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**The Incubator of Human Capital:  
The NBER and the Rise of the Human Capital Paradigm**

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We dedicate this paper to Martin Feldstein, whose vision brought the NBER into the modern age and made 1050 Mass Ave the meeting place for economists and an incubator of human capital.

We thank Jennifer Walsh for locating Library of Congress codes for all NBER volumes.

The field of human capital was not invented by NBER researchers, but it was nurtured and expanded at the NBER. We explore how the NBER was an incubator of human capital research and the ways human capital theory brought the NBER into the modern era of economics.

## 1. What is Human Capital Theory?

Human capital theory is the notion that an investment in human beings today has a payoff in the future. The investment can be in education, training, health, job search, migration, or anything that impacts income or productivity in the future. One implication of human capital theory is that individuals have a capitalized value (based on their expected future earnings) that can be augmented through investments, as well as reduced by depreciation, illness, injury, or job loss. The theory expands the static notion of the value of skills and places it in a dynamic framework.

When aggregated across all individuals, human capital is the economy's stock of intangibles embedded in individuals.<sup>1</sup> Human capital is the wealth of a nation separate from the stock of land and physical capital. Human capital theory became ascendant when the economic growth of many richer nations became increasingly difficult to fully attribute to the growth of the physical capital stock and the size of the labor force.

The concept of human capital is the neuronal fiber that connects the two halves of the economist's brain—the micro and macro. The micro advances of human capital concern the dimension of time, its value, and the allocation of time use over the life cycle. Human capital gives individuals the ability to transform time today into more productive time tomorrow. Getting more goods tomorrow involves borrowing from one's own time today, and possibly also from the capital market.<sup>2</sup>

Even though human capital theory has become a staple of micro theory, it was called into being through the macro part of the economist's brain. The impetus was to understand the residual in growth accounting and the fact that increases in physical capital were slowing even though output was greatly increasing. The fact that economic growth was so much higher than could be explained by increases in conventional inputs was apparent to many economists long before Robert Solow gave it mathematical precision.

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<sup>1</sup> Intangible capital (such software and computerized data bases, R&D, and brand equity and firm-specific resources) is increasingly recognized as a source of national wealth and economic growth (Corrado, Hulten, and Sichel 2009).

<sup>2</sup> See Ghez and Becker (1975).

## 2. Spread of Human Capital Ideas

The human capital construct is deep in the bones of economics and finds mention by many of the classical economists, even if they did not use the precise phrase (Kiker 1966). In his fourth definition of capital, Adam Smith noted: “The acquisition of ... talents during ... education, study, or apprenticeship, costs a real expense, which is *capital in [a] person*. Those talents [are] part of his fortune [and] likewise that of society” (emphasis added; see also the discussion in Spengler 1977). Marshall noted that “the most valuable of all capital is that invested in human beings,” and he termed the concept “personal capital.” Irving Fisher used the precise phrase, “human capital.”

But the term “human capital” was seldom used in economics and related literature before the 1950s. That is clear from the Google Ngram of Figure 1, which gives the ratio of all books using the phrase “human capital” to those that mention the word “economics.”<sup>3</sup> We will take this ratio to mean the percentage of all books concerning economics that reference “human capital.”

In 1950, fewer than 0.5% of all books concerning economics referenced “human capital.” Astoundingly, when the series ends in 2009, 16% did. The series has two apparent upticks: one around 1966 and another around 1990. We do not want to make too much of the timing of the increase since the series changes a bit depending on which corpus of Google books is used. But the increase in the 1990s appears to be robust. It should also be noted that an Ngram of the word “education” does not reveal a similar increase around 1990 and, in fact, does not increase much at all during the last half century.

It should come as no surprise that the concept of human capital was known and discussed throughout the history of our profession. The question is why the phrase did not become a serious part of the economists’ jargon until the late 1950s and why it took so long for the phrase to be widely used.

We use the term today as if it were always part of our lingua franca. But it wasn’t. Not that long ago, even economists scoffed at the notion of “human capital.” As Theodore Schultz noted in his American Economic Association presidential address in 1961, many thought that free people were not to be equated with property and marketable assets (Schultz 1961). To them, that implied chattel slavery.

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<sup>3</sup> The graph gives the ratio of books that use the phrase “human capital” to those that use the word “economics” *or* the phrase “human capital.” “Human capital” is added to the denominator because some books that use “human capital” may never mention “economics.” That group is small. Adding other terms, such as “personal capital,” has little impact on the series.

In *Human Capital* (published first in 1964 and preceded by his 1962 *Journal of Political Economy* article, “Investment in Human Capital”), Gary Becker admitted that he hesitated to use the term “human capital” as the title of the book and employed a long subtitle—*A Theoretical and Empirical Analysis, with Special Reference to Education*—to guard against criticism (Becker 1964). Becker noted that “passions are easily aroused on this subject,” and he offered several reasons why.

Many in the early 1960s viewed education as serving a multitude of purposes that went beyond increasing future income. Education has cultural aims, it uplifts, and it gives meaning to life. The idea that education was only to increase income was seen by many as base and disreputable. Becker also mentioned the obverse factor. Many, he noted, were skeptical of the estimates of the return to education since ability bias was thought to be a major contaminant. Therefore, some were revulsed at the notion that education was only for economic gain and others questioned that the gain was caused by education.

But by the third edition of *Human Capital*, published in 1993, Becker marveled that the phrase and concept had gained traction in economics, and across a variety of academic fields and by the general public. Figure 1 gives credence to that statement. Between the publication of the first and the third editions of *Human Capital*, the use of the phrase in books that mentioned economics had increased more than six times.

But it is not clear what enabled the phrase to lose its negative press. Perhaps it was the greater acceptance of the economic model for providing insights into many areas of “non-market” behaviors including marriage and cohabitation, fertility, child rearing, crime, and education (Becker 1976). Perhaps it was stronger causal evidence that education actually boosted earnings (even as it elevated the soul).<sup>4</sup> Perhaps, in addition, economists and economics became more respectable (actually, banish the thought).

Our sense is that “human capital” was called into being by changes in the economy. As Schultz noted, the “unexplained rise in the economic value of man” (1972, p. 1) needed an explanation. Furthermore, the greatly increased use of the term in the 1990s, as seen in Figure 1, was necessitated by vastly increased income and wage inequality in the US and elsewhere. Human capital had become more fashionable because it was needed to help explain the economy in the modern era.

