
**Earnings Over the Life
Cycle: The Mincer
Earnings Function
and Its Applications**

Earnings Over the Life Cycle: The Mincer Earnings Function and Its Applications

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Abstract

In 1958, Jacob Mincer pioneered an important approach to understand how earnings are distributed across the population. In the years since Mincer's seminal work, he as well as his students and colleagues extended the original human capital model, reaching important conclusions about a whole array of observations pertaining to human well-being. This line of research explained why education enhances earnings; why earnings rise at a diminishing rate throughout one's life; why earnings growth is smaller for those anticipating intermittent labor force participation; why males earn more than females; why whites earn more than blacks; why occupational distributions differ by gender; why geographic and job mobility predominate among the young; and why numerous other labor market phenomena occur. This review surveys the answers to these and other questions based on research emanating from Mincer's original earnings function specification.

*This review draws on and extends material from Polachek (1995) and Polachek (2003). I thank Thomas Kniesner and James Ziliak for their insightful comments on an earlier draft, as well as comments by Barry Chiswick concerning the historical origins of the empirical specification of the Mincer earnings function.

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1

Introduction: Why Study Earnings Functions?

Over the last half century labor economics has undergone a major transformation. Rather than view labor as an amalgam of homogeneous workers in an aggregate economy-wide production function, modern labor economics considers labor as a conglomeration of heterogeneous human beings each differing in on-the-job productivity. Nowadays labor economists emphasize how economies enhance worker productivity employee-by-employee through motivating workers to put out effort and to invest in human capital. As a result labor economists concentrate on the earnings distribution across workers rather than the functional distribution of income between labor and capital. How this shift in emphasis came about is an interesting story. It begins with Wassily Leontief, Theodore Schultz, and D. Gale Johnson, but continues with Jacob Mincer and later extends to today's research on effort enhancing contracts.

Leontief, in 1946, found US exports to be labor rather than capital intensive. This was surprising because US wages were relatively high compared to wages in other countries. Based on the theory of comparative advantage, the United States should have exported capital intensive commodities, given her relatively high wages. Yet, as just

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mentioned, using an input–output table for 1939, Leontief (1946) found US exports to be labor rather than capital intensive.

About 15 years later, Schultz (1961a,b) found that the prevailing economic models failed to fully account for US growth. Between 1919 and 1957 per annum United States output rose 3.1%, while labor and capital increased a mere 1% (1961: 50). According to Schultz, output rose far more quickly than one would expect given the secular increases in capital and labor. Similarly in Britain and other countries, changes in physical capital and labor also explained only a fraction of the growth of national income.

At the same time the proportion of National Income going to labor rose. According to Johnson (1954), in the decade 1900–1910, labor’s share was about 69.4% of national income. Four decades later, in 1940–1949, it was 75.2%. Based on the National Income and Products Account’s compensation data, Krueger (1999) estimated labor’s share to be about 77% in 1998.

When these three findings emerged, the theory of comparative advantage along with the prevailing growth theory models relied on the standard neoclassical production function framework. One limitation of this framework was the assumption of input homogeneity. Homogeneity implies each unit of capital is identical to each other, as is each unit of labor. Because few countries achieved sustained levels of economic growth without having invested substantially in education, researchers began to question whether input quality, particularly for labor, really was constant. Since education and training reflect labor quality, a new line of research, namely human capital, theory developed to study how society invests to enhance worker quality, and hence worker productivity. As such Leontief’s paradoxical finding that US exports are labor intensive could be solved by realizing that US workers had a relatively high skill embodiment. Similarly unmeasured worker human capital could explain Schultz’s observation regarding US growth, and at the same time Johnson’s finding that labor’s share of national income increased.

Although these developments took place in the 1950s and 1960s, human capital theory actually had its roots at least as far back as Sir William Petty who considered labor to be “the father of wealth”

(Kiker, 1971, p. 62). Petty capitalized the wage bill (which he got by deducting property income from national income) to obtain an estimate of human wealth (Hull, 1899, I, p. 108). Slightly later, the Spanish economist Gasper Melchor de Jovellanos (1744–1811), another very early human capital pioneer (Street, 1988), dealt with the capitalized value of labor and applied his human capital ideas to redirect financing so that Spain could use education to solve its economic problems. Other early economists who considered human capital include Adam Smith, Jean Baptiste Say, Nassau William Senior, Friedrich List, Johann Heinrich von Thünen, Ernst Engell, Léon Walras, Irving Fisher (Kiker, p. 51) and Karl Marx (Walsh, 1935). Indeed according to Kiker “human capital was somewhat prominent in economic thinking until Marshall discarded the notion as ‘unrealistic’ (ibid., p. 51) ... since human beings are not marketable (ibid., p. 60).”

These economists were primarily concerned with the capitalized value of labor particularly as it applied to measuring national wealth and the resulting changes in national wealth caused by war (Giffen, 1880; Guyot, 1914; Boag, 1916) or immigration (Kapp, 1870). Not considered were life cycle aspects of an individual’s investment decisions. However, in 1935 John Walsh produced tables essentially containing age-earnings profiles for select occupations (law, engineering, and medicine) and in the process computed net present values (that is, benefits minus costs) for each. Similarly Friedman and Kuznets (1945) go one step further by comparing present values for US professional practitioners to determine “whether the assumptions of perfect competition do describe the world we live in, or whether the analysis of income differences should be based on the theory of non-competing groups” (Barna, 1947, p. 64).

