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*Introduction to the Second Edition*<sup>1</sup>

In the preface to the first edition, written about a decade ago, I remarked that in the preceding few years "interest in the economics of education has mushroomed throughout the world." The mushrooming has continued unabated; a bibliography on the economics of education prepared in 1957 would have contained less than 50 entries, whereas one issued in 1964 listed almost 450 entries and its second edition in 1970 listed over 1300 entries.<sup>2</sup> Moreover, this bibliography excludes the economic literature on health, migration, and other nonschooling investments in human capital, which has expanded even faster.<sup>3</sup>

<sup>1</sup> I am indebted for helpful suggestions to Robert Michael, Victor Fuchs, and William Landes.

<sup>2</sup> See M. Blaug, *Economics of Education*, 2nd ed., London, 1970.

<sup>3</sup> I do not attempt to summarize or survey this growing body of literature on investments in human capital. A number of surveys and collections of essays have been published recently and the interested reader is referred to these. See, for example, UNESCO, *Readings in the Economics of Education*, United Nations Educational, Scientific and Cultural Organization, Paris, France, 1968; M. Blaug, *Economics of Education*, Elmsford, N.Y., 1970; B. F. Kiker, *Investment in Human Capital*, Columbia, S.C., 1971. Within the National Bureau of Economic Research, there have been three recent surveys of certain aspects of this literature; see Jacob Mincer, "The Distribution of Labor Incomes: A Survey with Special Reference to the Human Capital Approach," *Journal of Economic Literature*, 8, 1, March 1970; Finis Welch, "The NBER Approach to Human Resources Problems," *NBER An-*

This sustained interest in human capital and the continuing attention shown to the first edition of this book has encouraged me to issue a second edition. Nothing in the first edition has been changed; even the errors remain, conspicuous as they are to me now.<sup>4</sup> I have, however, incorporated three additional papers written within the first few years after the publication of the first edition. One of these three additions has not previously been published and another has not been readily available.

Chapter II developed an analysis of postschool investment and used it to explain age-earnings profiles and to interpret data on earnings per hour. That chapter also introduced a distinction between specific and general training to explain the relation between job skills and labor turnover, and the "hoarding" of labor during cyclical swings in business. These concepts have spawned a large and important literature that has successfully explained many aspects of the labor market in the United States and elsewhere.<sup>5</sup>

Chapter III introduced an analysis of the accumulation of human capital over the life cycle to explain, among other things, the shape of age-earnings profiles, the concentration of investments at earlier ages, and the personal distribution of earnings. This chapter also helped stimulate a large and empirically relevant literature.<sup>6</sup>

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*nual Report*, September 1971; and Theodore W. Schultz, "Human Capital: Policy Issues and Research Opportunities," in *Human Resources*, Fiftieth Anniversary Colloquium, Vol. VI, NBER, 1972.

<sup>4</sup> Let me mention only two here. In the adjustment (in Appendix A, section 1C) to determine what earnings would have been if nobody had been unemployed, I used the duration of unemployment; this was incorrect because I had, and used, information on the fraction unemployed. (I am indebted to Robert Solow for pointing out this error.) Fortunately, a correct adjustment gives only slightly different results from the incorrect one used. There is a more serious error in my discussion of the riskiness of investments in education (Chapter IV, section 4). I ignored the then developing literature on optimal portfolios, and did not derive my measure of marginal risk—the variance in the rate of return—from an analysis of utility maximization. (I am indebted to Lawrence Olson for pointing out these difficulties to me.)

<sup>5</sup> For a sampling of this literature, see Donald O. Parsons, "Specific Human Capital: An Application to Quit Rates and Layoff Rates," *Journal of Political Economy*, 80, 6, 1120–1143 (November–December 1972); Sherwin Rosen, "Learning and Experience in the Labor Market," *Journal of Human Resources*, 7, 3, Summer 1972, pp. 326–342; Lester Telser, *Competition, Collusion, and Game Theory*, Chicago, 1972; Masatoshi Kuratani, "A Theory of Training, Earnings, and Employment: An Application to Japan," Ph.D. dissertation, Columbia University, 1973; and L. Landes, "Male-Female Wage Differentials by Occupation," Ph.D. dissertation, Columbia University, 1973.

<sup>6</sup> See, for example, Jacob Mincer, "On-the-Job Training: Costs, Returns, and Some Implications," *Journal of Political Economy*, 70, 5, Part 2, October 1962, pp. 50–79; Yoram Ben-Porath, "The Production of Human Capital and the Life Cycle of Earnings," *Journal of Political Economy*, 75, 4, August 1967, Part 1, pp. 352–

The personal distribution of earnings is partly determined by the distribution of, and the returns from, human capital. Mincer is responsible for the pioneering analysis that relates the distribution of earnings to human capital.<sup>7</sup> Section 3 of Chapter III extended his analysis by relating the distribution of earnings explicitly to rates of return and investment costs.

