less education. The difference in lifetime earnings can then be expressed as an annual percentage rate of return on the costs involved in obtaining the education. (p. 13)

He also identified two distinct perspectives of the returns-to-education approach: "(1) the personal profit orientation; and (2) the national productivity orientation" (p. 14). According to Bowen, the personal profit orientation considers differences in lifetime earnings as evidence of personal financial gain relative to investments in education. Therefore, this orientation is useful to the individual who attempts to determine the appropriate level of education to acquire. The personal profit orientation is also useful for guiding the "country's decision as to what fraction of the costs of education should be borne by the students themselves" (p. 14). Assessing the costs of acquiring education, Bowen indicated that all private costs, including opportunity costs, should be considered.

Bowen explained that the national productivity orientation considers differences in lifetime earnings relative to educational attainment as an indicator of how investments in education affect national productivity. This orientation presumes "that in a market economy differences in earnings reflect differences in productivity" (p. 14). If the assumption is correct, the national productivity orientation "is relevant to the question of whether society as a whole is investing the right share of its resources in education" (p. 14). Bowen indicated that an assessment of societal investment should consider all private costs and public subsidies.

Bowen's prime concern for methodology, as different from contextual description, tends to clarify and confuse the categories arranged by Blaug. For example, Bowen's residual approach was more descriptive, methodologically, than Blaug's human capital formation category. However, by emphasizing the methodology of residual explanation, Bowen was also required to include Denison's production function with significantly dissimilar studies. This confusion was compounded when Bowen's methodological discussion of the returns-to-education approach also included elements of Denison's study. Through examining the Blaug and Bowen attempts, however, it is possible to see human capital studies as divided among three major methodological approaches: (a) the production function approach, (b) the measurement of the returns approach, and (c) the aggregate accounting approach. Validating these proposed classifications may prove useful for dividing the literature, examining techniques of empirical analysis, and designing future research.

Brief Criticisms

A thorough review of the criticisms lodged against human capital theory would be instructional, especially if the counterarguments provided most energetically by Schultz (1971) were considered. In fact, authors outside the field have repeatedly praised scholars of human capital theory for their characteristic self-disclo-

sure of critical aspects (Abramovitz, 1962; Benson, 1978; Blaug, 1978; Bowen, 1964). In retrospect, broadly conceived theoretical criticisms were effectively dismissed by Fisher (1906), whereas philosophical and moral criticisms arising from various senses of social consciousness were patently addressed by Schultz (1963). The most plausible criticisms of human capital theory are likely to endure, however, because they are substantively premised on methodological imperfections.

Benson (1978) provided considerable insight into criticisms of methodology which primarily seemed to arise from underlying assumptions and statistical constructs. He stated that "human capital theory rests on two basic assumptions: 1. Education helps develop skills of work, that is, improves the capacity of the worker to be productive. 2. Earned income reflects marginal productivities of different categories of workers" (p. 101).

Addressing the development of worker skills, Benson asserted that on-the-job training would logically contribute more to worker productivity than conventional human capital analysis acknowledged. In support of this logic, he cited Mincer's (1974) analysis, which included formal education, work experience, and the number of weeks worked as statistical measures. Benson also suggested that the value of education as a means of developing worker capacities may depend on the production mix—what is produced and the capital provided for that production (p. 72).

Addressing the assumption that income is a reflection of worker productivity, Benson narrated what he considered a very damaging criticism:

> Outside a few professional fields, there is little association between educational attainment and the ability to perform in a given line of work. The salary and wage differentials reflect, not differences in performance, but the simple regard that employers hold for educational attainments per se. (p. 94)

Closely related to this screening hypothesis is Benson's discussion of the mediative effects of ability on both assumptions, suggesting that ability and education are complementary factors relating to worker income and worker productivity (p. 93).

