Volume Title: Schooling, Experience, and Earnings

Volume Author/Editor: Jacob A. Mincer

Volume Publisher: NBER

Volume ISBN: 0-870-14265-8

Volume URL: http://www.nber.org/books/minc74-1

Publication Date: 1974

Chapter Title: Summary and Agenda

Chapter Author: Jacob A. Mincer

Chapter URL: http://www.nber.org/chapters/c1770

Chapter pages in book: (p. 128 - 144)

8

Summary and Agenda

8.1 SUMMARY OF FINDINGS

The first task of the study was to derive and estimate the relation between accumulated investments in human capital of workers and their earnings. This human capital earnings function was then applied to answer two questions: (1) How much of the existing inequality in the distribution of labor incomes can be attributed to individual differences in investments in human capital? (2) Can the intricate yet rather stable patterns of the earnings structure be understood in terms of human capital investment behavior? The "earnings structure" is the aggregate earnings distribution and its partition into schooling and age subgroups. The "patterns" are the comparative sets of means, variances, and shapes of the component and aggregate distributions of earnings.

The summary which follows is by no means comprehensive, nor does the exposition follow the sequence or methods of the analysis. The findings are described broadly and somewhat selectively in terms of the three research objectives of the study:

8.1.1 THE EARNINGS FUNCTION

If completion of schooling meant completion of investment in human capital, the earnings function would be approximately estimated by a simple regression of earnings (in logs) on years of schooling. As the present study indicates, the observed correlation using this "schooling model" is rather weak. Variation in earnings associated with age is not captured by the schooling model, and this omission is, in part, responsible for the low correlation. Though age can be viewed as an inherent depreciation phenomenon in the human capital terminology, the growth of earnings with age can ultimately be interpreted in the human capital model as being a consequence of net self-investment activities that are continued after the completion of schooling. The theory predicts that investments are concentrated at younger ages, but continue at a diminishing rate throughout much of the working life; because of increasing marginal costs, investments are not made all at once in a short period, but are staggered over time, and decline continuously, both because benefits decline as the payoff period shortens, and because opportunity costs are likely to rise with experience. This is true of both gross and net investments.

Since earnings are a return on cumulated net investments, they also rise at a diminishing rate over the working life, and decline when net investment becomes negative, as in old age. The typical (logarithmic) working-life earnings profile is, therefore, concave from below, as illustrated in Chart 4.3. Its rate of growth is a positive function of the amount invested and of the rate of return. Its degree of concavity depends on how rapidly investments decline over time. In effect, the earnings profile is directly proportional to the cumulated investment profile. The magnitude of the cumulated investment cannot to be observed, but it is a concave function of experience. Hence, to expand the schooling model into a more complete earnings function, the linear schooling term must be augmented by a nonlinear, concave, years-of-experience term. This function can be applied in multiple regression analysis to earnings data of individuals who differ in both schooling and age. While age is not the same as work experience, the latter can be estimated as actual age minus estimated age at completion of schooling, though direct information on experience is preferable. Clearly, direct information on experience is necessary for specifying earnings functions of individuals whose attachment to the labor force is not continuous.[1]

The human capital earnings function may be expressed either in dollars or in logs. In part, the choice depends on whether absolute or relative earnings inequalities are to be examined. If dollar values are used, the investment variables (schooling and experience) must also be expressed in dollars. If log earnings are used, then the investment variables can be expressed in units of time—years of schooling and years of experience. The time measures of investment are far more readily available than the dollar ones. For both reasons then—interest in relative comparisons and data availability—the logarithmic formulation is preferred.

The next choice concerns the specification of post-school investment as a function of time. Here the only guidance provided by theory is that annual instalments of post-school investment, and, a fortiori, their time-equivalents, must decline over the working life.

The form of the investment profile determines the form of the earnings profile. To take the two simplest forms, a linear investment decline implies a parabolic experience function, while an exponential decline of investment ratios gives rise to a type of Gompertz function. The latter yields a somewhat better fit, though such discrimination is rather weak. The Gompertz curve requires no decline of the earnings profile, a condition that is largely satisfied if data are restricted to four decades of working life and to weekly (or hourly) earnings. These conditions are fulfilled in the empirical analyses of annual earnings when weeks worked during the year are used as a standardizing variable.