The additional material added in the second edition includes a portion of a paper, written jointly with Barry R. Chiswick,<sup>8</sup> which provides a convenient formulation for statistical estimation of the relation between the log of earnings, rates of return to human capital, and the time spent investing in human capital. Regression equations derived from this formulation are developed to estimate the contribution of schooling to earnings inequality in the United States, especially its contribution to the difference in earnings inequality between the South and the North. This line of empirical analysis has more recently been extended to include postschool investment in a major study by Mincer,<sup>9</sup> and in other studies as well.<sup>10</sup>

In the first edition, although Chapter III assumed that individuals maximize their well-being as they accumulate human capital over their lifetime, no explicit model of utility or wealth maximization was developed. Therefore, the factors determining the distribution of investments at different ages were not explicitly analyzed. In my Woytinsky Lecture, published in 1967 and reprinted here as an addendum to Chapter III (see p. 94), a model of wealth maximization is developed that explains the distribution of investments, in particular the decline in investments over time, by (a) the decline in benefits from additional capital as fewer years of life remain, and (b) the rise in

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365; Michael Grossman, "On the Concept of Health Capital and the Demand for Health," *Journal of Political Economy*, 80, 2, March-April 1972, pp. 223-255; and Yoram Weiss, "Investment in Graduate Education," *American Economic Review*, 61, December 1971, pp. 833-852.

<sup>7</sup> See Jacob Mincer, "Investment in Human Capital and Personal Income Distribution," *Journal of Political Economy*, August 1958.

<sup>8</sup> Gary S. Becker and Barry R. Chiswick, "Education and the Distribution of Earnings," *American Economic Review*, May 1966.

<sup>9</sup> See his *Schooling, Experience, and Earnings*, NBER, 1974.

<sup>10</sup> See, for example, Barry R. Chiswick, *Income Inequality: Regional Analyses within a Human Capital Framework*, NBER, 1974; Thomas Johnson, "Returns from Investment in Human Capital," *American Economic Review*, 60, 4, September 1970, pp. 546-560; C. Michael Rahm, "The Occupational Wage Structure," Ph.D. dissertation, Columbia University, 1971; Jacob Mincer and Solomon Polachek, "Family Investments in Human Capital: Earnings of Women," *Journal of Political Economy*, 82, 2, March-April 1974; and Frank Stafford and G. Johnson, "The Earnings and Promotion of Women Faculty," Department of Economics, University of Michigan, mimeo, February 1973.

investment costs because foregone earnings rise as human capital is accumulated.<sup>11</sup>

Here the analysis goes behind the distribution of human capital and rates of return and examines the underlying distribution of opportunities and abilities. Since the observed distribution of earnings results from the interaction of these underlying distributions, the relative importance of opportunities and abilities is not easily "identified," although some tests are suggested. I have added a supplement to this discussion of "identifiability" that is motivated by many recent attempts to assess the independent effect of family background on earnings. It shows why these attempts understate the effect of background, and overstate the effect of human capital, on earnings, perhaps by substantial amounts.

The Woytinsky lecture also analyzes the effects on inequality and skewness in earnings of more equal opportunity, minimum schooling legislation, and "objective" selection of applicants to scarce places in schools. In it I attempt to explain, too, why earnings are more equally distributed and less skewed than incomes from nonhuman capital. Although the formulation has some unsolved analytical difficulties, I believe that this paper opens up a promising line of investigation that has received insufficient attention.<sup>12</sup>

The models of capital accumulation in the lecture—and in Ben-Porath's paper and several subsequent ones—have several limitations. Since the total hours supplied to the market sector are taken as given, these models do not consider the interaction between changes in wage rates over the life cycle resulting from the accumulation of human capital and the optimal allocation of time between the market and nonmarket sectors. Moreover, human capital is assumed to affect only earnings and the production of additional human capital, and to have no direct effect on utility or consumption.

These and some other restrictions are relaxed in the final essay added to this second edition. This paper, which I wrote and circulated in 1967 but never published, builds on the new approach to

<sup>11</sup> At about the same time, a similar but more rigorously formulated model was independently developed by Ben-Porath (*op. cit.*).