Critical exploration of the statistical constructs supporting human capital methodologies would be more clearly and efficiently conveyed in specific reference to individual studies. Nevertheless, a few of the major criticisms may be mentioned through association with critical reviews of benchmark publications. For example, Abramovitz (1962) reviewed the production function study conducted by Denison (1962) and suggested that indexes constructed to represent variables in the function inherently assumed qualitative homogeneity. Statistically and factually, Abramovitz observed that qualitative factors are inherently heterogeneous. Benson (1978) supported this criticism more candidly by incorporating production mix heterogeneity into the discussion, asserting that production function analysis "is interesting as a description of what has happened in the past . . . but it should not be used uncritically to predict the future" (p. 73).

In a closely related discussion, Benson also explained that aggregated national accounts generally exclude external costs and benefits, social valuations, and quality of life attributes (pp. 42–48). Similarly, Mincer (1965) expressed reluctant concern regarding comments made conclusively by Schultz (1963). Mincer sug-

gested that the missing external and nonpecuniary elements associated with statistical constructs created theoretical inconsistencies, especially when optimal educational investment questions were considered.

Within the purview of optimal investment analysis, Benson (1978) suggested that the greatest limitation of the rate of return method was imposed by its basic education and income levels formula. He asserted that this formula tends to overestimate the contribution of education to economic growth by inadequately accounting for other important influences such as ability (p. 93). A similar reference to ability was made in Solow's (1965) review of Becker's (1964) rate of return monograph, although Solow seemed complacently satisfied with Becker's treatment. Benson and Solow seemed closer in agreement that other important influences should be included in the basic formula, even though each admitted that many such influences may be immeasurable. Expanding a theme articulated by Schultz (1961, 1963), Solow suggested that elements of present and future consumption could have been more aggressively considered by Becker.

While criticisms of the general theory pale in comparison to those of methodology, it seems appropriate to state that credible applications of human capital theory must be accompanied by critical qualifications. Bearing this in mind, perhaps Schultz put it best by stating,

> One view is to look on these empirical imperfections as unavoidable and forget about them. But this view is all too convenient, hard as it is to show precisely what can be done to reduce such flaws in our estimates of the costs and benefits of schooling. We should not only be on our guard in recognizing the limitations of these estimates but also develop alternative approaches to check our confidence in these matters. (1971, p. 58)

Today, Schultz's statement seems to describe exactly how the field has evolved. Because an optimal methodological approach was never established, the field has grown laterally through the development of alternative approaches to multiple applications. This progression of lateral growth also poses implications for critics. The validity of criticisms lodged against human capital theory must be measured in terms of specific applications. The social value and critical aspects of each study are everywhere in proportion to the ways in which results and conclusions are expressed and used. Human capital theory is highly theoretical in an empirical sense, adding useful information to that which is already known; it does not provide bottom line answers or solutions.

Conclusion

The purpose of this review has been to present the historical and methodological foundations of human capital theory more usefully and more comprehensively than common sources of reference. For the most part, textbooks that facilitate the study of education finance and the economics of education contribute to the understanding of human capital theory; however, most likely due to constrained publication resources, their presentation of the history and the alternative methodologies which comprise the field of inquiry are woefully inadequate. Furthermore, diverse applications and interpretations of the general theory across many disciplines have rendered the study of human capital through journal publications and conference presentations a frustrating and wholly inefficient experience. These

circumstances have contributed to widespread misunderstanding of the work that has been accomplished as well as supported the state of empirical stagnation revealed by Blaug (1976, 1992). The critical position of this review has been that by focusing on the work accomplished during the time period when the field was articulated and established by its founders, a comprehensive understanding of the general theory and major methodologies which support the human capital position will be attained. This knowledge may be used to interpret the significance of research studies that were completed after the foundations of the field were established, inform researchers in their design of future human capital theory applications, and improve empirical techniques and methodological approaches within the field.

The theory of human capital as applied to education has paralleled a powerful paradigm created by the general public: Pursuit of education leads to individual and national economic growth. Especially where schoolchildren are concerned, this paradigm of thinking has placed local educators and education policymakers under considerable pressures from the voting public. Parents want local educators to provide children with diplomas, if not specific job skills, that will ensure fruitful participation in the economy. Industrialists want educators at local levels as well as the education system at large to graduate young people who are ready to function productively in a competitive workforce. All too often, public opinion swells to exaggerate the economic purpose of education, especially during sustained periods of economic downturn, to unfairly scrutinize educators, the education system, and education policies on bases of economic rather than educational importance.