With an interest primarily to explain a country’s growth, initial research considered aggregate measures of human capital. Perhaps this is why Schultz developed exhaustive measures of US human capital stock (Schultz, 1961a,b). From these he tried to quantify the portion of GNP growth unexplained by conventional models. While macroeconomic growth considerations can explain motives for public human capital investment, other patterns, such as repeated evidence that the most educated workers have the highest earnings led researchers to

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explore reasons why individuals devote their own resources to educational investments. Clearly if education enhances personal earnings then private spending on education pays. Understanding such investments in education resulted in studies deriving methods to estimate private (Becker, 1964) and social rates of return (Psacharopoulos, 1985).

Although Pigou (1928, p. 29) in his statement “there is such a thing as *human capital* [emphasis mine] as well as investment in material capital” was probably the first to coin the term *human capital* when describing ambiguities between consumption and investment, Mincer (1958) was the first to employ the term prominently in his pioneering work to model earnings distribution using the mathematical tools of neoclassical capital theory. By developing a very parsimonious model first utilizing only schooling (and later experience and annual weeks worked), he was able to account for about 60% of the variation in US annual earnings for adult white men. His resulting “earnings functions” have been applied in over 100 countries with the same resounding success achieved with US data. Invariably, according to computations based on his methodology, schooling rates of return are in the 5%–15% range, exactly the same range as high-grade commercial investments. Similarly all cross-sectional earnings profiles proved concave, just as he predicted.

Understanding individual earnings gets at the very core of social science because it answers questions regarding the very foundations behind human well-being. Indeed comprehending the determinants of earnings helps policy makers develop tactics to promote wealth, to help ease poverty and eventually to put countries on a path to increased growth and prosperity. Human capital theory shows that neither luck nor decree lessen poverty, but instead concerted individual investments in human capital raise earnings and ease deprivation. Even low-ability workers can benefit from training. These insights led to viable policies increasing overall wealth. As many have shown (for example, Barro and Sala-i-Martin, 1999), human capital theory has strong implications for economic growth.

Before Mincer’s 1958 article, the predominant theories of earnings distribution relied mostly on luck to determine who succeeded financially. Such theories offered no economic rationale into the earnings

distribution process. However, by adopting notions of Adam Smith's theory of compensating differentials coupled with Friedman's notions of "choices among alternative [work options] differing in the probability distribution of the income they promise" (Mincer, 1958, p. 284), Mincer was able to devise an entirely new theory. His innovation was to realize that an individual's choices produced income streams easily evaluated using capital theory. Treating schooling and occupation as investment opportunities, he ingeniously modeled the outcome of a person's investment choices. By assuming individuals invest up to the point where investment costs just equal the present value of schooling gains, he obtained a simple and tractable econometric specification leading to the now famous log-linear earnings function. Not only did this formulation provide a measure of private rates of return to schooling, but it easily generalized to get at post-school on-the-job training, as well. This work showed that a worker's wages consistently rise over the life cycle at a decreasing rate, yielding a concave earnings profile for most individuals. Subsequent work by Ben-Porath motivates some of the technical assumptions Mincer makes to estimate this concavity. Human capital theory also explains gender, race, and ethnic differences in earnings, geographic and job mobility, occupational choice as well as worker turnover, unemployment, and other labor market phenomena.

At present, a number of survey articles have been written on the Mincer earnings function. Perhaps four of the recently most popular are Card (1995, 1999); Heckman et al. (2006); and Lemieux (2006b). Card concentrates on econometric issues with regard to identifying the causal relationship between schooling and earnings. Heckman et al. concentrate on empirical support using past and current data and on how to best incorporate future earnings uncertainty. Lemieux concentrates on how well the most common version of the Mincer earnings function fits current data. In short, these four surveys focus heavily on econometric issues. This survey differs from each of these. Whereas I cover a number of econometric issues, I focus more on the underlying economics behind the Mincer earnings function, as well as its robustness and its relevance to policy applications. Topics include verifying the consistently observed cross-sectional concavity and corroborating implications regarding earnings distribution particularly at the "overtaking"

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level of experience, across many countries and demographic groups. Among the policy relevant applications are how to use Mincer's theories to estimate discrimination, particularly race and gender differences in both earnings and occupational distributions. In addition, I show how with a simple modification the earnings function can be adapted to measure incomplete information in labor markets, an extension which is important in measuring just how competitive particular labor markets really are.

Recent extensions of the life cycle model involve incentive based compensation schemes. In these models, firms provide a contract to workers to encourage them to maximize their effort and hence their productivity. Some argue that such contract models complement human capital in explaining wages and other labor market phenomena; others argue that contract models substitute for the human capital model. The final part of this survey explores this question and concludes that one has to consider both types of models simultaneously in a unified framework to determine the relative merits of each.

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