The two forms of the human capital earnings function used in the analysis are the logarithmic parabola (P) and the Gompertz curve (G):

$$\ln E_{s,t} = \ln E_0 + r_s s + r_p k_0 t - \frac{r_p k_0}{2T} t^2; \qquad \text{(P)}$$

$$\ln E_{s,t} = \ln E_0 + r_s s + \frac{r_p k_0}{\beta} (1 - e^{\beta t}). \qquad \text{(G)}$$

$E_{s,t}$ is gross annual earnings of a worker with s years of schooling and t years of work experience. "Gross" earnings are inclusive,

1. Analyses of female earnings demonstrate dramatically that it is experience rather than age that matters (Mincer and Polachek, 1974).

"net" earnings exclusive, of investment expenditures. r_s and r_p are rates of return on schooling and post-school investments, respectively. k_0 is the ratio of investment to gross earnings at the start of work experience, and β is the annual decline of this ratio. T is the positive net investment period.

In principle, the earnings function represents a unification of analyses of investment parameters and income distribution; it provides an analytical expression for the earnings profile as an individual growth curve. Its coefficients combine estimates of rates of return and volumes of investment. At the same time, the coefficient of determination of the multiple regression measures the fraction of total earnings inequality (variance of logs) that can be attributed to the measured distribution of investments in human capital.

The standard procedure for estimating a rate of return to education involves discounting of differences in earnings between two groups differing in education. However, the estimated rate is not a rate of return to schooling but a weighted average of returns to schooling and to other investments in human capital in which the two groups differ.

In contrast, the earnings function regression procedure does not require pairwise comparisons and can be used to separate estimates of rates of return to schooling from the rates on other (post-school) investment activities. In the empirical work, the estimates of rates of return to schooling are produced unambiguously, but this is not quite true of the rate on post-school investments. Rough tests of the difference between these parameters are possible, however: at the present aggregative level of information, the null hypothesis of no difference cannot be rejected. Whether rates of return differ at different schooling levels can also be tested. The finding is that rates decline as schooling level rises for annual earnings, but not for hourly or weekly earnings.

Use of earnings functions also makes it possible to study the relation between schooling and post-school investments. In dollar volumes the relation is found to be positive. This finding is consistent with a notion of complementarity between the two investment forms, but does not constitute a proof. The positive correlation may simply mean that in comparing individual lifetime investment programs, the scale of investments varies more than their composition. On the basis of the comparative advantages enjoyed by different people and differing relative price structures among them, individuals substitute one form of investment for the other. Yet, because of similar ability and opportunity constraints in schooling and in job training, individuals tend to invest more or less in both. Evidently, scale effects outweigh substitution effects.

It should be noted that though more educated people invest more dollars after completion of schooling, they do not spend more time in post-school investments. The investment-earnings ratio would measure the amount of time (in years) spent in investment (training) activity, if only expenditures of time were involved. On the average, the correlation between "time-equivalents" (that is, investment-earnings ratios) of school and post-school investments appears to be weakly negative. The opportunity cost of an hour is, of course, greater at higher levels of schooling; hence, there is a positive correlation between dollar volumes of investment and schooling, even though "time" volumes are uncorrelated.

The Gompertz curve is a familiar empirical representation of industrial growth. Its fit as an individual growth curve of earnings is no mere coincidence, as the staggered investment interpretation is suitable in both cases. There is a widespread view that differs with this interpretation of individual earnings growth. According to this view, the individual earnings curve is intrinsically an age phenomenon: it reflects productivity changes due to inherent biological and psychological maturation, leveling off early and declining much later because of declining physical and intellectual vigor. There is evidence, however, to indicate that aging affects earnings only to a minor degree. In data where age and work experience can be statistically separated, the position and shape of earnings curves is found to be mainly a function of experience, not of age. Earnings profiles differ by occupation, sex, and color in systematic ways that cannot be attributed to aging phenomena. What is sometimes thought to be an alternative interpretation of the earnings profiles as "learning curves" is not at all inconsistent with the human capital investment interpretation, provided it is agreed that learning in the labor market is not costless: even if apparently costless differential "learning-by-doing" opportunities exist among jobs, competition tends to equalize the net returns, thereby imposing opportunity costs on such learning.

