

Recommendations to  
the Bureau of Economic Analysis  
On Improving  
the National Economic Accounts

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(Excerpts from the Symposium)

## BEA's Strategic Plan for 2001–2005

BEA published a preliminary strategic plan in the December 2001 *SURVEY OF CURRENT BUSINESS* and invited public comment. The plan, which incorporated suggestions from BEA's customers, staff, and partner statistical agencies, presented the elements of BEA's planned work and initiatives through 2005. As development of the preliminary strategic plan neared completion, Secretary of Commerce Donald E. Evans and Secretary of Treasury Paul H. O'Neill asked BEA to convene experts in the fields of economics and business and solicit their opinions and insights on the expansions and improvements to the national accounts necessary for capturing the changing economy. Participants in that meeting, held in November, 2001, included members of the Administration and other Federal Government and private-sector experts. The private-sector experts comprised the members of BEA's Advisory Committee—distinguished economists and business people—and two invited guests, both distinguished economists.

Abstracts of the comments of those attending the meeting follow. They begin with Commerce Under Secretary for Economic Affairs Kathleen Cooper's introductory remarks and end with BEA Advisory Committee Chair Professor William Nordhaus's overview of targets for developing and

broadening the national accounts. The comments reprinted here range from specific suggestions for improvements in the accounts to broad suggestions for recasting and expanding the accounts.

The revised plan is presented here, beginning on page 20, in table form by national economic account. The table summarizes each component of the plan and provides milestones through 2005 that serve as checks on progress toward the stated goals.

The strategic plan will be updated later this year to add milestones for FY 2006 and to reflect changes in priorities and opportunities. The activities listed in the revised table and the timing of the milestones are based on the assumption that BEA will receive adequate budget funding for each of those years.

I would like to thank the members of the BEA Advisory Committee and the expert commentators and the customers and other respondents for their valuable contributions to the refinement and further development of BEA's strategic plan.

**J. Steven Landefeld**  
*Director, Bureau of Economic Analysis*

### **Kathleen B. Cooper**

#### **Under Secretary for Economic Affairs, U.S. Department of Commerce**

I want to thank each of you for your attendance today. One of the pleasures of public service is to be able to draw on the thinking of such a distinguished group of economists for their insights—members of the Bureau of Economic Analysis advisory committee and special guests for this brainstorming session, Marina Whitman and Robert Hall. Let me also welcome and acknowledge Richard Clarida from the Treasury Department and Randy Kroszner from the CEA, who will share their perspectives with us. I must thank as well Lawrence Slifman from the Federal Reserve for joining us and for providing input on behalf of the Federal Reserve.

This is a brainstorming session, not a place for speeches. We would appreciate your expert evaluation on the design and composition of the national income and product accounts. Secretary Evans, Deputy Secretary Bodman, and I are committed to working with you to ensure that our national accounts meet the high standards demanded by today's economy.

During today's session, Richard Clarida will report to you that Treasury Secretary O'Neill shares these goals. Steve Landefeld, the Director of the Bureau of Economic Analysis, and I expect this session to be the first of several

and hope you can participate throughout and share your recommendations to help guide our future work on the national accounts.

We have already begun a number of important changes here at BEA to improve the national accounts. Working closely with the President and the Congress, we received funding to begin the important task of upgrading the GDP to improve our measures on important sectors of the economy, including the impact of IT and telecommunications, pharmaceuticals, financial derivatives, and various forms of compensation. In addition, BEA took initial steps to address long-overdue and urgently-needed improvements to the reliability of its GDP processing system, while at the same time developing and beginning to implement a comprehensive plan to improve its performance. Other changes over the past year have been important first steps in providing electronic filing for respondents to BEA surveys and easier and expanded access to BEA's Web site through interactive and easily downloadable data sets, which has been widely praised by data users.

In the upcoming year, BEA, with the support of the Administration, will be working on a number of initiatives to improve the quality and timeliness of economic statistics. Your contributions today will be important in fleshing out these activities. Indeed, BEA has made excellent strides in updating its strategic plan. What we learn from you will help us put the finishing touches on it.

## William D. Nordhaus

### A. Whitney Griswold Professor of Economics, Yale University, and Chair of the BEA Advisory Committee

The U.S. national economic accounts are by necessity a work in progress. Their unfinished state is in part due to the limited resources available to any statistical agency. But even more it reflects the underlying evolution in the nature and composition of the economy, changes in available source data, improved statistical and economic methodologies, and increased linkages with the world outside our borders, along with changes in the priorities of those who use the accounts. These incessant changes require a parallel philosophy among those who design and produce the accounts.

