

MEASURING INVESTMENTS IN HUMAN CAPITAL WITH EMPHASIS ON RATES
OF RETURN TO COLLEGE EDUCATED MALES AND FEMALES

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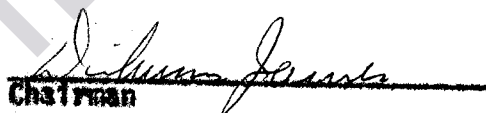
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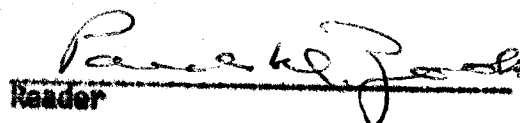
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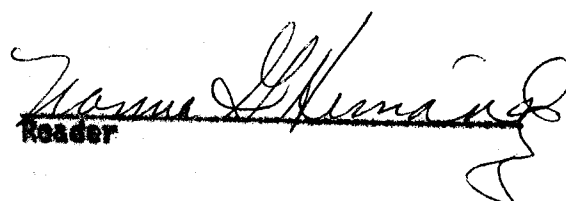
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Chapter 1

INTRODUCTION

Literature on the economics of human capital dates as far back as 1691 when Sir William Petty attempted a calculation of the money value of laborers for the purpose of including this value in estimates of national wealth.¹ In 1853 William Farr calculated the value of a human being by capitalizing future lifetime earnings.² The human capital concept was recognized by Adam Smith (1776) but the concept fell into disuse as the result of the writings of Alfred Marshall (1890). Marshall recognized the value of educated labor but preferred to limit the concept of capital to include only physical capital.³

The modern emergence of the study of the economics of human capital can roughly be dated to an address given

¹B. F. Kiker, "The Historical Roots of the Concept of Human Capital," Journal of Political Economy, LXXIV (October, 1966), pp. 481-499; see also, Selma J. Mushkin, "Health as an Investment," Journal of Political Economy, LXX, Part 2 (October, 1962), pp. 129-157.

²Kiker, op. cit.; see also, David R. Witmer, "Economic Benefits of College Education," Review of Educational Research, XL (October, 1972), pp. 511-524.

³Mark Blaug, An Introduction to the Economics of Education, (Baltimore: Penguin Books, Inc., 1970), pp. 2-3.

by Theodore W. Schultz in December 1960 and published in March 1961.⁴ Although the time span between Marshall and Schultz was not lacking in work on human capital analysis, Schultz formulated a conceptual framework upon which the subsequent proliferation of studies developed. Up to 1966 this proliferation accounted for approximately eight hundred to nine hundred items concerning various aspects of investments in human capital.⁵

It appears that the modern interest in human capital may have developed from the recognition of two unrelated gaps in economic analysis. First, studies had been made relating increased absolute lifetime earnings with increased absolute units of education. One study appeared in the late 1920's conducted by American Telephone and Telegraph Corporation at the direction of its president, Walter S. Gifford.⁶ This study indicated a high correlation between education, grades and income. A later study conducted by Herman P. Miller concerned lifetime earnings and education in the years 1939

⁴Theodore W. Schultz, "Investment in Human Capital," American Economic Review, LI (March, 1961), pp. 1-17; see also, Theodore W. Schultz, The Economic Value of Education, (New York: Columbia University Press, 1963), for a basic guide to Schultz's approach to human capital analysis and theory.

⁵M. J. Bowman, "The Human Investment Revolution in Economic Thought," Economics of Education 1, M. Blaug (ed.), (Baltimore: Penguin Books, Inc., 1968), Chapter 6. This article can be combined with Miller's to give a good extensive history of the concept of human capital.

⁶Witmer, op. cit., pp. 512-513.

to 1959, using United States Bureau of Census reports.⁷ This type of research indicated a high correlation between "more" education and "more" lifetime income. However, it was left to future study to identify the precise inter-relationship between education and income. In other words, still to be determined was the actual cause-effect link between the two factors of more education and more income.

The second gap in analysis appeared to be a result of the reevaluation of the makeup of an economy's total stock of capital. The reevaluation was a result of research which attempted to isolate the factors accounting for economic growth. It was found that increases in the stock of physical capital and the size of the labor force could not explain all of the increases in national output.⁸ These results indicated that some "residual" or unexplained factor(s) still needed to be defined. These research results also pointed to the lack of information concerning the actual causes of economic growth or non-growth.

