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GDP and Beyond

Summaries from the 2020 Annual Meeting of the American Economic Association

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The views expressed in this paper are those of the author and do not necessarily represent the U.S. Bureau of Economic Analysis or the U.S. Department of Commerce.

Statistical agencies around the world have made remarkable recent progress in developing the national accounts. The Bureau of Labor Statistics and the Bureau of Economic Analysis have developed a production account in both current and constant prices for the United States. The output side of the account is based on the Gross Domestic Product (GDP), while the input side is based on the Gross Domestic Factor Outlay (GDO). Productivity is the ratio of output to input.

Although GDP has been the starting point for national accounting since the 1930's, the GDO is a relatively recent addition to the official system of national accounts, dating from the past decade. Annual and quarterly estimates of both sides of the accounts in current and constant prices are now an integral part of our system of accounts. In the United States the official system of accounts includes 65 industries. For each industry, output is generated by inputs of capital, labor, energy, materials, and services and productivity is the ratio of outputs to inputs in constant prices at the industry level.

Today I will outline the next steps in the development of our national accounts. Although the developments I will describe are widely discussed among economic statisticians, none of these developments has achieved the official status of the production accounts, which are regularly published along with the rest of the national accounts. I will consider two sets of developments that are ripe for consideration by agencies like BEA and BLS. The first of these is investment in human capital and the second in the measurement of economic welfare.

In presenting my proposals for future development of our national accounts I will draw upon my article from the *Journal of Economic Literature* for September 2018, "Production and Welfare: Progress in Economic Measurement." This article covers the measurement of both investment in human capital and the measurement of economic welfare.

Investment in human capital has undergone rapid development and a number of alternative approaches have been considered. I will focus on the lifetime income approach that I developed with Barbara Fraumeni in a series of papers dating from 1989 to 1992. BEA has maintained a research program that follows this approach and the latest report was published by Fraumeni, Michael Christian of the University of Wisconsin, Madison, and Jon Samuels of BEA. This is my top short-term priority for development of our national accounts.

The measurement of economic welfare is a more challenging endeavor that has attracted the attention of very distinguished economists and economic statisticians. In recent years this has taken the form of the measurement of inequality, including the relative importance of compensation for different levels of income, for example, the top one percent. However, the remaining areas of disagreement have proved to be a major barrier to incorporation of measures of inequality into the national accounts. Accordingly, this is my top long-term priority for development of our national accounts.

1. Investment in human capital.

I will begin with my top short-term priority, investment in human capital. Investment in human capital is based on the same methodology as investment in physical capital. The methodology begins with the definition of income from human capital. This includes income from participation in the labor market, but also includes non-market labor income – leisure time, household production, investment in education, and investment in child-rearing.

In my work with Fraumeni, investment in human capital is based on lifetime labor incomes for all individuals in the U.S. population. We have found it useful to distinguish among three stages of the life cycle. In the first stage individuals may participate in formal schooling, but not in the labor market. In the second stage individuals may work and may also go to school. In the third stage individuals may participate in the labor market, but not in formal schooling.

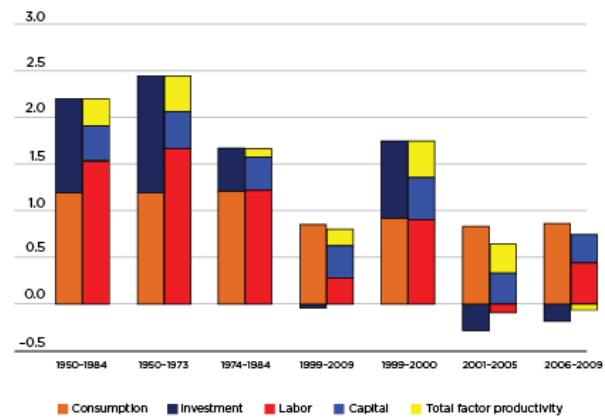
In the third stage of investment in human capital total labor compensation includes market labor compensation (after taxes) as well as non-market labor compensation. The value of the non-market portion of labor compensation is delivered directly to the household. As an example, non-market activity may include leisure time as well as various forms of household investment.

Household investment takes the form of additional experience that adds to the compensation of the worker over the worker's remaining lifetime. This compensation must be discounted back to the present at each point of time to obtain the asset value of the worker's experience. The asset value appears on the household balance sheet along with the value of the household's other assets. Similarly, the value of additional schooling is the increase in the lifetime labor income resulting from education and appears as an asset of the household.