### 3. The Early Human Capital Incubators of the NBER

#### a. Early Macro Incubators

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<sup>4</sup> See the summary in Card (2001)

The NBER played an outsized role in many facets of the rise of the concept of human capital and in its measurement. In large part this was because of the importance of empiricism at the NBER ever since its founding.

As Becker noted in his preface to the first edition of *Human Capital* in 1964: “The origins of this study can be traced ... to the finding that a substantial growth in income in the United States remains after the growth in physical capital and labor has been accounted for.” That is, the subject was motivated by a need to understand the “residual” in economic growth estimates.

NBER researchers were among the first to notice that changes in physical input measures could not explain changes in aggregate output (see Griliches 1995 on the discovery of the residual). Many at the NBER, including Stigler (1947) and Abramovitz (1956), breathed empirical life into these theoretical notions.<sup>5</sup>

In his work on the capital stock, Kuznets bemoaned that “the concept of capital formation ... was too narrow” and that conventional ways of measuring capital understated it. “For many purposes—particularly the study of economic growth over long periods and among widely different societies—the concept of capital and capital formation should be broadened to include investment in the health, education, and training of the population itself, that is, *investment in human beings*” (1961, p. 390; emphasis added).

The study of human capital gave NBER research on productivity and growth a means to comprehend the mystery of the residual. It connected the world of macroeconomics and financial capital with that on investments in people.

#### b. Early Micro Incubators

Becker’s preface to *Human Capital* included a second motivation for the study human capital: “the importance of education in the promotion of economic development.” Oddly, few NBER studies before 1962 mentioned education at all. That neglect seems odd since educational advances in the US were already enormous, both in absolute terms and relative to educational improvements in other nations (Goldin and Katz 2008). The US had been a leader in the education of its people. How could NBER researchers have neglected such an important part of the US economy?

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<sup>5</sup> Griliches notes that Copeland (1937) provided the earliest attempt to express an index of outputs divided by inputs. Stigler has written that his own empirical work on the subject was probably the first ever.

One reason concerns measurement. Until the 1940 US population census, there were no data collected at the national level that could bear on earnings and education. But there were a host of other data that could have been mined on the increase of educational inputs and its role in enhancing skill. See, for example, the many series in Goldin and Katz (2008) from the US Office (Bureau) of Education that chart the expansion of education, as well as those that use occupational wage data and the 1915 IA state census for micro-data on earnings by education level.

Another possibility for the failure of the NBER to study education is that NBER research was steered toward the issues that had preoccupied Mitchell, Burns, and Fabricant. Until the late 1950s, these did not include areas such as education, health, and training, although several publications early in the NBERs history had concerned international migration.

There was one important exception. The study began life as a survey by the US Department of Commerce with data that eventually spanned 1929 to 1936. The data was meant to enhance national income statistics and better estimate the incomes of those in private professional practice. The study became the most controversial published volume in the history of the NBER.

The initial author was Simon Kuznets, whose interest in the data concerned national income statistics. But Kuznets was preoccupied with his other studies at the NBER and hired a research assistant to help with the study. That researcher was Milton Friedman, who would become among the most important economists of the twentieth century.

Friedman had already earned an MA at the University of Chicago and then worked in Washington, DC on New Deal projects.<sup>6</sup> Friedman became a staff economist at the NBER in 1937. The study with Kuznets, *Income from Independent Professional Practice* (1945), became Friedman's PhD dissertation at Columbia University around 1940. But the volume was held up for four years in large part due to a dissent by one of the directors, but also because of the exigencies of war.<sup>7</sup>

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<sup>6</sup> Milton Friedman appears as a member of the NBER research staff with the 1937 Report of the Executive Director.

<sup>7</sup> All NBER publications had to undergo NBER Board review and one member of the Board (C. Reinhold Noyes) disagreed with the Friedman and Kuznets conclusion, particularly the discussion in chapter 4, that supply restrictions for doctors (due to the American Medical Association) increased the earnings of physicians above those of dentists, who faced fewer entry restrictions. See, also, a letter from Mitchell to Burns, cited by Irwin Collier (2017) from the Duke University archives, that shows Mitchell's agreement with Noyes and his lack of confidence in Friedman.

The research was important in a host of ways. It introduced the concepts of permanent and transitory income and it grappled with many of the issues at the heart of human capital theory, including investment under uncertainty, the financing of strangers, “equalizing differentials,” “non-competing groups,” and the reasons for variability in individual professional incomes as well as differences in earnings across professions.<sup>8</sup> Many of Friedman’s key lifetime insights were nascent in this early work including income contingent loans and the theory of the consumption function.

The volume had a seminal impact on another great mind of human capital research—Jacob Mincer. That influence came up in an interview one of us (Goldin) did with Mincer in 2002.<sup>9</sup> The story, of how Mincer saw the “human capital” light and its impact on his life, goes as follows.

*Mincer:* [The Friedman and Kuznets] work had a very big impact on me ... [As a graduate student] at Columbia my interest was in wage determination ... I was approaching it like a Bureau person by looking at various comparisons — by industry, occupation, age, sex, race. I had chapters along those lines. A fellow student of mine ... suggested looking up [*Incomes from Independent Professional Practice*]. When I read this book it took me back to Adam Smith and then I realized that all the comparisons I was making had as a basic principle education and age. If you pushed the comparisons, each one of them had underlying differences in human capital.

*Goldin:* Would you have used that term, “human capital” at that point?

*Mincer:* Yes, I used it immediately ... This was like a revelation. That same afternoon ... I had this principle established, written out and shown with empirical data. My sponsor, [Harold] Barger, immediately said “this is great” and sent a copy to Ted Schultz. I didn’t know there was a whole industry brewing in Chicago involving economic growth and human capital ... It took me [just] a few days to turn around all the material I had into an organized analysis of wage differentials. I then got the offer from Ted Schultz to come to Chicago for a post-doctoral fellowship ... [It was] 1957 ... I immediately went to Chicago.

#### 4. The Flowering of Human Capital at the New York City NBER

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<sup>8</sup> “A young man must not only have the ability to practice a profession and must not only want to enter it; he must also be able to finance his training and be cognizant of opportunities; and both entry into the profession and his success in it will be greatly facilitated if he has the proper background and connections. ... Unlike high returns on capital invested in machinery, high returns on capital invested in professional training need not lead to an increase in investment. Capital invested in human beings is not separable from the individual and cannot be bought and sold on the open market.” (1945, p. 391).