⁷Herman P. Miller, "Annual and Lifetime Income in Relation to Education: 1939-1959," American Economic Review, L (December, 1960), pp. 962-986; see also, P. C. Glick and H. P. Miller, "Educational Level and Potential Income," American Sociological Review, XXI (June, 1956), pp. 307-311.

⁸Edward F. Denison, "United States Economic Growth," Journal of Business, XXXV (April, 1962), pp. 109-121; see also, Edward F. Denison, "Education, Economic Growth, and Gaps in Information," Journal of Political Economy, LXX Part 2, (October, 1962), pp. 124-128, Edward F. Denison, "Sources of Postwar Growth in Nine Western Countries," American Economic Review, LVII (May, 1967), pp. 325-332 and Schultz (1961), op. cit., pp. 5-6.

By addressing himself to these gaps in terms of human capital, Schultz was able to ask some of the basic questions concerning the concept of human capital: What is the definition and scope of investment in human capital? What are the returns to these investments? What conceptual and measurement problems must be faced in analyzing and calculating these investments and returns? Should man be studied from an economic point of view? What implications do these types of studies and questions have on the efficiency and the equitable distribution of investments in human capital? What do these studies add to the tools of analysis for the supply and demand for education?

Since these questions were formulated, they have been studied, argued, measured and subjected to a myriad of interpretations. Like many areas of economic study, the results of the study of human capital are inconclusive but still show some basically consistent tendencies.

An example of interpretation problems can be found in the attempt to separate institutionalized and non-institutionalized learning. Not all learning takes place within the confines of formal education, yet all learning has some influence on future income. Thus, in this case, an interpretation problem and an additional measurement problem are raised. It is relatively easy to measure institutionalized learning by calculating the number of years spent in formal education, while the measurement of non-institutionalized learning and its contribution to the human capital investment

is almost impossible.

Several basic subdivisions emerged as the study of human capital intensified. These areas include: (1) formal education, (2) informal education, (3) health, (4) migration and information and (5) "other" factors. This last item covers a wide range of matters difficult to define and measure such as family influences and natural ability.

In addition to Schultz, other authors have made significant contributions to the study of human capital. For instance, Gary S. Becker has added a basic theoretical statement to the study of investments in human capital.⁹ By using a microeconomic theory of wages and marginal productivity, Becker developed a human capital investment model for on-the-job training with further applications to other types of human capital investments. The model was also used to derive human investment returns by geographical area and by ethnic origin.

Human capital implications have also become a part of macroeconomic studies. These studies include international comparisons of education and national income at various stages of economic growth, manpower forecasting for

⁹Gary S. Becker, Human Capital, (New York: Columbia University Press, 1964); see also, Jacob Mincer, "On-The-Job Training: Costs, Returns and Some Implications," Journal of Political Economy, LXX Part 2 (October, 1962), pp. 50-79; and Peter B. Doeringer and Michael J. Piore, "Labor Market Adjustment and Internal Training," Proceedings of The Eighteenth Annual Meeting of The Industrial Relations Research Association, (Industrial Relations Research Association: 1965), pp. 250-263.

economic growth and the human capital factor of economic growth.¹⁰ The majority of these studies are directed at developing countries with the basic objective of finding methods of stimulating and maintaining economic growth.

Of the three macroeconomic approaches given above, the manpower forecasting appears to be the most widely researched. Manpower forecasting is an attempt to predict the needed future supply of skilled manpower for a given level of national income and then to suggest necessary policies to insure that the supply will coincide with future needs. The major manpower forecasting study is that of Harbison and Myers, in which the authors constructed a composite index that allowed the ranking of seventy-five

¹⁰Blaug classifies the works of Harbison and Myers as international comparisons since they group and rank countries according to their composite index. Blaug classifies works edited by H. S. Parnes for the OECD as manpower forecasting studies and projections; see Blaug (1968), op. cit., and M. Blaug (ed.), Economics of Education 2, (Baltimore: Penguin Books, Inc., 1969). A different approach uses the results of international comparisons as a guideline for less developed countries in planning the best path for economic development. An example of such a guideline is the extensive and rapid investment by less developed countries in modern technology based on the assumption that this step will bring instant "modernization", (see UNESCO, Secondary Education, Social Structure and Development in Latin America, (Mimeo: UNESCO, November, 1971). This approach, however, has its fallacies, but in the context of the evolution of the human capital concept it deserves a mention (see T. W. Schultz, "Investment in Human Capital in Poor Countries," Paul D. Zook (ed.), Foreign Trade and Human Capital, (Dallas: Southern Methodist University Press, 1962)).

countries into four degrees of stages of development.¹¹ For each stage they constructed a set of specific policies required to insure the supply of skilled manpower needed for economic growth.