There are many possible targets for developing and broadening the national economic accounts. In this brief overview, I will list three that appear to be central to me. The first category, improving the core accounts, involves relatively straightforward extensions of the current activities of BEA. The second, integration of income and capital accounts, requires a new initiative and improvements in underlying source data. The third category, developing satellite accounts on nonmarket activities, will require new methodologies but will illuminate our society in ways that cannot be captured by existing market accounts.

#### Improve timeliness, accuracy, and coverage of core accounts

The U.S. national income and product accounts (NIPA's) arose in response to the Great Depression. Measures of national output at that time were incomplete and produced with a long lag, so policymakers had only impressionistic views of economic trends based on scattered financial and industrial data. The first accounts were developed at the Commerce Department in collaboration with the National Bureau of Economic Research under the leadership of Dr. Simon Kuznets, who received the Nobel Prize for his pioneering role in that work. These accounts were submitted to the Senate in 1934 and published as a Senate document.

Since that time, the "core accounts," which consist of the major accounts for income, product, and expenditure, have been developed and expanded in many directions. Among the important developments have been sectoral and regional accounts as well as series that illuminate trends in national saving and investment, per capita output and income, the return to capital, inflation, productivity, the shares of income going to different factors of production, international linkages, and the sources of economic growth. The current core accounts are an essential ingredient for analyzing U.S. economic

conditions and trends.

Given the continuing importance of the core accounts, I would point to three general areas that could use some tuning up.

*Recommendation 1. The first priority for BEA is continuing to improve the coverage and detail of the core accounts.*

Continuing to develop and improve the core accounts should clearly be the top BEA priority. The BEA strategic plan contains many elements for improving the core accounts.<sup>1</sup> Among the most important items to improve existing accounts, I would place the following: Development of a full set of integrated income and wealth accounts; more timely publication of the input-output data; continuing the development of the industry accounts with a full set of comparable historical data; improvement of source data with particular attention to the income side of the accounts; ensuring a smooth transition to the new North American Industry Classification System (NAICS); and improved measurement of real output in those sectors where price indexes are deficient. Some of these will be discussed in greater detail below.

In addition to the ongoing work on improving and developing the core accounts, I point to two areas that deserve particular attention.

*Recommendation 2. Working with the Bureau of Labor Statistics (BLS), BEA should work to improve the price indexes underlying the national accounts.*

It is little appreciated that the Government virtually never measures "real GDP." Rather, real output is derived from nominal output and the associated price indexes. For this reason, developing accurate price indexes is critical for the accurate measurement of the real side of the national accounts.

One of the most exciting areas for those working with government data has been the improvement in price indexes over the last two decades. BEA has been in the forefront of this movement, first with computer prices, and then, working with BLS, in many other areas.

Much progress has been made—but much work remains to be done. BEA and BLS need to continue to develop realistic price indexes for those areas of the accounts where input-type measures are used (such as in financial services and health care) or where the deflators are not closely related to the actual good or service to which it is associated. Additionally, BEA and BLS should continue to march ahead in improving their measures of quality change and the inclusion of new products, particularly with the introduction of hedonic techniques where appropriate.<sup>2</sup>

1. See "BEA's Preliminary Strategic Plan for 2001–2005," SURVEY OF CURRENT BUSINESS (December 2001): 23–39.

**Recommendation 3. BEA should work to improve the timeliness and accuracy of its reports and to develop an experimental monthly GDP series.**

One area of continuing importance for the national accounts is to produce data that will improve our understanding and therefore our managing of business cycles. The economic history of the recession of 2001 will ultimately be written based primarily on the data coming from the national accounts along with data from the labor market.

Currently, the “advance” GDP estimates are published at the end of the first month following the end of the quarter to which they refer. The timing and quality of the advance estimates are limited by the absence or poor quality of certain key data, such as those on inventories and international trade. It seems likely that a modest investment in improved source data in a few key areas can shift the entire schedule of releases forward by 1 or 2 weeks. While I know of no formal studies of the value of early information in this area, the value is likely to be many times larger than the cost of gathering the required new data to prepare more reliable and timely GDP estimates.