<sup>9</sup> See NBER Historical Archives, Oral Histories of the NBER, [Mincer](#).

The NBER was enabled to explore education and human capital in large measure because of several grants from the Carnegie Corporation. A Carnegie grant was first mentioned in the 1958 NBER annual report as funding Becker's research on the returns to education. Becker later credited the grant and other NBER support with why he took a job at Columbia and the NBER rather than a higher-paying one at Chicago, after completing his PhD at Chicago. "For twelve years I divided my time between teaching at Columbia and doing research at the Bureau. My book on human capital was the outgrowth of my first research project for the Bureau."<sup>10</sup>

A Carnegie grant also funded an event, sponsored by the Universities-NBER Committee for Economic Research and held in 1961, called "The Exploratory Conference on Capital Invested in Human Beings." The planning committee included, among others, George Shultz (chair), Theodore Schultz, Robert Solow, and Gary Becker.

The resulting volume, published as a special supplement in the *Journal of Political Economy*, foretold the outpouring of research on human capital that was to come. As Selma Mushkin, one of the participants, surmised: "A theory of human capital is in the process of formulation" (1962, p. 129).

Looking back, the conference was who's who of human capital. The volume opens with Schultz's overview of the subject and continues with a star-studded cast: Becker on human capital, Mincer on on-the-job training, Sjaastad on migration, Stigler on modern search theory, Weisbrod on education, Denison on economic growth and augmented labor, and Mushkin on health—the human capital Oscars and Emmys rolled together!

By 1970, research on human capital had become sufficiently important for John Meyer, who was by then the president of the NBER, to ask Schultz to head one of the Fiftieth Anniversary colloquia. Its purpose was to assess the human capital efforts of the NBER and to evaluate the future. The Human Resources Colloquium was held in 1971 and was published in Schultz (1972).

Another NBER conference on human capital was organized by Schultz (1974) and published as a special issue of the *Journal of Political Economy*. The volume was titled "Marriage, Family, Human Capital, and Fertility" and added a host of new subjects that were informed by human capital and featured a number of young researchers such as James Heckman, Arlene Liebowitz, and Sol Polachek.

Prior to the 1962 volume, just a handful of NBER pieces directly related to human capital subjects and notions. We just mentioned the Friedman and Kuznets volume.

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<sup>10</sup> Quoted from Gary Becker's [Nobel Prize Facts](#).



Research on fertility was begun by Easterlin (1962) in a short piece that presaged his important work on the baby-boom and his theory of fertility cycles. Easterlin (1968) is a major work tying together the business cycle side of the NBER with the emerging one relating to fertility, family, and human capital more generally.

Becker presented an early version of his work on fertility at a Universities-NBER conference, and published as an NBER volume (Becker 1960). According to Becker, his paper was savaged by all except Kuznets, who also gave a paper at the conference.<sup>11</sup> Becker was grappling with an explanation for long-run changes in fertility. He had not yet worked out the model in his piece with H. Gregg Lewis (Becker and Lewis 1973) on the “quality-quantity” tradeoff and a comparison of the two papers shows how human capital theory had altered Becker’s thinking on the subject.

We would be remiss if we did not mention the work by NBER researchers on slavery. The now-famous paper by Alfred Conrad and John Meyer, published in the *Journal of Political Economy* in 1958, was originally presented at a Universities-National Bureau Committee on Economic Research conference.<sup>12</sup> Although Conrad and Meyer did not use the phrase “human capital,” they did use the term “slave capital.”

After the early 1960s, NBER work in various fields began to blossom under the direction and guidance of senior NBER staff members Becker, Fuchs, Juster, and Mincer. In 1967 a program on health under the direction of Victor Fuchs was announced with research contributions by Michael Grossman.

By 1970—the NBER’s fiftieth anniversary—the list of human capital researchers at the NBER for extensive or limited periods expanded to include V.K. Chetty, Barry Chiswick, Carmel Chiswick, Isaac Erlich, Albert Fishlow, Gil Ghez, Reuben Gronau, Sherwin Rosen, Jim Smith, Lewis Solmon, and Robert Willis. Some were short-term research fellows in residence from other institutions; others were graduate students at Columbia. Still other Columbia and Baruch graduate students and faculty, whom we shall not separately enumerate, spent part of their days at the NBER, just as graduate students and faculty do today.

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<sup>11</sup> See NBER Historical Archives, Oral Histories of the NBER, [Becker](#). Becker did not ingratiate himself with the demographers and sociologists by beginning his paper remarking on “the inability of demographers to predict western birth rates accurately in the postwar period ...”

<sup>12</sup> The event was held in 1957 at Williams College. The resulting volume (known as “volume 24”) contains classics in economic history, but not the piece by Conrad and Meyer, possibly because they preferred publication in the *Journal of Political Economy*. Another paper on slavery, by Robert Evans, was published in *Aspects of Labor Economics* (Universities-National Bureau Committee for Economic Research 1962a).

The work of Gil Ghez and Gary Becker on the *Theory of the Allocation of Time* that led to a co-authored volume of that title deserves special mention. That work was foundational and became the bedrock for much of human capital theory and Becker's work on the family.<sup>13</sup>

## 5. Bringing the NBER into the Modern

We previously noted the apparent paucity of research at the NBER on human capital until the early 1960s. But that may be misleading since the use of a catchword or phrase may indicate that a basic element had been discovered, not that the subject was entirely unknown. Biologists, for example, knew that various traits were inherited, but the use of the term "genetics" gained traction only after a key set of discoveries. Tracking the term "genetics" would miss various turning points in the intellectual journey of the discipline. Tracking "human capital" might do the same.

Therefore, in tracking NBER research from its inception in 1920, we have searched for topics that are associated with human capital research. These include education, labor, health, migration, women, children, demography, fertility, marriage, the family, and economic inequality.

NBER research, today, is disseminated through working papers, seminars, conference volumes, and other books. In the past, NBER research was circulated mainly in volume form. The "occasional research paper" series was begun in December 1940 and was continued by "Explorations in Economic Research" in 1974, during John Meyer's tenure as NBER president.<sup>14</sup> Shorter pieces in collected volumes have existed from the 1920s with different sponsors and interests, including the Conference on Research in Income and Wealth and the Universities-National Bureau Committee for Economic Research.