The third macroeconomic approach given above, the human capital factor in economic growth, has been extensively researched by Denison.¹² Denison's major study attempted to isolate the specific factors of economic growth in the United States between the years 1909 and 1929 and the years 1929 and 1957. By shifting the analysis to other countries, Denison expanded the analysis into an international comparison approach where specific growth factors were computed for different countries and then studied on a comparative basis.¹³ Denison's list of sources of economic growth includes:

"...(a) increases in the physical quantities of labour and capital, (b) improvements in the quality of labour, (c) improvements in the quality of capital, (d) removals of 'restrictions against optimum use of resources', (e) reductions of 'waste in agriculture', (f) interindustry shifts of resources, (g) the 'advance of knowledge', (h) the 'change in the lag of application of knowledge' and (i) 'economies of scale'. Factor (b), improvements in the quality of labour, is in turn broken down to (i) more education, (ii) increased employment of women, (iii) changes in the age-sex composition

¹¹Frederick Harbison and Charles A. Myers, Education Manpower and Economic Growth, (New York: McGraw-Hill Book Co., 1964); see also, Frederick Harbison and Charles A. Myers, Manpower and Education, (New York: McGraw-Hill Book Co., 1965).

¹²Denison (April, 1962 and October, 1962), op. cit.

¹³Denison (May, 1967), op. cit.

of the labour force and (iv) reductions in the length of the work week and in the work year."¹⁴

The United States study made by Denison showed the largest growth factor to be, "Labor, adjusted for quality change,".¹⁵

The modern interest in the concept of human capital has had approximately fourteen years to mature and this has allowed for in depth studies of the various areas discussed above. The prime objective of these studies has been to construct a framework within which human capital could be measured. One of the questions proposed above (page 4) was: What conceptual and measurement problems must be faced in analyzing and calculating these (human capital) investments and returns? The ability to answer this question by analyzing human capital stocks and flows has been established as the most critical step in building a usable tool for private and public decisions on the best allocation of resources. The subject of this thesis will be the problems associated with measuring human capital investments and returns.

By concentrating on rates of return to specific years of college education for United States males and females it should be possible to study some of the factors involved in measuring a human capital flow concept. By approaching the measurement problem in human capital analysis in this

¹⁴Blaug (1970), op. cit., p. 96.

¹⁵Denison (April, 1962), op. cit., Table 1, p. 111.

fashion, this thesis will attempt to answer such questions as: (1) What is human capital and how can it be measured? (2) What factors constitute the elements of rates of return to human capital? (3) With respect to returns to college education, what do current measurements indicate in terms of the profitability of acquiring this much education? (4) What results are obtained when rates of return to college education are measured for females as well as males? and (5) What policy implications are indicated by the rates of return to college education?

Chapter two will briefly discuss the general elements of human capital for the purpose of establishing the measurability of this type of capital. Once this measurability is outlined, three methods of measuring returns to human capital will be discussed. These three methods include: rate of return analysis, cost-benefit analysis and cost-effectiveness analysis. The thesis will explore the human capital measurement problem within a rate of return framework. Since the measurements taken in this paper are for a given level of formal education, and all other discussion is in terms of education, the last part of chapter two will be used to point out how other major human capital investments fit into the human capital framework. These other major investments include: on-the-job training, health and information/migration.

Chapter three will analyze, measure and discuss the direct and indirect costs and returns of human capital

investments. Also, this chapter will set out some of the major criticisms of the use of rate of return analysis on human capital investments.

Chapter four undertakes a measurement of human capital rates of return to college educated males and females. A general human capital rate of return model is suggested and then modified for application to rates of return to specific years of college education. The calculations in this chapter point out some of the practical difficulties encountered in measuring such rates of return. The rates calculated also suggest some policy implications for financing a college education and policy conclusions are discussed in the final part of the chapter.

PREVIEW

Chapter 2

THE HUMAN CAPITAL FRAMEWORK

Humans as Capital

This chapter will discuss why human capital can be measured in terms of investments and returns, possible methods of measuring returns to human capital investments and a brief discussion of on-the-job training, health and information/migration as human capital investments.

