

GARY BECKER ON HUMAN CAPITAL

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Gary Becker's work on "human capital" started around 1960. It was motivated by the rising interest in economic growth at the time. As stated in the introduction to the first edition of his book, *Human Capital*, "The origin of this study can be traced to the finding that a substantial growth in incomes in the US remains after the growth of physical capital and labor has been accounted for".¹ This unexplained residual suggested to several researchers that unmeasured features of the quality of the labor force must also be brought into consideration.² While econometricians such as Edward Denison, Dale Jorgenson, and Zvi Griliches turned to seek better data that would reduce the scope of the unexplained residual,³ Becker constructed a detailed and original theory regarding the possible effects of a major unobserved and all inclusive factor, termed, human capital, would have on observed outcomes such as wages and education and their variation over time and among individual types. Most of the theoretical results reported in the three editions of *Human Capital*, 1964, 1975, and 1995 are already anticipated in a single early paper that was published in the *Journal of Political Economy* in 1962.⁴

Broadly defined, human capital is the collection of productive skills embodied in a person that can be used to generate earnings in the labor market and to augment household's consumption options. It is a dynamic concept, as individuals can choose to invest in their own human capital and this investment decision can be analyzed by economic tools that are usually applied to financial investments based on forward looking considerations. The exception being that individuals can utilize their human capital at work or in the household but cannot sell or buy it in the market place.

Becker considered two different types of investments in human capital that influence wages: schooling and learning on the job. In both cases, finite life together with the inability to sell human capital, imply a decreasing rate of investment in human capital over the life cycle. We thus observe that schooling occurs mainly early in life and that life-time wage profiles are concave as human capital produced on the job rises at a decreasing rate.

An important refinement of Becker's analysis of investment in human capital and its relation to wages arises from his distinction between specific and general learning on the job. General training affects the worker's output and his wages in many uses and firms, while specific training mainly affects his output and wages in

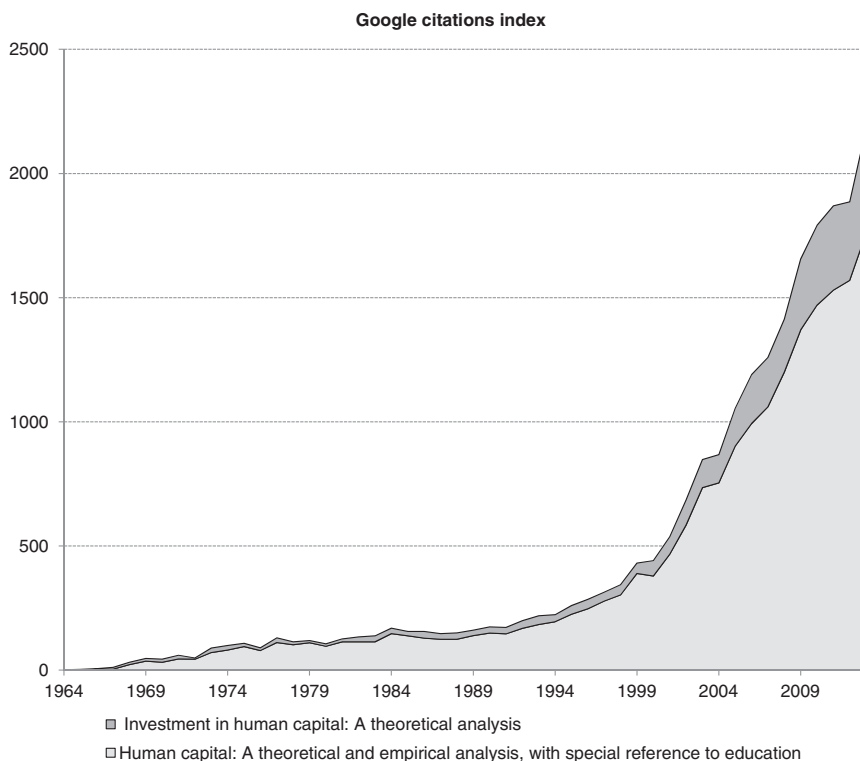
a particular firm. Training workers is costly and the expected wage of the worker should reflect this cost. If training is general, the worker must pay to the firm the full cost of his training by working at an initially low wage. However, if training is specific, the firm and its trained workers should share the costs and benefits from training during the expected duration of the employment relationship. Moreover, specific training creates a mutual interest of the firm and its workers in a lengthy relationship, which can be strengthened by offering a rising wage profile during the workers' tenure in the firm.