BEA prepares estimates for the major output and income series averaged on a quarterly and annual basis. I have never understood why the subannual basis for the accounts was quarterly rather than monthly, weekly, or semiannually, although I would guess that this practice arose because company accounts, which were originally so critical to national accounts, were presented on a quarterly basis.

I would recommend that BEA consider developing the major income and product accounts on a monthly basis. Indeed, at present many components of the accounts (incomes, production, and prices) are already available on a monthly basis. Consumption, government spending, inventory changes, foreign trade, labor market data, and virtually all major income measures except profits are available on a monthly basis. It would appear relatively straightforward to develop procedures for estimating or interpolating the missing variables on a monthly basis. It should be emphasized that the only current monthly output measure, the Federal Reserve's monthly industrial production index, is unrepresentative of the economy in that it covers less than 20 percent of GDP and omits the entire service and trade sectors.

There are many reasons for developing monthly GDP, but one important reason is that it will provide more timely and useful information on the pattern of cyclical movements. The business cycle of 2001 provides a useful illustration. Most economic data indicated that the econ-

omy was slowing from early 2001 and that the trauma of 9/11 had accelerated the downturn. Forecasts in late September and October 2001, particularly those from the New York financial community, were extremely gloomy. Data on sensitive sectors, such as travel and finance, tended to reinforce the gloom.

Because of the peculiar shape and timing of the 9/11 aftermath, the quarterly GDP data were unhelpful for forecasters and policymakers. The sharpest economic reaction to 9/11 probably came in late September and early October 2001, but this would have affected only one-sixth of the data for the third quarter. The major impact on GDP, if there were one, would be seen in the fourth quarter, whose advance and incomplete estimates were not available until January 30, 2002. Indeed, it was not until the preliminary estimates became available on February 28, 2002, that it became clear that real economic growth for the fourth quarter of 2002 was safely in the positive range. The growth rate for the second half of 2001 was essentially zero, and indeed, based on output movements, the recession appears to be the mildest in post-World War II history.<sup>3</sup>

Without the actual monthly GDP data, we cannot know how the pattern of output in late 2001 would have looked. But it is surely possible that by November 2001 discerning eyes would have suspected that the downturn was very mild and that the recession had essentially come to an end. Whether major policy errors were made in anticipation of a serious recession will have to wait for further analysis, data, and reflection.

Monthly GDP will be no panacea for policymakers. It may prove highly volatile and subject to excessive revisions. However, given BEA's existing data, it would seem useful to provide monthly GDP data on an experimental basis.

**Improve and integrate asset and wealth accounts with income and product accounts**

The next set of suggestions involves issues that are directed toward major conceptual gaps in the U.S. economic statistical system that BEA is most centrally posed to fill. While there are many issues, I will focus on developing a full set of asset and wealth accounts and linking those with the income and product accounts.

Historically, BEA has focused its work on developing income, expenditure, and product accounts, along with elaborations in terms of sectoral, regional, and international detail. Much less attention has been devoted to asset and wealth accounts, or to linking the asset and

2. A useful recent review of issues and potential improvements in constructing price indexes is contained in Charles Schultze and Christopher Mackie, eds., *At What Price?: Conceptualizing and Measuring Cost-of-Living and Price Indexes*, National Academy Press, Washington, DC, 2001.

3. A discussion of the pattern of output and other cyclical indicators along with a comparison with other postwar recessions is contained in William Nordhaus, “Puzzles About the American Economy in the Current Recession and Recovery,” forthcoming, *Brookings Papers on Economic Activity*, 2002:1. A draft of the paper is available at [http://www.econ.yale.edu/~nordhaus/homepage/recent\\_stuff.html](http://www.econ.yale.edu/~nordhaus/homepage/recent_stuff.html).

wealth accounts to the income and product accounts. At present, BEA maintains a detailed set of accounts on capital and capital formation, while the Federal Reserve has the financial complement of that in its flow of funds accounts. However, the United States at present does not have a comprehensive set of asset accounts that is conceptually consistent with and linked to the income and product accounts.

In this respect, it is instructive that we speak of the NIPA's rather than the national economic accounts. One of the major tasks of BEA and its sibling agencies should be to broaden the U.S. accounts to encompass a comprehensive set of national economic accounts linking production, income, consumption, accumulation, and wealth. The development of a set of national economic accounts is a major feature of the internationally developed system of national accounts (SNA).<sup>4</sup> Many of the principles and practices involved in a comprehensive set of national economic accounts have been realized for the United States in the Jorgenson set of accounts.<sup>5</sup> In moving toward a set of comprehensive accounts, the United States would also help achieve the important goal of harmonizing its accounting practices with those of other countries.