While educators know that the primary and most important purposes of education are not economic, they also recognize the effects that public opinion can have on funding for the provision of education as well as the means and methods by which education is provided. When public opinion asserts that education is a major determinant of economic growth, and the economy is doing well, human capital theory provides a powerful rationale that favors increased educational support. Financial aid and student loans to students and their families as well as expenditures for teacher preparation, modern school systems, and educational technology make good economic sense. During these times of good harvest, the public consensus seems to be that expenditures for expanded educational programs and inclusive education policies are solid investments.

When the economy takes a turn for the worse, however, the public conception of education as an economic investment can become devastating. Then, in addition to budget shortfalls caused by a declining tax base, educators and education policymakers must address public charges that investments in education are not paying off. Why is there unemployment among the educated? How can there be a decline in the standard of living when there are increased levels of educational attainment? How can education be used to guarantee economic growth? Although they are unaccustomed to answering these economic questions, educators are often held accountable to them by the public perception that education has an economic purpose.

There is an economic component to education: Education entails economic costs, and it provides individuals and society with benefits that are difficult to measure with economic certainty. The field of human capital theory provides an

empirical framework that begins to measure these economic relationships. With a complete understanding of the foundations of human capital theory, educators and education policymakers can formulate their own evaluations of human capital studies from diverse disciplines and specializations such as economics, sociology, psychology, political science, human development, and business to address public concerns that are based on economic trends and cycles, design educational programs that contribute to economic growth without compromising educative purpose, and, perhaps, to clearly define the economic component of education.

References

Abramovitz, M. (1956). *Resource and output trends in the United States since 1870.* New York: National Bureau of Economic Research.

Abramovitz, M. (1962). Economic growth in the United States [Review of the book *The sources of economic growth in the United States and the alternatives before us*]. *The American Economic Review, 52,* 762–782.

Becker, G. S. (1960). Underinvestment in college education? *The American Economic Review, 50,* 346–354.

Becker, G. S. (1964). *Human capital: A theoretical and empirical analysis, with special reference to education.* New York: National Bureau of Economic Research.

Becker, G. S. (1975). *Human capital: A theoretical and empirical analysis, with special reference to education* (2nd ed.). New York: National Bureau of Economic Research.

Becker, G. S. (1993). *Human capital: A theoretical and empirical analysis, with special reference to education* (3rd ed.). Chicago: University of Chicago Press.

Benson, C. S. (1978). *The economics of public education* (3rd ed.). Boston: Houghton Mifflin.

Blaug, M. (1966). *Economics of education: A selected annotated bibliography.* New York: Pergamon Press.

Blaug, M. (1970a). *Economics of education: A selected annotated bibliography* (2nd ed.). New York: Pergamon Press.

Blaug, M. (1970b). *An introduction to the economics of education.* Baltimore: Penguin Books.

Blaug, M. (1976). The empirical status of human capital theory: A slightly jaundiced survey. *Journal of Economic Literature, 14,* 827–855.

Blaug, M. (1978). *Economics of education: A selected annotated bibliography* (3rd ed.). New York: Pergamon Press.

Blaug, M. (Ed.). (1992). *The economic value of education: Studies in the economics of education.* Brookfield, VT: Ashgate Publishing.

Bowen, W. G. (1964). *Economic aspects of education: Three essays.* Princeton, NJ: Princeton University, Department of Economics, Industrial Relations Section.

Cohn, E., & Geske, T. G. (1990). *The economics of education* (3rd ed.). New York: Pergamon Press.

Corazzini, A. J. (1967). When should vocational education begin? *The Journal of Human Resources, 2,* 41–50.

Danzberger, J. P., Kirst, M. W., & Usdan, M. D. (1992). *Governing public schools: New times new requirements.* Washington, DC: Institute for Educational Leadership.