8.1.2 ACCOUNTING FOR INCOME INEQUALITY

As noted before, if only years of schooling are used in the earnings function, the correlation between years of schooling and (log) earnings of men of working age is less than 10 per cent. This does not mean, however, that schooling is unimportant. In part, the correlation is low because a mere counting of school years does not adequately measure direct costs of schooling and related quality aspects of education. Moreover, when the effects of post-school investments are not explicitly specified, they obscure the effects of schooling on earnings. If post-school investments differ among individuals and are important, the distribution of earnings will be increasingly affected by returns to accumulating post-school investments as years of experience increase. If post-school investments are not strongly correlated with schooling, the correlation between schooling and earnings will continuously decay with the passage of years of experience. The correlation between time-equivalents of school and post-school investment is certainly weak. The correlation between earnings (in logs) and schooling (in years) is, indeed, initially strong, reaching a coefficient of determination of one-third before the first decade of experience is over, but it declines continuously thereafter.

Theoretically, the correlation would be highest at the outset of work experience if post-school investment costs were included as part of income. Such initial "gross" earnings cannot be observed. However, the distribution of observed ("net") earnings 6–9 years later is likely to resemble the distribution of initial "gross" earnings, since net earnings are less than gross earnings, and both rise as post-school investments cumulate; after some years, net earnings begin to exceed the level of initial gross earnings. This "overtaking point" is reached after at most $1/r$ years of experience, where r is the rate of return to post-school investments. Hence this point is reached before the first decade of experience is over. In this period we observe the highest correlation between earnings and schooling.

The coefficient of determination (.33) of schooling and earnings within the overtaking subset of the earnings distribution represents an estimate of the fraction of earnings inequality that can be attributed to differences in years of schooling, since earnings are then least affected by post-school investments. The inequality of earnings at overtaking is about 75 per cent of aggregate inequality, which suggests that the distribution of schooling accounts for 25 per cent of the total (.33 × .75). Together, 50 per cent of aggregate inequality, measured by the variance of logs of annual earnings, can be attributed to the distributions of schooling and post-school investments (Chapter 3). The 50 per cent figure is an understatement, however, since actual rather than time-equivalent years of schooling were used. These fail to reflect quality differences among schools or the variation in expenditures of time and money among students attending schools of the same quality. An upward correction of the variance of schooling investments to take account of such individual differences would raise the explanatory power of schooling to about one-third of the aggregate, and the joint effects of school and post-school investments to about 60 per cent. Transitory variation in weeks worked during the year accounts for another part of aggregate earnings inequality. If so, perhaps as much as two-thirds of the inequality of "normal" (longer-run) earnings can be ascribed to the effects of the distribution of education and experience.

The estimates quoted above are largely indirect inferences, described in Chapter 3. If we restrict ourselves to direct (and incomplete) regression estimates, we find that even with the use of only two variables—years of schooling and of experience—the explanatory power of the earnings function regressions compares favorably with results of statistical studies of comparable microdata which employ a large number of explanatory variables on a more or less ad hoc basis.[2] It is far superior when weeks worked during the year is added as an explanatory variable.

It appears that the substantive conclusions about the quantitative and qualitative importance of human capital investments in the distribution of earnings are not much affected when the population is extended from white urban men to all men in 1959, or changed from (male) persons to family units.

8.1.3 THE EARNINGS STRUCTURE

There are several prominent features of the "skill" (schooling and experience) structure of earnings which appear rather stable in tem-

2. For a review of some of these studies, see Jencks et al. (1972).

poral and regional comparisons. Aggregate skewness and the growth of inequality with age are the best known. To these there may be added patterns of dispersion (variances) cross-classified by schooling and age. These are less familiar and perhaps also less stable.

The characteristic features of earnings distributions, such as aggregate skewness, and the relation of inequality to skill (or schooling) and age (or experience) have puzzled observers since detailed statistical data became available. Partial explanations, largely of the "random shock" variety, have been proposed.