The most convenient way to track the content of NBER volumes since 1920 is to use existing coding systems, of which the most extensive is the Library of Congress numbering scheme. We have looked up the codes for all 1,269 NBER published volumes (not working papers) from 1920 to 2019 listed on the NBER website.<sup>15</sup> Subtracting duplicates, internal documents, and other items that do not have LoC codes, results in 819 volumes. (These codes are not yet listed with NBER books, but will soon be.) We also used our knowledge of the volume content (see Appendix). The results are in Figure 2, part A.

In Figure 2, part B we use an EconLit search to code the fraction of NBER volumes

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<sup>13</sup> Ghez and Becker (1975). Also see Heckman (2014).

<sup>14</sup> The original "occasional paper" series appears to have ended with #119 in 1972.

<sup>15</sup> The entire occasional working paper series has one LoC code and is numbered from 1 to 119.

that reference “human capital” in the abstract, title, or JEL code. The series begins in 1991 when EconLit put JEL codes on papers and books.<sup>16</sup>

Therefore, we have two complementary measures. The first gives the human capital content of NBER volumes from 1920 to 2020. The second counts books that reference human capital as a phrase for the years after 1990. The first series is broad and covers a long period; the second is more direct but covers only the last three decades. The two series tell a somewhat similar story of the importance of human capital in NBER volumes.

Today, about 37% of all NBER volumes are concerned with material related to the human capital construct. The fraction was around 10% from the 1930s to the 1970s. A clear exception to the trend is the 1920s when about 27% were in the group. But there were only 16 books in that decade and most with human capital content concerned immigration, a very hot topic during that period of immigration restriction. Another break is with the 1940s when many volumes concerned subjects related to WWII. The main takeaway is that the subjects of human capital were not that high on NBER researcher’s lists until the 1970s and especially after the 1990s.

Using the EconLit coding, which can only be done after 1990, shows a large increase in NBER books that directly use the term human capital in the title, abstract, or JEL code. Just under 5% of NBER volumes referenced human capital in the early 1990s, but almost 25% did in the 2010s (see Figure 2, part B).

All economics books do not have a similar increase. At the start of the 1990s, all economics volumes referenced human capital to about the same degree as those put out by the NBER. But by the 2010s, NBER books reference human capital about four times the level of all economics books.

NBER publications shifted decisively in favor of working papers after the 1970s. The official NBER working paper series was begun in June 1973 with Finis Welch’s piece on “Education, Information, and Efficiency.” Around 1977, with the transition from John Meyer to Martin Feldstein, new program names began to be attached to the working papers. JEL codes were not requested of submissions until around 1996, but the staff at EconLit attached JEL codes to NBER working papers issued after 1990.

We have used these JEL codes and the EconLit search engine to code NBER working papers and all published papers in EconLit. The results for the search term human capital

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<sup>16</sup> EconLit appears to have no NBER books listed with a publication date prior to 1986. JEL codes appear on almost all NBER books and articles with 1991. There is a smattering of the new codes and the older ones from 1986 to 1990.

are given in Figure 3. Because there are so many more working papers than books, we aggregate by five-years.

The fraction of all NBER working papers that use the term human capital in the title, abstract, or JEL code increased from around 3% to 10% across the past three decades. Similar to the comparison of NBER volumes to all economics volumes, the human capital phrase does not increase much for all published papers, increasing from around 4% to only 6%. The NBER series should have a higher fraction with the term human capital since NBER working papers generally do not include theory pieces. But the three-fold increase in the past 30 years in the fraction of NBER working papers that directly use the term human capital increase when the fraction of all articles hardly budged, requires an explanation.

## 6. The Human Capital Takeoff at the Cambridge MA NBER

An increased fraction of NBER papers, since 1990, reference the phrase human capital. That is true in absolute terms and relative to all published articles in economics. Both series had about the same fraction in the early 1990s. But the phrase human capital was referenced in NBER working papers more than in the total group of published papers by the early 2000s, and the NBER share greatly exceeded the overall fraction referencing human capital by 2015-19. A similar story can be told for books, also using the EconLit search engine. The differences here are even greater, but the number of observations is much smaller. By the 2010s, almost 25% of NBER books referenced human capital but just 5% of all published books referenced in EconLit did.<sup>17</sup>

What accounts for the takeoff in NBER human capital publications relative to all in economics? Is it due to a change in the composition of NBER researchers or have NBER researchers across fields turned their attention more to human capital? We believe it is the latter, but we do not yet have a full answer.

The NBER relaunch in Cambridge, MA under Martin Feldstein in 1977, led to a reorganization with a focus on research programs (that could appoint NBER affiliates) spanning seven areas: Development of the American Economy; Economic Fluctuations and Growth; Health Economics; Labor Studies; Productivity; Monetary Economics; and Tax Policy (later renamed Public Economics). The rapidly growing network of NBER affiliates, NBER program meetings, conferences, working groups, and the NBER Summer Institute all

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<sup>17</sup> The fraction of all books that mention human capital, among those that mention economics, increases continuously from the 1960s (see Figure 1, which uses a Google Ngram), but greatly quickens in the 1990s. The levels are higher than in Figure 3. One reason is that the Google Ngram searches the entire book whereas EconLit uses only the abstract, title, and JEL code.

served during the last 40 years to create stronger connections among empirically-oriented scholars in economics and helped spread and foster advances in human capital research.

The NBER, today at 100 years old, now has 20 formal research programs, fostered first by Martin Feldstein and then by James Poterba. Programs on Aging, Children, Development Economics, the Economics of Education, and Health Care helped catalyze research on core human capital issues. But these new program areas were also a way to attract federal research funding. NBER working groups in Behavioral Economics, Cohort Studies, Economics of Crime, Personnel Economics, and Urban Economics incorporated a broader range of scholars and human capital topics into the NBER network.

Increased federal research funding for economists through the National Institutes of Health (including the National Institute of Aging and National Institute of Child Health and Development) and the Institute for Education Sciences helped galvanize economic research on human capital that spanned the life cycle from womb to tomb. Research flourished on the role of the in utero environment, early childhood education, health investments, K-12 and higher education, adult learning, retirement, aging, and life expectancy.

NBER researchers, such as David Wise of the Aging program and Caroline Hoxby of the Economics of Education program, have played key leadership roles in facilitating research expansions into new human capital areas.

## 7. Discussion and Conclusion

The human capital revolution incubated at the NBER in mid-twentieth century by scholars such as Milton Friedman, Gary Becker, and Jacob Mincer has greatly influenced and enriched economic research and policy analysis in the late twentieth and early twenty-first centuries. NBER-affiliated researchers have shown that shifts in the demand for skills stemming from technological change, combined with changes in access to educational opportunities, have been central to alterations in the wage structure, earnings inequality and cross-country differences in inequality (Autor 2014; Freeman and Katz 1995; Goldin and Katz 2008; Katz and Murphy 1992).