The most critical factor in studying human capital, as with many of the empirical studies in economics, is the availability of data. Although the basic principles can be applied to any type of human capital, the discussion here will be confined to formal education investments in human capital since these are the most easily measured. The final section of this chapter will, however, digress briefly into three other major areas of human capital investment.

The first step in constructing the framework is to ask why human capital can be measured. The economic concept of capital refers to something that incurs a cost when produced and is capable of producing a future flow of

output.¹ Given costs and output, and assuming an objective of profit maximization, the return on the capital investment will exceed the return on any alternative investment. This general analysis is applied to returns on investments in physical capital, but one can easily apply a similar analysis to investing in human capital.

From the time a human is conceived, he/she is being invested in through such things as pre-natal care, post-natal care, good home environment and, eventually, the largest investment: formal education.² Not all costs, however, are investments that will produce a future return. In contrast to expenditures on physical capital, expenditures on humans require a conceptual grouping of costs into three categories: (1) current consumption, (2) durable consumption and (3) pure investment.³ It should be stressed that while conceptually possible, actually grouping expenditures is virtually impossible. For example, current consumption might be expenditures on a music appreciation course, whereas, a durable consumer good could be a course in personal income

¹The economic concept of capital can be found in any economics principle's textbook. For example see: Paul A. Samuelson, Economics, (8th ed.; New York: McGraw-Hill Book Co., 1970), Chapter 30; see also, W. L. Peterson, Principles of Economics-Micro, (Homewood: Richard D. Irwin, Inc., 1974), Chapter 10.

²National Academy of Sciences, Maternal Nutrition and The Course of Pregnancy: Summary Report, reprint of Department of Health, Education and Welfare (Rockville: Public Health Service, 1970).

³Schultz (1964), op. cit., Chapter 1.

tax preparation and an investment expenditure could be a course in commercial welding.

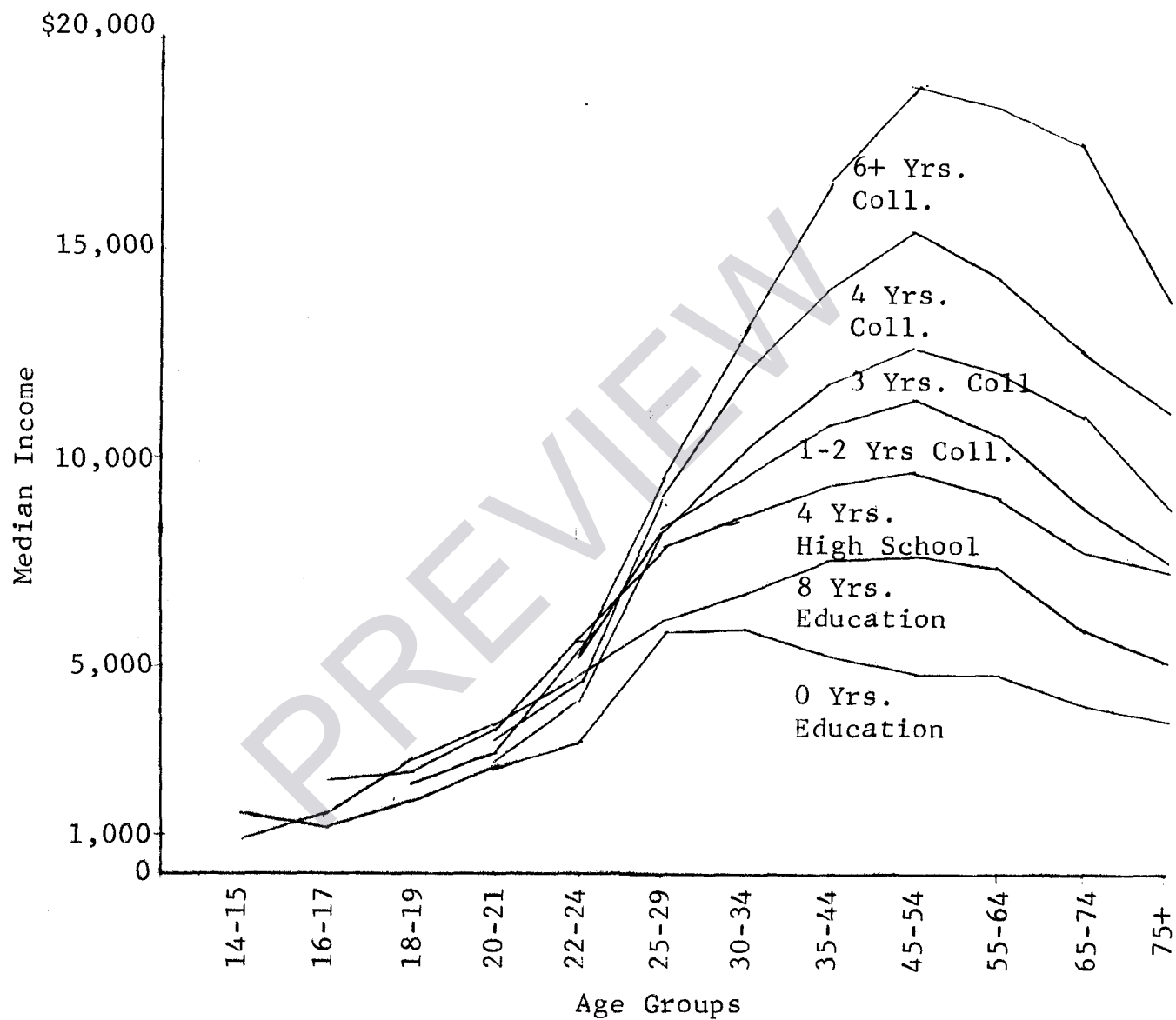
A closer look at the last example, a course in commercial welding, will bring into sharper focus the analogy between physical and human capital. The individual who enrolls in the commercial welding course does so at a cost. He/she gives up time and money to invest in the course in the expectation that the skill gained will secure a higher paying job at some future point in time. Hence, we have capital, the student, being invested in for the purpose of producing a flow of output, welding services. This flow of output should return a higher future income than if the course was never attempted.