**Recommendation 4. BEA should work with the Federal Reserve to develop a full set of asset and wealth accounts.**

**Recommendation 5. BEA should develop a full set of linked national economic accounts that include production, income, consumption, accumulation, and wealth.**

These recommendations are really two prongs of a common research project, which is to elaborate the wealth and asset structure of the United States and to make the linkage of the asset and accumulation accounts to the income and product flows.

The major purpose of such a set of accounts would be to provide a full and consistent framework for understanding the evolution of income, capital formation, and wealth. I will sketch two important applications here: Resolving the ambiguity about techniques for measuring the national and personal savings rates and improving current measures of saving and investment.

The first point involves conceptual difficulties in measuring savings. The traditional product-account (or NIPA) measure of saving in the national income accounts is the difference between current income and consumption. The NIPA definition contrasts with the asset-

account definition, which is (or should be) the change in real net wealth. The difference between the production-account and the asset-account definitions became particularly large during the asset bubble of the late 1990s. Data compiled by Gale and Sabelhaus indicate that for the 1990–99 period, the personal savings rate was a meager 3 percent of income using the product-account definition and a healthy 17 percent using the asset-account definition.<sup>6</sup> A similar calculation by Lusardi, Skinner, and Venti found the net asset-account savings rate for 1999 was 45 percent while the NIPA savings rate was 3 percent.<sup>7</sup> An integrated set of accounts, with a reconciliation table for different concepts, would help policymakers and analysts keep the different concepts and numbers clearly in mind.

A second set of issues concerns the narrowness of current product-account measures of saving and investment. It is not generally recognized that current measures of investment and saving cover an extremely limited sphere, including only investment in tangible capital (such as factories, equipment, inventories, and houses) along with software. Current concepts omit a wide variety of investment-type activities. Some important omissions are the acquisition of tangible nonhuman capital—such as consumer durables by households; development of land; expenditures for research and development; expenditures for education; the opportunity costs of students' time; the opportunity cost of training; and much of the Nation's expenditures for health.

It must be hard to explain to a student or a Secretary of Commerce why the purchase of a factory to produce a new drug is investment while the expenditure on research on that drug is not; or why building a new library is investment while purchasing new books for the shelves is not. We have only the sketchiest of estimates for the size of the omission, but estimates by Eisner indicated that the standard definition might underestimate the national saving and investment rate by as much as 500 percent.<sup>8</sup> Recent studies of Jorgenson and Fraumeni lead to similar conclusions.<sup>9</sup>

A great capitalist country such as the United States needs a fully developed set of capital accounts.

### The challenge of accounts for nonmarket activity

A final important challenge for the longer term lies in the area of nonmarket accounts. The national income and

4. The SNA, developed under the aegis of the United Nations and other international agencies, is a set of concepts, definitions, classifications and accounting rules. The latest SNA is from 1993 and can be found at <<http://esa.un.org/unsd/sna1993/introduction.asp>>.

5. The Jorgenson set of accounts is described in Barbara Fraumeni, "The Jorgenson System of National Accounting" in Lawrence J. Lau, ed., *Econometrics and the Cost of Capital: Essays in Honor of Dale W. Jorgenson*, MIT Press, Cambridge, Massachusetts, 1999.

6. William G. Gale and John Sabelhaus, "Perspectives on the Household Saving Rate," *Brookings Papers on Economic Activity*, 1999:1.

7. Annamaria Lusardi, Jonathan Skinner, and Steven Venti, "Saving Puzzles and Saving Policies in the United States," Dartmouth College Working Paper 01–04, February 2001.

8. See Robert Eisner, "Extended accounts for national income and product," *Journal of Economic Literature*, December 1988, 26:1611–1684, Table S.5 for comparisons of market and comprehensive income and saving measures.

9. Dale W. Jorgenson and Barbara M. Fraumeni, "Investment in Education and U.S. Economic Growth," *Scandinavian Journal of Economics*, 1992, Supplement, pp. 51–70.

product accounts are the most important measures of overall economic activity for a nation. Nevertheless, since their original development, there have been concerns that the accounts are incomplete and misleading because they do not cover vast continents of nonmarket activity such as unpaid work, the value of leisure time, much investment in human capital, and, most recently, the impact of and on the environment.