Denison, E. F. (1962). *The sources of economic growth in the United States and the alternatives before us.* New York: Committee for Economic Development.

Denison, E. F. (1974). *Accounting for United States economic growth, 1929–1969.* Washington, DC: The Brookings Institution.

Domar, E. D. (1961). On the measurement of technological change. *The Economic Journal, 71,* 709–729.

Fabricant, S. (1959). *Basic facts on productivity change.* New York: National Bureau of Economic Research.
Fisher, I. (1906). *The nature of capital and income.* New York: Macmillan.
Friedman, M. (1953). Choice, chance, and the personal distribution of income. *The Journal of Political Economy, 61,* 277–290.
Friedman, M., & Kuznets, S. (1945). *Income from independent professional practice.* New York: National Bureau of Economic Research.
Johnes, G. (1993). *The economics of education.* New York: St. Martin's Press.
Johnson, H. G. (1960). The political economy of opulence. *The Canadian Journal of Economics and Political Science, 26,* 552–564.
Kendrick, J. W. (1958). *Productivity trends in the United States.* Unpublished manuscript.
Kendrick, J. W. (1961). *Productivity trends in the United States.* New York: National Bureau of Economic Research.
Kiker, B. F. (1968). *Human capital: In retrospect.* Columbia: University of South Carolina, Bureau of Business and Economic Research, College of Business Administration.
Levin, H. M. (1989). Mapping the economics of education: An introductory essay. *Educational Researcher, 18*(4), 13–16, 73.
Marshall, A. (1948). *Principles of economics* (8th ed.). New York: Macmillan.
Mill, J. S. (1926). *Principles of political economy, with some of their applications to social philosophy* (W. J. Ashley, Ed.). New York: Longmans, Green and Company.
Mincer, J. (1958). Investment in human capital and personal income distribution. *The Journal of Political Economy, 66,* 281–302.
Mincer, J. (1965). [Review of the book *The economic value of education*]. *The American Economic Review, 55,* 637–638.
Mincer, J. (1974). *Schooling, experience, and earnings.* New York: Columbia University Press.
Psacharopoulos, G. (1973). *Returns to education: An international comparison.* San Francisco: Jossey-Bass.
Schultz, T. W. (1961). Investment in human capital [Presidential address delivered at the annual meeting of the American Economic Association, Saint Louis, MO, December, 1960]. *The American Economic Review, 51,* 1–17.
Schultz, T. W. (1963). *The economic value of education.* New York: Columbia University Press.
Schultz, T. W. (1971). *Investment in human capital: The role of education and research.* New York: The Free Press.
Schultz, T. W. (1981). *Investing in people: The economics of population quality.* Los Angeles: University of California Press.
Smith, A. (1952). An inquiry into the nature and causes of the wealth of nations. In R. M. Hutchins & M. J. Adler (Eds.), *Great books of the western world: Vol. 39. Adam Smith.* Chicago: Encyclopaedia Britannica. (Original work published 1776)
Solow, R. M. (1957). Technical change and the aggregate production function. *The Review of Economics and Statistics, 39,* 312–320.
Solow, R. M. (1965). [Review of the book *Human capital: A theoretical and empirical analysis, with special reference to education*]. *The Journal of Political Economy, 73,* 552–553.
Swanson, A. D., & King, R. A. (1991). *School finance: Its economics and politics.* New York: Longman.
Vaizey, J. (1962). *The economics of education.* London: Faber and Faber.
Woodhall, M. (1987). Economics of education: A review. In G. Psacharopoulos (Ed.), *Economics of education: Research and studies* (pp. 1–8). New York: Pergamon

Press.
Wright, J. W. (Ed.). (1992). *The universal almanac 1992.* New York: Andrews and McMeel.

Author

SCOTT R. SWEETLAND is Associate, Department of Educational Organization, Administration and Policy, State University of New York at Buffalo, Buffalo, NY 14260-1000. He specializes in economics and finance of education.

Received June 28, 1995
Revision received April 5, 1996
Accepted June 20, 1996