In the human capital model, most features can be explained by the correlation between the stock of human capital at any stage in the life cycle and the volume of subsequent investment. That this correlation is positive in dollar terms is understandable, if individual differences in ability and opportunity which affect investment behavior tend to persist over much of the life cycle. The positive correlation between schooling and post-school investment is an example of such persistence in behavior. (See Chapters 2 and 6.)

Several implications of the positive correlation between successive instalments of investment in human capital in dollar terms can be observed: Dollar profiles of earnings "fan out" with experience and, a fortiori, with age, both across and within schooling groups. Dollar variances in these groups, therefore, increase with experience and with age. Similarly, because the dispersion of dollar schooling costs increases with the level of schooling, variances of earnings increase with level of schooling. Since mean earnings increase with age and with schooling there is a positive correlation between means and variances in age and schooling subgroups of the earnings distribution. This correlation contributes to the appearance of positive skewness in the aggregate earnings distribution. This factor is independent of, and in a way more basic than, the shape of the distribution of schooling, which in the past also contributed to the positive skewness of earnings. The change in the distribution of schooling during the past two decades from positive to negative skewness implies that the distribution of schooling is no longer an important factor in explaining the persistence of positive skewness in the distribution of earnings. Indeed, the 1959 distribution of earnings at the overtaking stage of the life cycle is not skewed at all. The aggregate distribution, however, remains positively skewed.

If we define relative skill differentials in wages by percentage differentials in wage rates among schooling groups having comparable years of *experience,* we find that these are almost invariant over the working life. Since the logarithmic experience profiles of wages are concave, this finding implies that relative wage differentials among schooling groups increase with *age*. However, *within* schooling groups, relative wage dispersions, measured by variances of logs, show somewhat different profiles, depending on the level of schooling. When plotted against age, all are U-shaped along at least some portion of the curve, and clearly so at the center of the schooling distribution, that is, for the high-school group (see Chart 6.2). For the post-high-school group, the profile is mainly increasing. Within lower schooling groups, it first decreases and then levels off.

It was shown that both the wage differentials between schooling levels and the inequality patterns within the middle levels of schooling reflect a negligible correlation between post-school earning capacity and time-equivalent post-school investment. This same lack of correlation underlies the previously noted invariance between experience and relative wage differentials among schooling groups. The phenomenon arises if experience profiles of post-school investments, in time-equivalent units, are not systematically different among schooling groups. Put another way, it arises when the elasticity of post-school investments (in dollars) with respect to post-school earning capacity is, on average, unitary across schooling groups. Within schooling groups, however, the elasticity of investment with respect to earning capacity appears to increase with schooling level: it is less than 1 at lower levels and greater than 1 at higher levels.

The size of the elasticities and the systematic positive relation between schooling level and elasticity of investment with respect to earning capacity raise questions for further research. In this connection, it is noteworthy and suggestive that very similar patterns are found in studying the consumption function: The "long-run" elasticity of saving with respect to income is not clearly different from 1, and the "short-run" or cross-sectional elasticity increases with schooling level (Solmon, 1972).

The differential patterns of log variances by schooling level can also be analyzed by age: the ranking of log variances of earnings is inverse to schooling level at young ages, positive at older ages. Also, the age-schooling profiles of absolute and relative wage distributions aggregate to the well-known leptokurtic shape, with a skewness that is positive in dollars and negative in logarithms. Together with some observations on correlations of earnings of members of a Consumers Union panel, the distinctive profiles of relative variances constitute strong evidence for the human capital and against the purely stochastic theories of income distribution: Systematic, rather than chance, variation dominates individual earnings histories and individual differences in earnings.