The four recommendations in this area involve research, methodology, developing the framework, and data collection to begin the construction of nonmarket accounts. These activities should be undertaken jointly by BEA, other Federal statistical agencies, private researchers, along with the activities in other countries, but BEA can play a key leadership role in organizing these efforts.

***Recommendation 6. BEA should work with other government agencies and with private researchers to begin development of the framework and data collection for a set of nonmarket accounts.***

The threshold question is why should we devote scarce intellectual and governmental resources to studying nonmarket sectors? The basic reason is that economic and social welfare does not stop at the market's border but extends to many nonmarket activities.

Three particular areas are worth emphasizing. One important reason why we need better measures of nonmarket activity is because we spend increasingly fewer of our lifetime hours in market activities. A second and more speculative reason concerns the growing importance of nonmarket assets or mispriced market assets such as the environment and technology. A third reason, highlighted above, is that current measures of national saving and investment are defective because they omit much of the investment that takes place outside the marketplace. I will highlight three priorities in developing nonmarket accounts: green accounts, time-use studies, and health accounts.

***Recommendation 7. Among the priorities for nonmarket accounts is the development of a set of resource and environmental accounts.***

Critics of conventional accounts point to their omission of the contribution of natural resources and the environment to economic activity. Environmentalists argue that America's wasteful, consumptive ways are squandering our precious "natural capital." This issue was partially addressed when BEA unveiled its integrated environmental and economic satellite accounts (or IEESA's), designed to estimate the contribution of natural and environmental resources to the Nation's income. The first step, published in 1994, was a set of accounts for subsoil assets including oil, gas, and subsoil minerals.<sup>10</sup>

Many were surprised by the results of this first assay into green accounting. BEA's estimates take into account

that discovery adds to our proven reserves at the same time that extraction subtracts from or depletes these reserves (whereas both these activities are omitted from current core accounts). In fact, these two activities were almost exactly offsetting in the period BEA investigated. The net effect of both discoveries and depletions from 1958 to 1991 was between minus \$2 billion and plus \$1 billion, depending on the method used, as compared with an average GDP over this period of \$4,200 billion (in 1992 prices). Another important finding was that the rate of return to nonfinancial capital was reduced by 1 to 2 percentage points when depletion was accounted for.

A full set of environmental and resource accounts would require further work to develop accounts for renewable resources (such as timber and water) and environmental assets (such as the cost of emissions or the impact of air pollution on the economy and human health). Although a great deal of work has been done on valuing components of air quality, to date there have been no comprehensive environmental accounts for the United States. However, a recent study by the U.S. Environmental Protection Agency suggests that, in contrast to the minerals accounts, environmental accounts might produce large numbers.<sup>11</sup> Much methodological work and data gathering are required before a full set of environmental accounts can be developed. Many of the issues were reviewed by a panel of the National Academy of Sciences, whose report was published by the Academy and in the SURVEY OF CURRENT BUSINESS.<sup>12</sup>

***Recommendation 8. The U.S. should continue to work toward a comprehensive time-use survey of the U.S. population, which is the single most important data source for understanding nonmarket activity.***

The most precious of all our endowments is time, the 24 hours each day that we have to "spend" in work or play or study. Compared with many trivial areas, we know next to nothing about how Americans use their time because, unlike most other major countries, the United States does not collect regular data on time use by the population. This important gap in the Federal statistical system will be filled beginning with the BLS American Time Use Survey (ATUS), scheduled to begin in early 2003 and designed to measure the amount of time people spend doing various activities, such as paid work, childcare, volunteering, commuting, and socializing.<sup>13</sup>

10. "Integrated Economic and Environmental Satellite Accounts," SURVEY (April 1994), pp. 33-49.

11. United States Environmental Protection Agency, *The Benefits and Costs of the Clean Air Act, 1970 to 1990*, Washington, D.C., Office of Air and Radiation/Office of Policy Analysis and Review/Office of Policy, Planning, and Evaluation, April, 1997.

12. See Nordhaus, William D. and Edward Kokkelenberg, eds., *Nature's Numbers: Expanding the National Economic Accounts to Include the Environment: Report of the Panel on Integrated Environmental and Economic Accounting*, Washington, D.C., National Academy Press, 1999; see also the November 1999, February 2000, and March 2000 issues of the SURVEY OF CURRENT BUSINESS for reprints of three chapters from *Nature's Numbers*.