Investments in human capital over the life cycle generate earning differences among workers of different age and work experience. In addition, investments in human capital affect the distribution of life-time earnings in the society at large. Becker distinguished two different sources of such inequality, ability, and borrowing opportunities. Although ability endowments tend to be distributed symmetrically in the population, earnings are likely to be unequal and skewed because more able individuals have higher returns from investment in human capital and, therefore, invest more. Similarly capital constraints can generate inequality because individuals with limited access to the capital market will invest less in their human capital. The overall effect of these considerations on the inequality in individual earnings depends on the correlation between "ability" and "opportunity" in the population. If ability and opportunity are positively correlated, the option to invest in human capital would magnify the inequality in earnings in society, while a negative correlation reduces the inequality in earnings.

Becker extended the concept of human capital to include health and information about wages and potential job offers. He also considered the effect of human capital in extending household consumption options via a shift in the "household production function" that combines purchased goods with time spent working at home. Finally, he considered the role of parents' human capital on the education and the human capital acquisition of their children, which creates important inter-generational dynamics.

In this manner, Becker accomplished his early agenda to show that "The analysis of human investments offers a unified explanation of a wide range empirical phenomena which had either been given ad hoc interpretation or has baffled investigators."⁵ It is remarkable that Becker built this structure at a relative young age and was quite confident in the future impact of his work stating that "The next few years should provide much stronger evidence on whether the recent emphasis place on the concept of human capital is just another fad or a development of great and lasting importance."⁶

Looking back 50 years later, it is clear that human capital has proven to be a highly influential theoretical concept. This is indicated by the graph at the end of this paper that illustrates the sustained growth of scholarly citations of Becker's initial paper and the subsequent three editions of his "Human Capital" book. Several well-known economists have contributed to the success of this agenda, including Jacob Mincer, Yoram Ben Porath, Sherwin Rosen, James Heckman, Robert Lucas, and Robert Barro.⁷



Citations of Gary Becker's 1962 article and the three editions of *Human Capital*

Starting with the first edition of *Human Capital*, Becker was also interested in the measurement of the private rate of return from schooling. This single number could, in principle, guide individual decisions to acquire schooling, which is a major form of investment in human capital. Changes over time in rates of return can reflect changes in labor market conditions that affect the willingness to invest in schooling.

Becker used Census data from 1930 and 1940 and estimated a rate of return to college education of about 13 percent. At about the same time, Jacob Mincer used Census data using a simple parameterization of the “earning function” that also yielded a rate of return of about 13% for 1939. In a short review of Becker's *Human Capital* published in the *Journal of Political Economy*⁸ Robert Solow argued that “The heart of this book is the estimate of the internal return to College and high school education regarded as investment.” However, he criticized Becker for not accounting sufficiently for the non-monetary aspects of human capital and for ignoring risks. He also criticized the “belief that when any class of action leads to a positive money profits it is thereby explained.” In his early paper, Becker argued that psychic costs and returns can be included in the “real” income

streams and that, in principle, rates of return can be calculated for such streams. But in the second edition of “Human Capital” (page 198), Becker notes that “Quantitative estimates of psychic gains are never directly available” and reports only monetary returns. Becker was also well aware of the problem separating ability from schooling and the need to account for risk but had no systematic way to deal with that in calculating rates of return. Becker was also well aware of the problem separating ability from schooling and the need to account for risk but had no systematic way to deal with that in calculating rates of return. A large body of new research has revisited these difficult issues by using instrumental variable methods. The basic idea is to find variables that effect schooling decisions but are presumably independent of ability or psychic costs and benefits from schooling. An excellent recent survey of this work by David Card⁹ explains the logic of these methods and how they can be implemented and interpreted. His survey shows that, somewhat surprisingly, the high pecuniary returns that Becker and Mincer have estimated emerge also from the instrumental variable estimates that capture causal effects.