To more firmly establish the investment-return relationship for human capital, age-income profiles may be constructed and examined.⁴ Figures 1 and 2 are age-income profiles for United States males and females in 1969. The profiles were constructed using median income received in the year 1969 by males and females working full-time and further broken down by age and education. It should be noted that the amounts used to construct the profiles are unadjusted and taken on a cross-section basis rather than

⁴For other such charts see: Giora Hanoch, "An Economic Analysis of Earnings and Schooling," Journal of Human Resources, XI (Summer, 1967), pp. 310-329; for countries other than the U.S., see: Blaug (1970), op. cit., pp. 24-28.

Figure 1

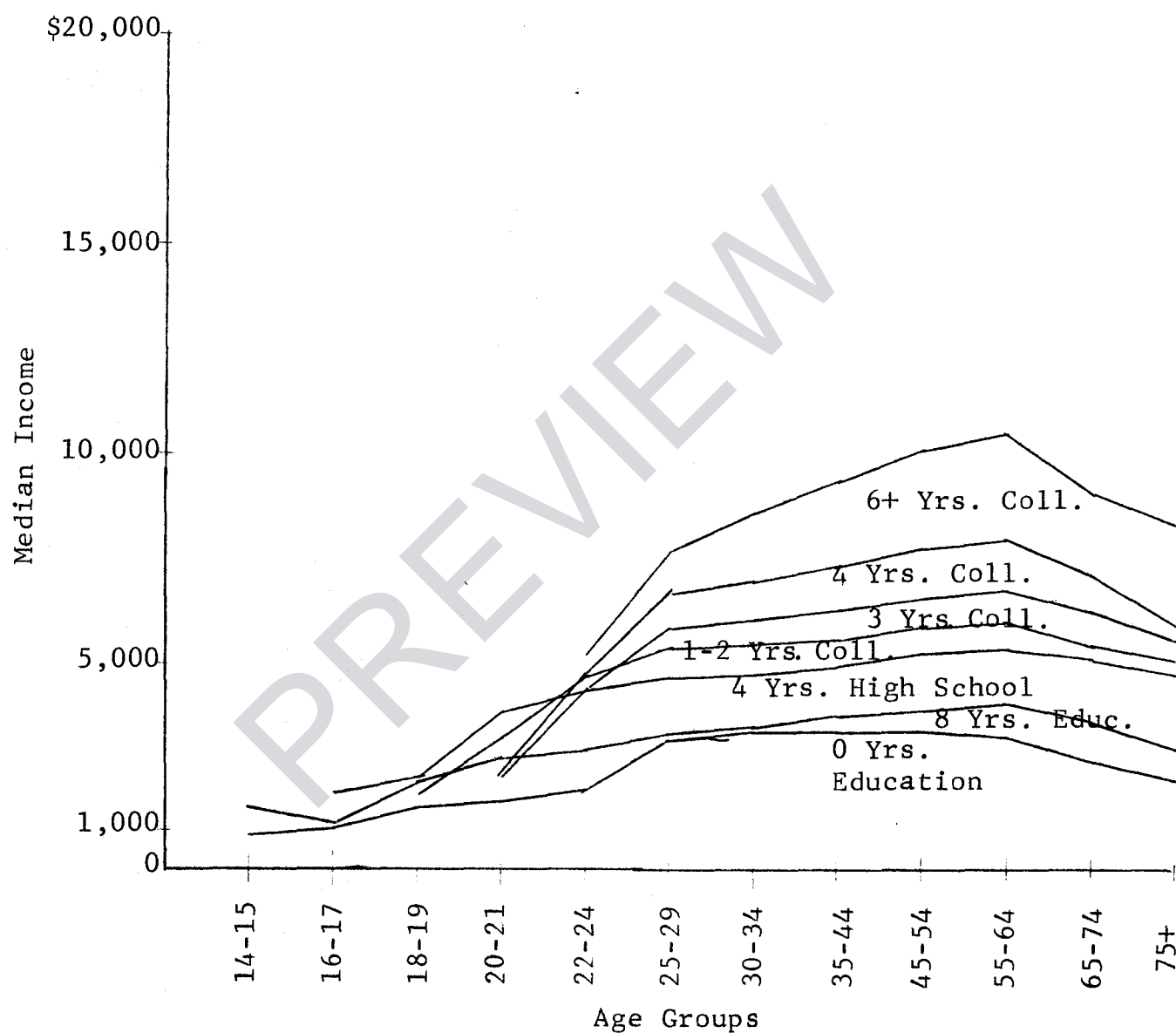
Unadjusted Age-Income Profiles for United States Male
Full-Time Workers 14 Years Old and Over with
Income by Years of Education, 1969



Source: Appendix A

Figure 2

Unadjusted Age-Income Profiles for United States Female
Full-Time Workers 14 Years Old and Over with Income
by Years of Education, 1969



Source: Appendix A

a longitudinal basis.⁵ Longitudinal data would require following two or more persons with different levels of education through their working lives to determine the additional amounts of income received as a result of additional amounts of education.

The age-income profiles shown in Figures 1 and 2 tend to substantiate earlier studies of human capital. These studies indicated a high correlation between more education and more lifetime income. Moreover, Figures 1 and 2 imply an investment-returns relationship by indicating more investment costs for additional units of education with a resulting higher lifetime income. Together with the investment-returns relationship, a number of other factors are suggested by comparing the two figures and by comparing profiles within each respective figure.