<sup>12</sup> However, see the discussions in Mincer, "The Distribution of Labor Incomes: A Survey with Special Reference to the Human Capital Approach," *Journal of Economic Literature*, 8, 1, March 1970, pp. 1-26; Barry Chiswick, "Minimum Schooling Legislation and the Cross-Sectional Distribution of Income," *Economic Journal*, 79, 3.5, September 1969, pp. 495-507; and Sherwin Rosen, "Income Generating Functions and Capital Accumulation," Harvard Institute of Economic Research, June 1973, unpublished.

household behavior. In this approach, households produce the commodities that enter their utility functions by combining market-purchased goods and services, their own time, and human capital and other environmental variables.<sup>13</sup> With this approach I consider the uses of an individual's time at different ages; in particular I focus on the allocation of time to three activities: the production of nonmarket commodities (nonmarket time); the production of human capital (investment time); and the production of earnings (labor market time). I am also able to treat systematically a direct effect of human capital on consumption by permitting it to affect the efficiency of household production.<sup>14</sup>

The empirical analysis from the first edition is left intact, even though a substantial body of additional evidence has been accumulated since then, because the major findings have stood up remarkably well to the additional evidence. These findings include:

1. The average money rate of return on a college education to white males is between 11 and 13 per cent, with higher rates on a high-school education, and still higher rates on an elementary-school education. This range for the rate of return on college education, as well as the decline in the rate with successive stages of schooling, has also been found in many subsequent studies.<sup>15</sup>

2. The higher earnings of, say, college graduates compared to high-school graduates are partly due to the college graduate's greater ability, ambition, health, and better educated and more successful parents. I concluded from an examination of several kinds of evidence that differences in these and related traits explain a relatively small part of the earnings differentials between college and high-school graduates (but a larger part of the differentials at lower education levels). Hence, rates of return to college graduates that are unadjusted for "selectivity" are not bad guides to the true rates. Subsequent studies have adjusted

<sup>13</sup> The approach is developed in my "A Theory of the Allocation of Time," *Economic Journal*, September 1965. A recent exposition can be found in Robert T. Michael and Gary S. Becker, "The New Approach to Consumer Behavior," *Swedish Journal of Economics*, 75, 4, 1973.

<sup>14</sup> A more extensive treatment of this subject, including some empirical work, can be found in Robert T. Michael, *The Effect of Education on Efficiency in Consumption*, NBER, 1972.

<sup>15</sup> See, for example, W. L. Hansen, "Total and Private Rates of Return to Investment in Schooling," *Journal of Political Economy*, 71, April 1963, pp. 128-140; G. Hanoch, "An Economic Analysis of Earnings and Schooling," *Journal of Human Resources*, 2, Summer 1967, pp. 310-329; and T. W. Schultz, *Investment in Human Capital*, New York, 1971.

for selectivity with a variety of data sources, and their conclusions usually have been quite similar to mine.<sup>16</sup>

Several papers in recent years have tried to formalize the rather old notion that education is largely a device to screen out abler persons for employers, and that, therefore, only a small part of earnings differentials by education can be attributed to the education per se.<sup>17</sup> *Even if schooling also works in this way, the significance of private rates of return to education is not affected at all.* Moreover, it should be noted that virtually no effort has been made to determine the empirical importance of screening. Furthermore, several major empirical issues must be resolved if screening is to be the primary explanation of earnings differentials. For example, college would be a horrendously expensive "employment agency": each year of college cost a typical individual in 1970 at least \$6000 and cost society at least \$1500 more than that. Surely, a year on the job or a systematic and intensive interview and applicant-testing program must be a much cheaper and more effective way to screen. My own opinion is that schooling-as-screening must occur in a world with imperfect information, but is a relatively minor influence in determining earnings differentials by education.

3. The evidence I examined indicated that rates of return on college and high-school education declined from about 1900 to 1940, but not after 1940, even though the relative number of college and high-school graduates also grew rapidly after 1940. I concluded that demand shifted more toward educated persons after 1940, partly due to the rapid growth of expenditures on R. and D., military technology, and services. The absence of any decline in rates of return after 1940

<sup>16</sup> For a sampling, see Orley Ashenfelter *et al.*, "Graduate Education, Ability, and Earnings," *Review of Economics and Statistics*, February 1968, pp. 78-86; Zvi Griliches and W. M. Mason, "Education, Income, and Ability," *Journal of Political Economy*, 80, May-June 1972, pp. S74-S108; W. L. Hansen, B. A. Weisbrod, and W. J. Scanlon, "Schooling and Earnings of Low Achievers," *American Economic Review*, 60, 3, June 1970, pp. 409-418; B. Weisbrod and P. Karpoff, "Monetary Returns to College Education, Student Ability and College Quality," *Review of Economics and Statistics*, November 1968; and A. Leibowitz, "Home Investments in Children," *Journal of Political Economy*, 82, 2, Supplement, March-April 1974, pp. S111-S131.