Research has flourished on the importance of early childhood education and environments for long-run economic outcomes and broadened the human capital perspective to examine the development and returns to social and emotional skills (Cunha and Heckman 2007; Currie 2011; Deming 2017; Heckman 2008; Heckman, Pinto, and Savelyev 2013).

Access to large administrative, linked longitudinal data sets from Census and the Internal Revenue Service has enabled researchers to build on the conceptual insights of

Becker and Tomes (1979). The results has been a better understanding of the determinants of, and geographical and racial variation in, intergenerational mobility (Chetty et al. 2014; Chetty et al. 2020). These huge administrative datasets have also furthered the human capital revolution by permitting more compelling empirical analyses of the long-run causal impacts of educational interventions and childhood neighborhood environments (Chetty et al. 2011; Chetty, and Hendren 2018; Chetty, Hendren, and Katz 2016).

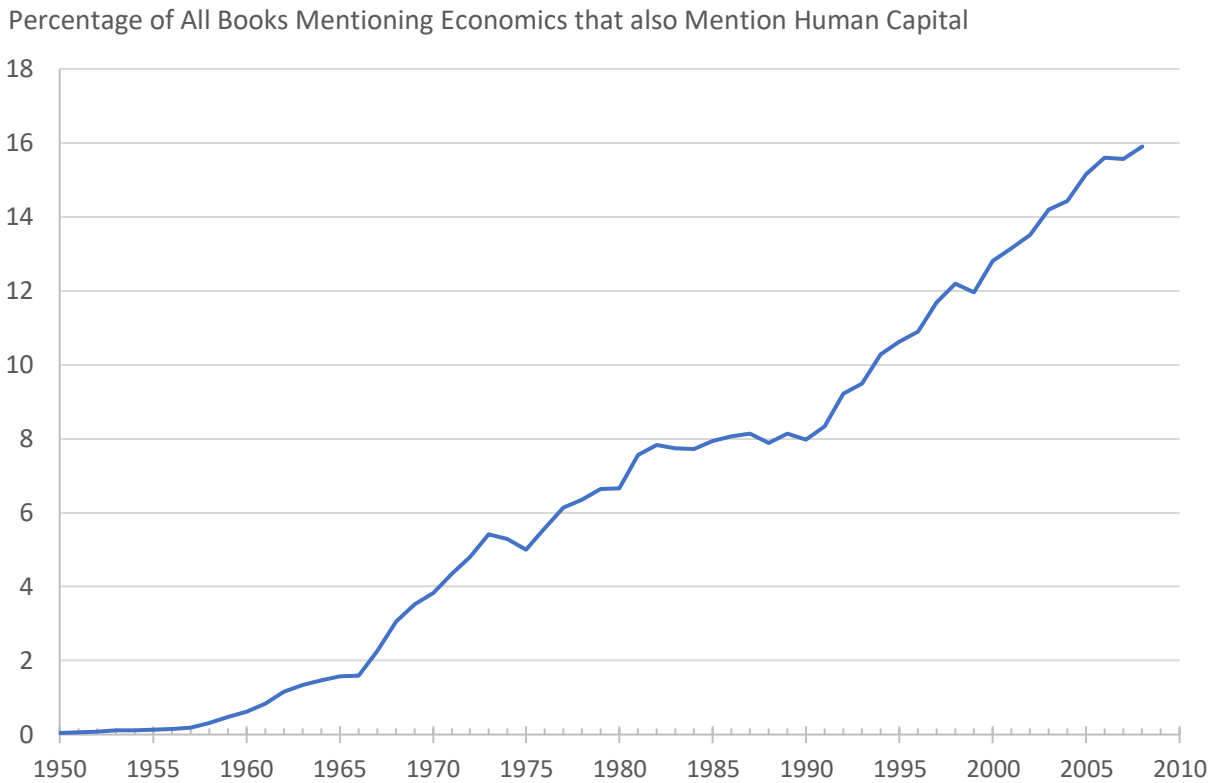
The fruits of the human capital revolution are clear in the range of papers presented at the NBER's Summer Institute. One entire week of the Summer Institute in recent years has been devoted to research on labor markets, children, education, development economics, economics of crime, health economics, health care, and aging.

Mainstream public economics research now engages with the implications of human capital investments for optimal tax policy (Stantcheva 2017) and for the welfare analysis of tax and expenditure policies. At the 2019 Summer Institute, a paper by Hendren and Sprung-Keyser (2019) demonstrated that government programs that expand investments in children from low-income families provide a very high social return to public funds.

Macroeconomic research at the NBER has also been infused with human capital ideas. These include improvements in the measurement of the contribution of human capital investments to cross-country income differences (Jones 2016) and the central role of search models, building on Stigler (1962), for understanding unemployment and labor market fluctuations.

At the end of NBER's first century, we can confidently say that we are all human capitalists now.