The first Figure presents a complete set of national accounts for the U.S. that includes investment in human capital in constant prices. In each pair of bars the first bar is the rate of growth of the output of the economy, divided between consumption and investment. We refer to this as the “full output” of the economy since each of the components of output includes investment in human capital. The second of the two bars is divided among capital and labor services in constant prices and productivity. We refer to the input as “full input” since each of the components includes the flow of services from human capital.

We note that “full investment” is negative for some of the time periods included in our study. Similarly, the “full input” of labor services is negative in the period 2001–2005. Finally, productivity growth is negative in the period 2006–2009. This reflects the fact that the rate of growth of full input exceeds the rate of growth of full output. We can summarize the results by saying both inputs and outputs incorporate measures of investment in human capital.

Figure 1. Contributions to Full Gross Private Domestic Product and Economic Growth with Human Capital



This chart is reproduced from Dale Jorgenson's presentation on GDP and Beyond at the 2020 Annual Meeting of the American Economic Association

2. Measurement of economic welfare.

The first challenge in measuring economic welfare is to overcome the presumption that this is impossible. This can be traced back to the vast literature on Kenneth Arrow's Impossibility Theorem. While Arrow (1963) assumed that measures of individual welfare were ordinal and non-comparable, substantial progress in the measurement of economic welfare has been made by assuming, instead, that measures of individual welfare are cardinal and interpersonally comparable. The impossibility theorem has now been replaced by the measures of individual and social welfare that are employed in statistical measures of poverty and inequality.

The point of departure for the measurement of individual welfare is household consumption. This is expressed in terms of the household equivalent member in real terms. Data on household consumption in current prices is combined with the number of household equivalent members and the cost of living for each household to obtain a measure of household welfare. My 2017 paper with Paul Schreyer, published in the *Review of Income and Wealth*, shows how to incorporate this information into the system of national accounts.

The third and final step in the measurement of social welfare is to define a social welfare function on measures of individual welfare. My 2014 paper with Daniel Slesnick proposes a class of social welfare functions that consists of the mean of measures of individual welfare and a generalized variance, consisting of deviations of the measures of individual welfare from the mean. We have proposed a utilitarian social welfare function that is the mean of measures of individual welfare and an egalitarian social welfare function that allocates the maximum amount of social welfare to the generalized variance. Both measures of social welfare utilize measures of individual welfare that are cardinal and interpersonally comparable.

In the accompanying table we present illustrations of the measures of social welfare that we have proposed. We define efficiency as the average of measures of individual welfare. In measuring efficiency all households have the same level of individual welfare. This is defined in terms of welfare per household equivalent member. Second, we define the standard of living as the measure of social welfare. The difference between the standard of living and the measure of efficiency is our measure of equity, so that the standard of living is the sum of equity and efficiency.

Contributions to Growth of the Standard Living, 1948–2010

	1948–2010	1948–1973	1973–1995	1995–2000	2000–2005	2005–2010
Egalitarian:						
Standard of living	2.34	3.45	1.87	1.96	1.82	-0.27
Efficiency	2.16	2.67	1.97	2.65	2.03	0.11
Equity	0.17	0.78	-0.11	-0.68	-0.21	-0.37
Utilitarian:						
Standard of living	2.24	3.09	1.90	2.20	1.93	-0.12
Efficiency	2.16	2.67	1.97	2.65	2.03	0.11
Equity	0.08	0.42	-0.07	-0.44	-0.10	-0.23

Source. Jorgenson, Dale W. and Daniel T. Slesnick. 2014. "Measuring Social Welfare in the U.S. National Accounts." *Measuring Economic Sustainability and Progress*, edited by Dale W. Jorgenson, J. Steven Landefeld, and Paul Schreyer: 43–88. University of Chicago Press.

Our egalitarian measure of the standard of living gives maximum weight to equity. Equity increases during the period 1948–73, but decreases during each of the following time periods. Our utilitarian measure of the standard of living gives the least weight to equity. Equity increases during the period 1948–73, but also decreases during each of the remaining periods. Our measure of efficiency is the same for both measures of the standard of living.

3. Summary and conclusion.

We have presented two alternative methods for extending and developing the national accounts. We have chosen the first of these, incorporation of investment in human capital, as the short-term priority. The novel feature of investment in human capital is the incorporation of distributional information about this investment into the national accounts. This is well-established in the literature on national accounting and has been implemented for the United States.

Our long-term priority for development of the national accounts is to incorporate measures of economic welfare. This involves the selection of a measure of social welfare that incorporates measures of individual welfare based on consumption. Consumption by individual households is combined by means of household equivalence scales and prices of the level of living to obtain measures of social welfare. Incorporation of these measures into the national accounts requires evaluation as well as data development. These principles can be illustrated by the measurement of poverty and inequality.

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