One possibility results from observing differences between the two figures with respect to the height of the profiles. For instance, the profile for a female with six-plus years of college indicates a lifetime income only as high as a male high school graduate. It can also be seen that the profiles for females are flatter and reach a peak later than the corresponding profiles for males. These differences could be explained by the late entry into the labor force by women who have raised a family and then returned to work.

⁵Figures used to construct Figures 1 and 2 can be found in Appendix A.

An explanation of the height differences between the two sets of profiles could be made in terms of sex discrimination in job access and promotion. The sex discrimination factor appears even more possible by studying the figures in Table 1. This table shows the median number of school years completed by level of income for United States males and females in 1969 as well as the percent of each income group that are high school graduates. A comparison between males and females for each income level shows that very few differences exist between median school years completed and the percent of each group that are high school graduates. Any differences that do exist within each income group are minimal. The conclusion appears to be that, in spite of the seeming equality of educational attainment, the age-income profiles of females peak at a much lower level than do those for males. This may well be a result of institutional barriers such as sex discrimination.

By further examining Figure 1, it appears that the profiles for male income earners all tend to peak within the same age range, ages thirty-five through sixty-five. The one exception is the profile for a male with zero education. Two possible reasons can be given for the shape of the zero education profile. The first can be found in the relatively early entry into the labor force of those with little or no education. The second possibility is that those with little or no education tend to be the first laid-off or fired when cutbacks in the work force are necessary.