Figure 1: Human Capital Google Ngram of All US Books: 1950 to 2009

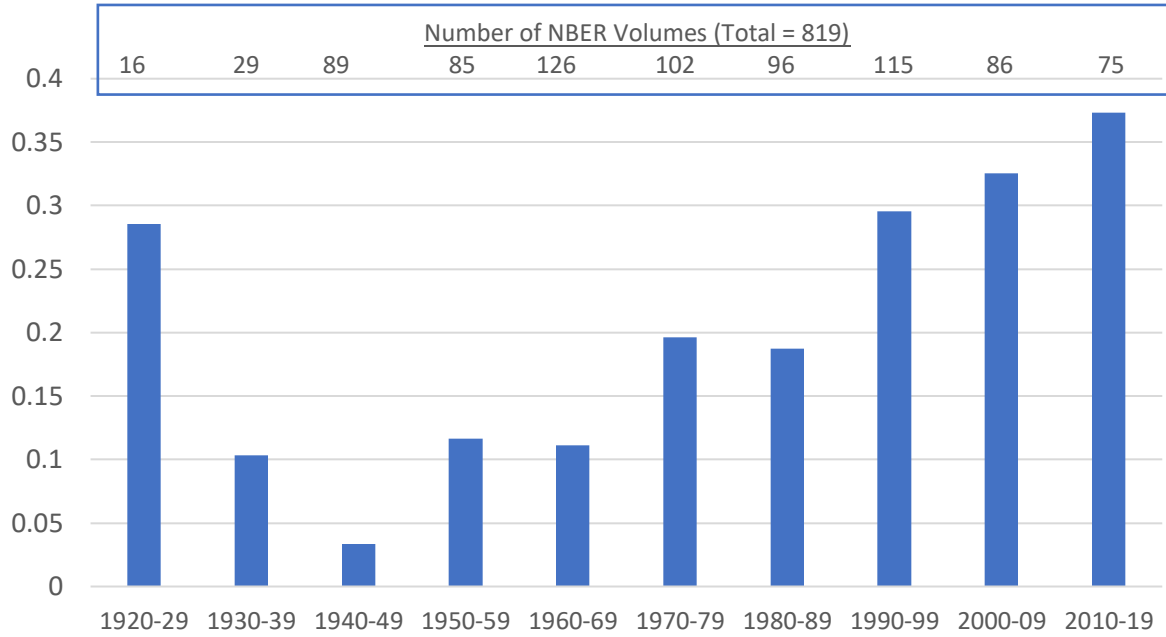


*Source:* Google Ngram Viewer using “American English (2009).”

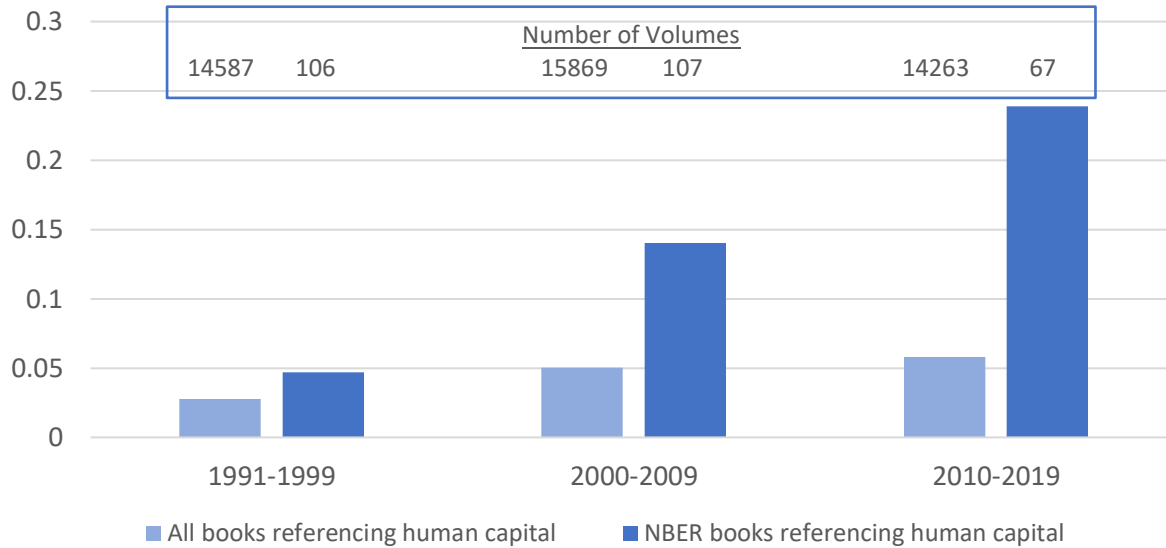
*Notes:* The graph gives the ratio of all books that mention “human capital” to those that mention “economics” or “human capital.” The reason for including both economics and human capital in the denominator is to make certain that there are no aberrant listings of human capital that are not in a book on economics. There are almost none in that group. A smoothing of three is used, meaning that three years on each side of the number are used to smooth, except for the endpoints.

Figure 2: NBER Volumes and “Human Capital”: 1920 to 2019

Part A: Fraction NBER volumes concerning “human capital” subjects



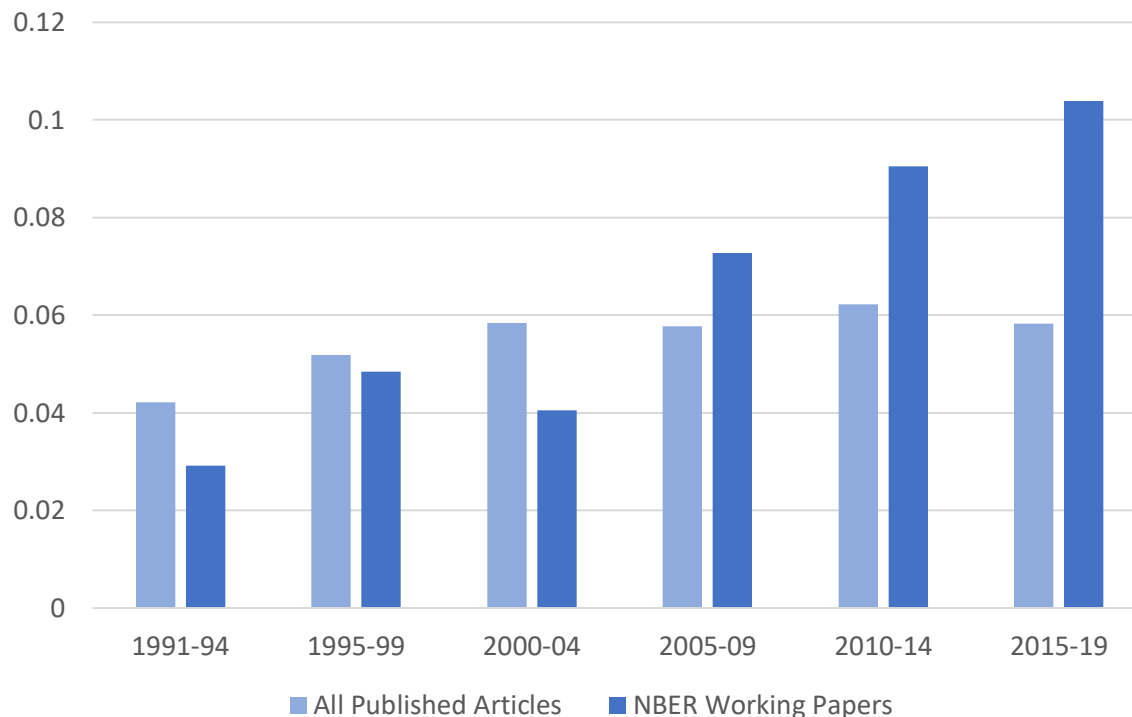
Part B: Fraction NBER volumes and all economic volumes referencing “human capital”



Sources and Notes: NBER website and Library of Congress search routine; EconLit search engine. See Appendix: Coding Volumes, NBER Working Papers, and Published Articles.