<sup>17</sup> See P. J. Taubman and T. J. Wales, "Higher Education, Mental Ability, and Screening," *Journal of Political Economy*, 8, 1, January-February 1973, pp. 28-55; M. Spence, "Market Signalling," Ph.D. dissertation, Department of Economics, Harvard University, 1972; J. E. Stiglitz, "The Theory of 'Screening,' Education, and the Distribution of Income," Cowles Foundation Discussion Paper #354, Yale University, March 1973; K. J. Arrow, "Higher Education as a Filter," in K. Lumsden, ed., *Efficiency in Universities*, New York, Elsevier, 1974.

has been confirmed in a few subsequent studies.<sup>18</sup> Perhaps the current (1973) weak market for highly skilled manpower is the beginning of a resumption of the earlier decline. Note, however, that the absence of any decline after 1940 is not unique in American history; skill differentials, and thus presumably rates of return on education, apparently did not decline from 1860 to 1890.<sup>19</sup>

4. Average money rates of return on education are not the same for all groups; they are higher on college education for urban white males than for black or rural males, and higher for black than for white women. The evidence I examined suggested that these differences in rates led to corresponding differences in the fraction of high-school graduates going on to college. This effect of rates of return on the incentive to acquire education has been found in other studies.<sup>20</sup> For example, a growth in the monetary return to blacks from a college education in the 1960s has apparently sizably increased their number going to college, as well as shifted their fields of specialization: out of professions that cater to segregated black markets, such as clergy and medicine, and into more integrated professions, such as business and engineering.<sup>21</sup>

5. In Chapter VII, I calculated age-human-wealth profiles for different education classes that show the relation between age and the present value of future earnings, and used them to understand, among other things, life-cycle variations in savings. Some studies have continued this analysis of the linkage between the accumulations of human and nonhuman wealth.<sup>22</sup> I also drew on evidence for slaves, the one example of an explicit market that trades and prices human capital stocks rather than simply the services yielded by these stocks. A major and insightful study has recently appeared that interprets the market

<sup>18</sup> See Z. Griliches, "Notes on the Role of Education in Production Functions and Growth Accounting," in *Education, Income and Human Capital*, W. L. Hansen, ed., NBER, 1970; and F. Welch, "Education in Production," *Journal of Political Economy*, 78, 1, January-February 1970.

<sup>19</sup> See C. Long, *Wages and Earnings in the United States, 1860-1890*, Princeton, 1960.

<sup>20</sup> See R. B. Freeman, *The Market for College-Trained Manpower*, Cambridge, 1971.

<sup>21</sup> See R. B. Freeman, "Changes in the Labor Market for Black Americans, 1948-1972," *Brookings Papers on Economic Activity* 1, Washington, D.C., 1973, pp. 67-120; and Finis Welch, "Education and Racial Discrimination," in O. Ashenfelter and A. Rees, eds., *Discrimination in Labor Markets*, Princeton, 1973.

<sup>22</sup> See G. Ghez and G. S. Becker, *The Allocation of Time and Goods over the Life Cycle*, NBER, 1974; and I. Ehrlich and U. Ben-Zion, "A Model of Productive Saving," mimeo, University of Chicago, 1972.



for slaves in the United States in terms of the theory of investment in human capital.<sup>23</sup>

The continuing vigor of the research in human capital is increasing testimony that this area of study is not one of the many fads that pass through the economics profession, but an important and lasting contribution. The major reason, in my judgment, is that the theoretical and empirical analyses have been closely integrated, with the theory often inspired by empirical findings.<sup>24</sup> The intimate relation of theory and observation has built a strong foundation for future work that cannot easily be torn down or ignored.

Therefore, I am confident that the analysis of human capital will continue to be a fruitful field of research. Although important studies of the effects of human capital in the market sector can be expected, I anticipate that the excitement will be generated by studies of its effects in the nonmarket sector. Major insights into the determinants of fertility, the production of health, the benefits from schooling to women who do not participate in the labor force, the productivity of marriage, and other topics will result from an integration of the theory of human capital with the allocation of time, household production functions, and the theory of choice.<sup>25</sup>

In short, the prospects for the analysis of human capital look almost as bright to me today as they did during its salad days.

<sup>23</sup> R. W. Fogel and S. Engerman, *Time on the Cross*, Boston, 1974.

<sup>24</sup> By contrast, in some other areas of research, such as research on economic growth, much of the theory seems to have developed quite independently of any empirical studies.

<sup>25</sup> For some beginnings, see Michael, *op. cit.*; Grossman, *op. cit.*; and the essays in T. W. Schultz, ed., *Economics of the Family: Marriage, Children, and Human Capital*, New York, NBER, 1975.