8.2 SOME QUESTIONS AND AN AGENDA FOR FURTHER RESEARCH

8.2.1 ABILITY, OPPORTUNITY, AND INVESTMENT

The model of worker self-investment as the basic determinant of earnings might be criticized as giving undue weight to the supply of human capital while ignoring the demand side of the market. Certainly, demand conditions in general, and employer investments in human capital of workers in particular, affect wage rates and time spent in employment, and thereby affect earnings. It should be clear, however, that the earnings function in this study is a "reduced form" equation, in which both demand conditions and supply responses determine the levels of investment in human capital, rates of return, and time worked. The present approach is an initial and simple one, and greater methodological sophistication is clearly desirable. There is a need to relate employers' behavior both as demanders of and direct investors in human capital to the observed distribution of earnings.[3]

The investment-earnings relation in this study is in reduced form also in the sense of describing equilibrium loci in the (human) capital market as well as in the labor market in which human capital is supplied as a factor of production. As Becker describes in his analysis, the cross-sectional earnings function results from two simultaneous structural relations in the (human) capital market. These are demand functions (D_i), which relate individual investments to marginal rates of return, and supply functions (S_i), which relate the volume of funds that can be obtained for human capital investment to their marginal "interest" costs. Of course, worker demand for self-investment (D_i) is, in part, derived from employer demand for the workers' human capital.

3. For an interesting attempt in an analysis of the earnings distribution in Japan, see Kuratani (1972).

The amount the individual invests, the magnitude of his marginal and average returns, and therefore the volume of his earnings are simultaneously and optimally determined by the intersection of the demand and supply curves. Overall labor and capital market conditions determine the group (or sectoral) levels of the *D* and *S* curves, individual levels of demand are determined by tastes and abilities, and differences in levels of supply curves represent differences in investment financing opportunities. Thus, it is equally correct to say that the distribution of earnings is determined by the distribution of accumulated human capital and of rates of return to human capital investment or that the distribution of earnings is determined by the distribution of ability and opportunity. Or, putting it in a causal hierarchy, the distribution of accumulated human capital is a proximate determinant of the distribution of earnings, and is treated that way in this study. In turn, ability and opportunity determine the distribution of human capital, and this is the focus of Becker's (1967) analysis.

A low correlation between investment in human capital and earnings would not constitute a rejection of the human capital hypothesis. Of course, if we had information on both volumes of investment and rates of return for each worker, the relations would be perfect and tautological. However, we are relating only volumes of (accumulated) investment to earnings, while the variation in rates of return and in unmeasured quantities of investment are left in the statistical residual. Thus, aside from such measurement error, the correlation reflects the structure of individual supply (opportunity) and demand (ability) conditions in the cross section: the wider the dispersion of supply and demand intersections (i.e., of rates of return at given volumes of investment), the weaker the correlation. The correlation would be perfect if any of the following were true: perfect equality of opportunity (i.e., a common supply curve for all); perfect equality of ability (i.e., a common demand curve); or perfect positive correlation between ability and opportunity. The greater the departure from these conditions, the lower the correlation.

The fact that rates of return are negatively or not at all related to schooling level suggests that inequality of opportunity (dispersion of supply curves) is at least as great as inequality of ability (dispersion of demand curves). At the same time, the positive association of indexes of ability (I.Q. and other test scores) to investments (schooling) suggests that ability and opportunity are positively associated among individuals. Indeed, with sizable inequalities in ability and opportunity from individual to individual, the correlation of human capital with earnings would be weak unless the correlation between individual ability and opportunity were quite strong.

A single cross section, such as the 1959 one in this study, does not yield much insight into these aspects of the social structure, but can provide a frame of reference for studying changes by means of repeated analyses of comparable periodic data, such as decennial censuses.

To the extent that ability and opportunity affect rates of return but not volumes of investment, they create residual variation in earnings at given levels of human capital. The earnings function could be expanded to incorporate ability or opportunity variables to account for some of the residual variation.[4] However, the question in this study is not what explains earnings, but what are the effects of human capital investment on earnings. Moreover, the residual contains unmeasured components of investment, such as quality of schooling and within-group variation in post-school investment. Even in the residual, therefore, ability and opportunity may be acting on earnings via investment, rather than independently.

It is widely believed that the omission of ability from the earnings function creates a specification bias: leaving out a variable which is positively correlated with earnings and investment biases the coefficient of investment (average rate of return) upward. Whether this argument is correct depends on the concept of ability and the causal structure of the model: if ability affects earnings *only because* it affects investment in human capital, one of the variables is redundant when both are entered in the earnings function.[5] When the

---

4. Note, incidentally, that at fixed levels of investment, ability and opportunity are perfectly negatively correlated. Both, therefore, could not be entered as explanatory variables in the same equation.

