

## Human Capital and the National Accounts

By Dale W. Jorgenson

KATHARINE Abraham's paper, "Accounting for Investments in Formal Education" (2010), provides an excellent and comprehensive survey of the main issues regarding the measurement of education and provides important links to the substantial literature in labor economics. Estimates of expenditures on education provide the starting point for the measurement of investment in human capital. This approach can be extended to expenditures on training, as in the recent work of Carol Corrado, Charles Hulten, and Daniel Sichel (2009). While expenditures on education and training are inputs into the process of investment, the central question is: what is the output?

Barbara Fraumeni and I (1989) have proposed a measure of the output of education and training, namely, the increment to lifetime labor incomes. This accrues as current income to individuals who receive the education and training. Our approach has the important advantage of providing separate measures of output and input. The value of input into investment in education is equal to expenditures on education and the incomes of students in school. The value of output is equal to additions to lifetime labor incomes.

The lifetime incomes approach to measuring investment in human capital has attracted considerable attention from national accountants. Michael Christian (2010) has developed new estimates for the United States. Australia, Canada, France, New Zealand, Norway, Poland, and Spain have developed measures of investment in formal education based on our approach. In September, the OECD launched a project to apply this approach to more than 20 countries, including the major OECD countries. A research project on these measures was completed for China last October.<sup>1</sup>

1. See Gang Liu (2010).

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There has been a steady growth of interest in applying national accounting ideas to economic activity that occurs outside markets. While the boundary between market and nonmarket activities has always been ambiguous, the traditional approach to national accounting has leaned toward a narrow definition of the boundaries. Systems of "satellite" accounts apply a broader definition but are consistent with national accounting principles. Formal education is an obvious candidate for such a satellite system because of its economic importance.

National accounting principles stress the use of accounting concepts such as double-entry bookkeeping and the separation of quantity changes from value changes through the use of prices. The National Academies report by Abraham and Christopher Mackie *Beyond the Market* (2005) presents these ideas and applies them to a wide range of issues, including investment in human capital. The report is summarized in their chapter in *A New Architecture for the U.S. National Accounts*, a book edited by Steven Landefeld, William Nordhaus and me (2006). Nordhaus has contributed a chapter to this book outlining the basic principles of nonmarket accounting.

A second reason for the emergence of interest in our approach is the increasing currency of the basic concepts of capital theory in the national accounts. The work of the Canberra II group, part of the United Nations 2008 System of National Accounts, has been instrumental in developing a workable approach to the application of capital theory to national accounting issues. The results are summarized in Paul Schreyer's *OECD Manual: Measuring Capital* (2009). These ideas are applied to the U.S. national accounts in my paper with Landefeld.<sup>2</sup>

From the point of view of these recent developments in national accounting, Barbara Fraumeni and I have applied the same principles to human capital as to other forms of capital. We have established the conceptual basis for including investment in formal education

2. Jorgenson and Landefeld (2006).

in the output of the economy. We have also developed measures of the contribution of net saving in the form of human capital to the income and expenditure account and the contribution of the stock of human capital to the national wealth.

The key to measuring investment in formal education is the definition of human wealth as lifetime labor income. The value of human wealth for society as a whole is the sum of lifetime labor incomes over the whole population. Since the value of this investment includes nonmarket incomes of individuals who participate in formal education, it is important to include both market and nonmarket components of lifetime labor incomes. By measuring the increments to lifetime labor incomes with increases in educational attainment, we can quantify investments in formal education.

The key inputs into a satellite system for formal education are first, an estimate of the population, classified by age, sex, and education. Data on market labor incomes for the employed population are available from the Census of Population and the Current Population Survey. We have controlled estimates of hours worked to totals from the national accounts. We make similar estimates for nonmarket labor time up to 14 hours per day. These estimates could be improved by the incorporation of data from the American Time Use Survey as Abraham suggests.

We estimate the value of nonmarket time to be the after-tax market wage multiplied by the nonmarket time available. This is consistent with evidence from microeconomic studies, like those cited by Abraham. Our key assumption is to anchor expectations about future wages with current data for wages of people with the same gender and educational attainment but different ages. We also allow for an increase in wages, relative to current wages, at a constant rate, which we interpret as the rate of labor-augmenting technical change.

We view investment in formal education as a production process with outputs given by increments to lifetime incomes and inputs of educational institutions—most importantly, teachers' labor compensation—as well as the services of school facilities and the costs of school materials and other expenses. However, the inputs also include the value of the time of students, and this is precisely equal to the increments in their lifetime incomes since they “own” all the benefits of a better education. In a system of national accounts this must be counted as their current income from schooling.

The same principles can be applied to training, provided that expenditures on training can be identified and individuals can be classified not only by educational attainment but also by the training they have received. To separate investment in formal education from investment in training, it would be necessary to cross-classify individuals by educational attainment and training. Similarly, this principle could also be applied to other investments in human capital, such as medical care, provided that the population can be classified by health status.

Fraumeni and I have also applied this accounting approach to child rearing by the family. The change in lifetime incomes from maturing or “growing up” is a form of investment in human capital. This is an output of the family but accrues to the child as income. Finally, we have applied these principles to the value of new individuals added to the population, whether through birth or immigration. Individuals are subtracted from the population through death or emigration. Investment is the difference between the additions and the subtractions. Both demographic accounting and time use accounting can be incorporated into a satellite accounting system for human capital.

My main conclusion is that accounting for human capital should be viewed as an important addition to national accounting for nonmarket activities, perhaps the most important addition. Investment in human capital is the ultimate intangible form of investment. This includes, but is not limited to, investment in formal education. Abraham has provided an up-to-date survey of this topic that can serve as a guide to the Bureau of Economic Analysis and other statistical agencies interested in exploring this important new frontier for research on national accounting.

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