Figure 3: Fraction NBER Working Papers and All Published Articles Concerned with “Human Capital”: 1991 to 2019



*Source:* EconLit search engine. See Appendix: Coding Volumes, NBER Working Papers, and Published Articles

*Notes:* Graph gives the results for (“Human Capital” + “NBER Working Paper”) divided by “NBER Working Paper” as words/phrases used in the title or abstract of the working paper or in the JEL category assigned by the researcher or by EconLit (after 1990 when the NBER did not request a JEL code). The results for (“Human Capital” + “the”) divided by “the” is computed in the same manner but for published articles (not working papers). The number of NBER working papers catalogued was 1,645 for 1991-94 and increased to 5,602 in 2015-19. The number of economics articles was 41,864 for 1991-94 and increased to 235,487 in 2015-19. Errors bars have not been added, but t-statistics are all large.

Appendix: Coding Volumes, NBER Working Papers, and Published Articles

A. NBER Volumes

To categorize NBER volumes beginning with the first in 1920, we have collected all the Library of Congress (LoC) catalogue numbers for NBER volumes that are coded. (NBER volumes are currently being categorized, by NBER staff, using JEL codes but only a small fraction have been done.) JEL codes for NBER Working Papers were requested only beginning around 1996, but were assigned to papers after 1990 by EconLit staff. Note that NBER occasional papers are generally not coded under the LoC system, although they appear to share a general code that is given the occasional paper number.

The number of books that we have coded is around 820 but there are 1,270 books and occasional papers listed on the NBER site. Note that NBER internal documents (e.g., annual reports) and short papers do not have LoC numbers. There are also many repeated entries in the NBER system.

The LoC coding scheme is a reasonable, but imperfect, device to code economics books. We have used the following LoC codes to indicate relevance to the concept of “human capital.” The topics/words included are: labor, labor force, employment, compensation, health and disability, demography, income inequality, marriage, the family, women, children, human physical growth, scientific personnel, time use, pensions (but not savings and Social Security separately), and unions.

The LoC codes used are as follows:

LoC Number	Content for “Human Capital” Designation
E1	History of the Americas, relevant portions
H11	Social Sciences, only if Labor Force, Employment, Servants, Compensation
HA	Health and disability, not Social Security; Health care, but not health costs
HB848-3697	Demography
HC106	Most listings, but not exclusively national income
HC110	Income inequality
HD4801-8943	Labor; not housing and not business cycles
HQ	Marriage and the family
HV	Items regarding women and children
GN	Anthropology (human physical growth)
JV6001-9480	Migration
L	Education
Q1	Scientific personnel
RA	Medicine and the state
TX	Home economics

All other codes are treated as not having “Human Capital” content.

#### B. NBER Working Papers

We have used the EconLit search engine to find mention of the phrase “human capital” and “NBER Working Paper” in all working papers. We deflate by all working papers that mention the “NBER Working Paper.” EconLit uses only a limited number of fields (articles are not available to the coders). These fields include the title, authors, the abstract of the article, and the JEL codes for the article.

Counts of the term “human capital” may be understated if the phrase was not in the title or abstract or JEL code. Note that just two JEL codes (E24; J24) list the phrase “human capital” and any paper listing either of these codes will be included in the human capital group. A count of papers that list the phrase “human capital” in the title or abstract or that list at least one of the relevant JEL codes, will likely understate all papers that concern “human capital.” Another consideration is that, with few exceptions, EconLit provides JEL codes for NBER working papers (and possibly for all published articles) only after 1990. The listings for “human capital” before 1991 will greatly understate the total since a large fraction with JEL codes E24 and J24 do not include the phrase in the abstract or title of the paper.

#### C. All Published Articles

The fraction of all published articles referencing “human capital” is computed from EconLit by counting all articles with “the” in the abstract, title, or JEL code (the presumption is that the number will be all articles). The numerator is the number that use the phrase “human capital” in the abstract, title, or JEL code and “the,” to make certain that no articles omitted in the denominator are in the numerator.

#### D. NBER and other published volumes after 1990

The fraction of all volumes referencing “human capital” is computed from EconLit by counting all volumes with “the” in the abstract, title, or JEL code. The numerator is the number that use the phrase “human capital” in the abstract, title, or JEL code and “the,” to make certain that no volumes omitted in the denominator are in the numerator. The limitation on the JEL codes for the volumes is the same as for the articles.

## References

- Abramovitz, Moses. 1956. "Resource and Output Trends in the U.S. since 1870," *American Economic Review* 46(2): 5-23.
- Autor, David H. 2014. "Skills, Education and the Rise of Earnings Inequality among the 'Other 99 Percent'," *Science* 344 (6186): 843-51.
- Becker, Gary S. 1960. "An Economic Analysis of Fertility." In George Roberts, ed., *Demographic and Economic Change in Developed Countries*. NBER. New York: Columbia University Press.
- Becker, Gary S. 1962. "Investment in Human Capital: A Theoretical Analysis," *Journal of Political Economy* 70(5) part 2: 9-49.
- Becker, Gary S. 1964. *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. National Bureau of Economic Research. New York: Columbia University Press.
- Becker, Gary S. 1976. *The Economic Approach to Human Behavior*. Chicago: University of Chicago Press.
- Becker, Gary. 1993. *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*." Third Edition. NBER. Chicago: University of Chicago Press.
- Becker, Gary S., and H. Gregg Lewis. 1973. "On the Interaction between the Quantity and Quality of Children," *Journal of Political Economy* 81(2) part 2: S279-S288.
- Becker, Gary S., and Nigel Tomes. 1979. "An Equilibrium Theory of the Distribution of Income and Intergenerational Mobility," *Journal of Political Economy* 87(6): 1153-89.
- Card, David. 2001. "Estimating the Return to Schooling: Progress on Some Persistent Econometric Problems," *Econometrica* 69(5): 1127-60.
- Chetty, Raj, John Friedman, Nathaniel Hilger, Emmanuel Saez, Diane Schanzenbach, and Danny Yagan. 2011. "How Does Your Kindergarten Classroom Affect Your Earnings? Evidence from Project Star," *Quarterly Journal of Economics* 126(4): 1593-660.
- Chetty, Raj and Nathaniel Hendren. 2018. "The Impacts of Neighborhoods on Intergenerational Mobility I: Childhood Exposure Effects," *Quarterly Journal of Economics* 133(3): 1107-162.