5. A similar redundancy occurs when parental education is entered in the earnings function. Parents' education is positively correlated with the education of their children. Unless parents' education has an effect on children's earnings aside from affecting the investment in their human capital, its inclusion will obscure the estimated effects of human capital on earnings.

Another redundancy may result from the inclusion of occupation together with education in the earnings function. Occupational advancement is a medium by which growth in human capital leads to higher earnings power. Entering both variables as coordinate leads to an apparent and misleading reduction in the coefficient (rate of return) of education.

variables are not coordinate, but hierarchical, they should be treated recursively.

However, a specification problem does arise in my formulation of the earnings function. The function specifies accumulated (invested) human capital, while observed earnings are a return on the total human capital stock, including "original" or "initial" components and those not accumulated in the forms explicitly specified in the function, yet correlated with them. "Ability" may be viewed as such an "initial" component, or E_0 in my earnings function. Empirical measures of ability, as imprecise as they are, have been found to be positively associated with both schooling and earnings. Empirical estimates of the bias in the rate of return (coefficient of the schooling variable) due to the omission of ability average less than two percentage points, as against an uncorrected estimate of the rate of return which exceeds 10 per cent.[6] If these findings can be taken at face value, I have overstated the explanatory power of *accumulated* human capital to some extent.

8.2.2 FAMILY INVESTMENT IN HUMAN CAPITAL OF CHILDREN

The process of investment in human capital is not restricted to schooling and job training. Much of it takes place in the home, particularly during the preschool stage of the life cycle, as well as later. In empirical studies of intergenerational influences on educational attainments it has been found that the education of parents is a significant variable. This may be interpreted as evidence either of the transmission of parental tastes and motivations or of the greater propensity of more educated parents to invest in the education of their children, or both. One form of this investment is more and better schooling. Another is the time and other resources parents spend on their children, which we may call "home" investments. These investments were not specified in my earnings function. Although time devoted to children may be viewed as a parental consumption activity, to the extent that measurable opportunity costs

6. This conclusion was reached in Becker's preliminary investigation (1964), and has not been modified by a series of more intensive recent studies. See Griliches and Mason (1972), Hause (1972), and a survey by Welch (1972). Somewhat greater bias was found in a sample studied by Taubman and Wales (1972).

are involved, an investment model can be developed for research purposes and can be used in the earnings function framework.

The visibility of these opportunity costs emerges from research on labor supply, viz., women reduce their market work to take care of their young (particularly preschool) children. The reduction in earnings which results from the reduction of time spent in the labor market is a direct measure of the opportunity cost of these investments. Estimates of these costs are feasible.[7] Their analysis should contribute to the explanation of phenomena such as the importance of family background in school performance of children; the effects of growing up in a broken home; the positive correlation between educational attainment of children and that of their parents, particularly that of the mother. Whether and how much these preschool investments affect the children's earnings beyond affecting school attainment of the child can only be answered by the proper incorporation of the variable in the human capital earnings function.

The promise of this kind of research is its contribution not only to an understanding of the observed distribution of income at a point in time, but also to the analysis of intergenerational social and income mobility. Inferences about mobility depend on the strength of the correlations between family income and education of parents, as well as on the structure of parental labor supply functions at different levels of education and income. Depending on such parameters, the same earnings function can produce different mixtures of perpetuation and reshuffling of poverty and affluence.

8.2.3 The Distribution of Employment as a Component of the Earnings Distribution

Annual earnings are a product of the wage rate and of time spent in gainful employment. Thus the distribution of employment is an important component in the distribution of earnings, all the more so as the correlation between wage rates and employment appears to be positive, at least in the 1960 data: more skilled workers have higher annual earnings both because they are paid more per hour, and because they work more during the year.

---

7. Research into these matters is currently being conducted by Arleen Leibowitz at NBER. See Leibowitz (1972). See also Mincer and Polachek (1974).