At the same time, there is more recent work on the non-pecuniary returns to schooling. A paper in the *American Economic Review* by Chiappori Iiyigun and Weiss exploit early insights of Becker on assortative matching to construct a measure of the returns to schooling in the marriage market in terms of raising the probability of marriage and achieving a better match.¹⁰ A working paper by Bernard Salanie Pierre Andre Chiappori and Yoram Weiss applies this model to US data and provides estimates showing that women have higher such returns than men. This may explain why more women than men now have a college degree.¹¹

Another researched outcome of education is health. It is well established that more educated individuals live longer.¹² However, the causation is not clear as early health can effect education, or education can raise wages that in turn affect health and finally, parental income can affect both outcomes. Again, instrumental variable methods have been used to identify causality. This literature is summarized in a recent working paper by David Cutler and Adriana Lleras-Nuney.¹³ Using compulsory schooling laws as an instrument, education was found to have a positive effect on health in Denmark, Sweden, and Germany. However, no effect was found in England. Examining such studies in both developed and undeveloped countries, the authors conclude that “education appears to be causally related to health in many settings, but not always, and the reverse is also true”.

To end on a personal note, I have known Gary Becker for 45 years and was influenced by him in many ways. His untimely death at age 84 was a shock to all his friends. It is a great loss that his sustained flow of new ideas has stopped forever.

NOTES

1. *Human Capital* New York : National Bureau of Economic Research ; distributed by Columbia University Press, 1964.

2. See Theodore Schultz "Investment in Human Capital" Ch. 2, The Free Press, 1971 and Zvi Griliches (1960) "Measuring inputs in Agriculture a Critical Survey" *Journal of farm Economics* 42, 1,411–1,433).
3. See Denison, E. (1962) "The sources of Economic Growth in the US and the Alternatives before us". Supplementary paper No. 13 (New York Committee for Economic Development) and Dale Jorgenson and Zvi Griliches (1967) "The explanation of Productivity Change" *The Review of Economic Studies*, 14, 249–283.
4. "Investment in Human Capital: A theoretical analysis" *Journal of Political Economy* (1962) 70, 9–49.
5. "Investment in Human Capital: A theoretical analysis" *Journal of Political Economy* (1962) 70, 10.
6. Investment in Human Capital: A theoretical analysis" *Journal of Political Economy* (1962) 70, 40.
7. For a description of some of these contributions, see the surveys: "Wage Determination" by Robert Willis and "Determination of Life-cycle earnings" by Yoram Weiss in the *Handbook of Labor Economics* (1986), Edited by Orley Aahenfelter and David Card, North Holland, part 3, chapters 10 and 11.
8. *Journal of Political Economy* (1965) 73, 552–553.
9. "Estimating the Return to Schooling: Progress on Some Persistent Econometric Problems" *Econometrica*, 69, 1,127–1,160.
10. Pierre Andre Chiappori, Murat Iyigun and Yoram Weiss "Investment in Schooling and the Marriage Market" *American Economic Review* (2009) 99, 1,689–1,713.
11. Bernard Salanie, Pierre Andre Chiappori and Yoram Weiss "Partner's Choice and the Marital College Premium", (2011) Discussion Paper 11-04 Columbia University.
12. For example, in 1980 at age 25, those with some college could expect to live another 54.4 years whereas the life expectancy at 25 for those with a high school degree or less was only 51. See Cutler D.M., E.R. Mera and S. Richard (2008) "The Gap get Bigger, Changes in Mortality and Life Expectancy by Education", (1981–2008) *Health Affairs* 27, 350–360.
13. David M. Cutler and Adriana Lleras-Muney (2012) *INSIGHTS FROM INTERNATIONAL COMPARISONS* NBER Working Paper 17,738.