- Chetty, Raj, Nathaniel Hendren, Maggie Jones, and Sonya Porter. 2020. "Race and Economic Opportunity in the United States: An Intergenerational Perspective," *Quarterly Journal of Economics*, forthcoming.
- Chetty, Raj, Nathaniel Hendren, and Lawrence F. Katz. 2016. "The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment," *American Economic Review* 106(4): 855-902.
- Chetty, Raj, Nathaniel Hendren, Patrick Kline, and Emanuel Saez. 2014. "Where is the Land of Opportunity? The Geography of Intergenerational Mobility in the United States," *Quarterly Journal of Economics* 129(4): 1553-623.
- Collier, Irwin. 2017. "Economics in the Rear-View Mirror: Archival Artifacts from the History of Economics." <http://www.irwincollier.com/nber-mitchell-to-burns-about-friedman-1945/>
- Conrad, Alfred, and John Meyer. 1958. "The Economics of Slavery in the Ante Bellum South," *Journal of Political Economy* 66(2): 95-130.
- Copeland, Morris. 1937. "Concepts of National Income." In *Studies in Income and Wealth*, vol. 1: 3-63.
- Corrado, Carol, Charles Hulten, and Daniel Sichel. 2009. "Intangible Capital and Economic Growth," *Review of Income and Wealth* 55(3): 661-85.
- Cunha, Flavio, and James Heckman. 2007. "The Technology of Skill Formation," *American Economic Review* 97(2): 31-42.
- Currie, Janet. 2011. "Inequality at Birth: Some Causes and Consequences," *American Economic Review: Papers and Proceedings* 101(3): 1-22.
- Deming, David. 2017. "The Growing Importance of Social Skills in the Labor Market," *Quarterly Journal of Economics* 132(4): 1593-640.
- Denison, Edward. 1962. "Education, Economic Growth, and Gaps in Information," *Journal of Political Economy* 70(5) part 2: 124-28.
- Easterlin, Richard. 1962. *The American Baby Boom in Historical Perspective*. NBER Occasional Paper no. 79.

- Easterlin, Richard. 1968. *Population, Labor Force, and Long Swings in Economic Growth: The American Experience*. NBER. New York: Columbia University Press.
- Freeman, Richard B., and Lawrence F. Katz, eds. 1995. *Differences and Changes in Wage Structures*. Chicago: University of Chicago Press and NBER.
- Friedman, Milton, and Simon Kuznets. 1945. *Income from Independent Professional Practice*. New York: NBER.
- Ghez, Gilbert R., and Gary S. Becker. 1975. *The Allocation of Time and Goods over the Life Cycle*. NBER. New York: Columbia University Press.
- Goldin, Claudia, and Lawrence F. Katz. 2008. *The Race between Education and Technology*. Cambridge MA: Belknap for Harvard University Press.
- Griliches, Zvi. 1995. "The Discovery of the Residual: An Historical Note." NBER Working Paper no. 5348 (November).
- Heckman, James. 2008. "Schools, Skills, and Synapses," *Economic Inquiry* 46(3): 289-324.
- Heckman, James. 2014. "Introduction to *A Theory of the Allocation of Time* by Gary Becker." IZA DP no. 8424 (August).
- Heckman, James, Rodrigo Pinto, and Peter Savelyev. 2013. "Understanding the Mechanisms thorough which an Influential Early Childhood Education Program Boosted Adult Outcomes," *American Economic Review* 103(6): 2052-86.
- Hendren, Nathaniel, and Benjamin Sprung-Keyser. 2019. "A Unified Welfare Analysis of Government Policies." NBER Working Paper no. 26144, December.
- Jones, Charles I. 2016. "The Facts of Economic Growth," *Handbook of Macroeconomics*, vol. 2A: 3-69.
- Katz, Lawrence F., and Kevin M. Murphy. 1992. "Changes in Relative Wages, 1963-1987: Supply and Demand Factors," *Quarterly Journal of Economics* 107(1): 35-78.
- Kiker, B. F. 1966. "The Historical Roots of the Concept of Human Capital," *Journal of Political Economy*, 74(5): 481-99.
- Kuznets, Simon, with Elizabeth Jenks. 1961. *Capital in the American Economy: Its Formation and Financing*. Princeton NJ: Princeton University Press for the NBER.

- Mincer, Jacob. 1958. "Investment in Human Capital and Personal Distribution of Income," *Journal of Political Economy* 66(4): 281-302.
- Mincer, Jacob. 1962. "On-the-Job Training: Costs, Returns, and Some Implications," *Journal of Political Economy* 70(5) part 2: 50-79.
- Mushkin, Selma. 1962. "Health as an Investment," *Journal of Political Economy* 70(5) part 2: 129-57.
- Roberts, George. 1960. *Demographic and Economic Change in Developed Countries*. Universities-NBER Conference Volume. Columbia University Press.
- Schultz, Theodore W. 1961. "Investment in Human Capital," *American Economic Review* (presidential address) 51(1): 1-17.
- Schultz, Theodore W. 1962. "Reflections on Investment in Man," *Journal of Political Economy* 70(5) part 2: 1-8.
- Schultz, Theodore W. 1972. *Human Resources*. Fiftieth Anniversary, Colloquium VI. National Bureau of Economic Research. New York: Columbia University Press.
- Schultz, Theodore W., ed. 1974. "Marriage, Family, Human Capital, and Fertility," *Journal of Political Economy* 82(2), Part II.
- Spengler, Joseph J. 1977. "Adam Smith on Human Capital," *American Economic Review: Papers and Proceedings* 67(1): 32-36.
- Stantcheva, Stefanie. 2017. "Optimal Taxation and Human Capital Policies over the Life Cycle," *Journal of Political Economy*, 125(6): 1931-90.
- Stigler, George. 1947. *Trends in Output and Employment*. Twenty-fifth Anniversary Series. NBER.
- Stigler, George. 1962. "Information in the Labor Market," *Journal of Political Economy* 70(5, Part 2): 94-105.
- Universities-National Bureau Committee for Economic Research. 1962. "Investment in Human Beings," *Journal of Political Economy* 70(5), part 2.
- Universities-National Bureau Committee for Economic Research. 1962a. *Aspects of Labor Economics*. NBER. Princeton, NJ: Princeton University Press.