This initiative is in my view the most important and exciting Federal statistical initiative today and deserves careful continuing review and ample fiscal resources.

Better data on time use is critical for many areas in augmented and nonmarket accounting. We need time-use data for building household accounts, for estimating the relative importance of nonmarket investment and consumption, for estimating trends in leisure time, and for understanding the activities of that third of the U.S. population that is retired. Moreover, current measures of work hours used in productivity measures could be improved with focused time-use studies, particularly for the growing share of the workforce (such as professionals for which data hours are relatively unreliable).

One unique feature of time budgets is that they provide a comprehensive budget that includes all activities—nonmarket as well as market. Because time inputs are the most valuable economic input, a time budget will also allow a rough estimate of the relative importance of market and nonmarket activities. While we have extremely sparse historical time-use data for the United States, data on time use in the United Kingdom over the last century indicate that work hours have declined from about half to less than 20 percent of disposable adult hours, although that trend appears to have stabilized in recent years.<sup>14</sup> An important topic is to determine the relative importance of nonmarket and market activities.

***Recommendation 9. Estimating intangible and nonmarket investments is a high priority for both nonmarket accounts and for understanding saving and wealth.***

A large and growing share of the economy's resources is devoted to investments in education, research, and health. As noted above, because of faulty accounting, their contribution to economic welfare is misclassified, underestimated, and omitted—misclassified because they are largely treated as consumption or intermediate product rather than investment; underestimated because we routinely mismeasure the real output growth of these activities; and omitted because the accounts leave out those activities, particularly important for education, that occur outside the marketplace.

A sector in which augmented accounts may be particularly illuminating is the health-care sector. I will summarize a recent study that asks how standard measures of income would change if they adequately reflected improvements in the health status of the population.<sup>15</sup> Traditional income and product accounts look at the

flows of consumption and income but do not consider the length of life or the quality of the population's health. We might broaden our accounting concepts to include "health income" by correcting income measures for mortality and morbidity changes. Such an approach would take into account improvements in health status along with the implicit prices of improved health. If, for example, an individual would pay 1 percent of market consumption each year to gain an additional life-year, then we use that value to account for improvements in health status.

An example will illustrate the methodology. From 1975 to 1995, the population-weighted average annual mortality rate declined by 2.25 per year per thousand persons. Using standard estimates of the willingness to pay to reduce mortality risk (\$2.66 million per life saved in 1992 prices), this decline in mortality is valued at \$5,985 per person per year over this period. The average per capita consumption over this period was \$14,700 per year. Hence the economic value of improvements of living standards due to reduced mortality is 40 percent of consumption over this period, or about 2 percent per year. I have constructed a preliminary set of estimates of the value of improvements in life expectancy for the period 1900–1995 using actual data on life expectancy, population distribution, and consumption. (These estimates omit changes in morbidity, for which data are relatively poor.) The major result is that the value of improvements in life expectancy over the twentieth century was about as large as the value of the growth in all nonhealth market consumption goods and services put together. Over this period, the value of improved health or health income grew at an average annual rate between 2.2 and 3.0 percent of the value of market consumption whereas consumption grew at a rate of about 2.1 percent. This suggests that a proper accounting of the value of health improvements would produce a major revision to our measured living standards.

## Conclusion

The purpose of this discussion has been to give a flavor of the exciting developments and prospects for improving and extending the national economic accounts. There is much fruitful work ahead that will sharpen our estimates, make them more timely and reliable, improve their utility for understanding both business cycles and economic growth, as well as broaden the purview of the national economic accounts.

13. See Diane Herz and Richard M. Devens, Jr., "The American Time-Use Survey," *Industrial Relations*, Volume 40, No. 3, July 2001.

14. See the discussion in William Nordhaus, "New Directions in National Economic Accounting," *American Economic Review*, May 2001, which extends the results from Jesse H. Ausubel and Arnulf Gruebler, "Working Less and Living Longer: Long-term Trends in Working Time and Time Budgets," *Technological Forecasting and Social Change*, 1995, pp. 113–131.

15. Nordhaus, William D. "The Health of Nations: The Contribution of Improved Health to Living Standards," forthcoming in Kevin M. Murphy and Robert H. Topel, eds. *Exceptional Returns: The Economic Value of America's Investment in Medical Research*, University of Chicago Press, available at <<http://www.econ.yale.edu/~nordhaus/homepage>>.