Much of the individual variation in weeks and hours of work is random, particularly over short periods such as a year. Nevertheless, some of the employment variation may be attributed to differences in human capital, that is, to skill and experience differences among workers. The differences in employment, which consist of differences in labor force participation and in unemployment, originate both on the demand and supply side of the market. A number of hypotheses involving labor supply functions, health differentials, employer demand and investment in workers, household and market production functions,[8] and institutional factors, such as minimum wages and income maintenance programs, can be brought to bear on the analyses of the employment distributions. Once the relation between employment and wage rates is better understood, the employment variable, which is simply entered multiplicatively (additively in logs) in the earnings function, will be more appropriately specified. The expanded earnings function will appear as a product of two functions: the wage rate, or productivity, and the employment function, with independent variables in each. This is a schematic and operational representation of how the labor market interacts with households to produce the observed distribution of earnings.

8.2.4 FURTHER ELABORATION OF EARNINGS FUNCTIONS

The earnings function in this study represents an initial attempt at a more comprehensive formulation than the rudimentary schooling model. The next development would be a more detailed specification of various forms of human capital and of investment activities, beyond the general categories of schooling and post-school investment. Parental investments in children, particularly preschoolers, were already mentioned. Among other aspects of initial capacity, health levels should also be included. Both investments in health and the life cycle of human capital depreciation, including the important problems of obsolescence, deserve special attention.[9]

The specification of schooling investments in this study leaves out direct cost components and students' earnings. As was indi-

8. These are the subject of current research at NBER. See Mincer (1973).

9. For a beginning on the subject of health in the context of human capital, see Grossman (1972 and 1973). For attempts at analysis of depreciation plus obsolescence, see Koeune (1972) and Rosen (1974).

cated, such data, when available, can be entered in the earnings function quite easily.[10]

Perhaps the most important and urgent task is to refine the specification of the post-school investment category. First, direct information is needed on years of experience. In the present study years were estimated as age minus (estimated) year of graduation. For persons fully and continuously attached to the labor force this proxy variable may serve well enough. (Still, even the analysis of male earnings would be improved by direct information on experience, as the National Science Foundation studies suggest.) For persons whose labor force attachment is partial and discontinuous such information is indispensable.[11] Of course, we need to remember that it is not the time spent in the labor market, but the volume of investment activity taking place during that time which determines earnings. Comprehensive data on this do not exist, but intensive even if fragmentary case studies might be feasible.

Even when work experience is measured in time units, the total of it could be segmented into a sequence of jobs constituting the work history of the individual, if data were available. Whether in chronological or, preferably, in panel form, this is ultimately the way in which the analysis of labor mobility should be incorporated into the human capital framework.[12] Search for and the acquisition of job information are topics pertinent to the subject of labor mobility, but their inclusion in the earnings function would depend on the availability of data meeting rather exacting specifications.

8.2.5 TOWARD A FULLER ANALYSIS OF INCOME DISTRIBUTION

In sum, fuller analysis of the distribution of earnings would require both an expansion of the earnings function to include details (variables) on a number of forms of investment in human capital, as well as a system of equations that includes not only the investment-earnings relation but a formulation in which investment is the de-

10. Some work along these lines is currently being done by Solmon and Wachtel (1972) at NBER.

11. This point emerges forcefully from papers by Malkiel (1971) and Polachek (1973) and Mincer and Polachek (1974).

12. Longitudinal data recently collected in the National Longitudinal Samples and by NBER (NBER-TH sample) make possible a start on such analyses.

pendent variable and another in which (time spent in) employment is the dependent variable.

Coverage of the data used for the analyses should be expanded to include women, blacks, older people, and people who live in nonurban areas. Moreover, grouping of persons into households as well as their behavior as members of households, needs to be studied in the context of income distribution. For this, the merging of population, labor supply, and human capital theories is required.

Finally, to move toward the distribution of income as distinguished from the distribution of earnings, nonemployment income must be brought into the analysis. This is not merely an accounting problem. Attention will have to be extended from human capital to the interaction of human and nonhuman capital accumulation and use by households, and to the effects of transfer incomes on both.