Introduction

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Since the creation of national accounts during the Great Depression there have been calls to expand macroeconomic statistics to better account for economic growth, the sustainability of growth, and the effect of growth on economic well-being. The Great Recession, the increasing concentration of income, and the importance of education, human capital, health, and the environment have underlined the urgency of moving forward on a measurement agenda of expanding the scope of national accounts.

This volume would be the latest in a long series of Studies in Income and Wealth and earlier National Bureau of Economic Research (NBER) publications dating back to the 1930s that have played a key role in the development of the US national accounts and those of other nations. The most recent NBER volume on national accounts was *A New Architecture for the National Accounts*, which laid out a plan for integrating the existing systems of accounts, identifying gaps and inconsistencies, and expanding and integrating systems of nonmarket accounts into the core system. That 2006 volume (a) helped efforts to better integrate the Bureau of Economic Analysis's own national and industry accounts; (b) fostered collaborative research that produced three integrated accounts (Integrated Federal Reserve Board/BEA Income, Product, and Financial Accounts; Integrated Bureau of Labor Statistics /BEA Productivity Accounts; and Prototype Integrated BLS/BEA Industry-Level Production Accounts); (c) advanced

further work on the integration of micro- and macrodata; (d) contributed to significant extensions and improvements in key census data used in these new integrated accounts; and (e) laid the groundwork for extensions of the accounts in the areas of household production, health, education, and the environment.

This volume provides a framework for building on the accomplishments associated with the 2006 *New Architecture* volume by extending the work on integration and extensions of the accounts begun with that volume and stimulated by the new international System of National Accounts (SNA) framework introduced in 2008. This volume also begins to address long-standing gaps, including those related to economic welfare and sustainability that became increasingly apparent during the recent recession. Work in this volume shows advances within a national accounts framework, and so contributes to other national and international initiatives such as those pursued by the Organisation for Economic Co-operation and Development (OECD) that aim at developing better indicators of material well-being and the quality of life.

The NBER research on the national accounts has been important in leading innovation and has been a unique and long-standing forum for collaboration between academia and government. Just as the creation of the national accounts in the 1930s in response to the Great Depression was a collaborative effort between academia and government, so too is the statistical response to the Great Recession outlined in this volume.

The Great Recession and the associated financial crisis provide an opportunity, as economic calamities of the past have, to make substantive progress in our understanding of the economy. As one looks to the United States and other countries' gross domestic product (GDP) and other national accounts statistics, over time, most major innovations have been collaborations between academic, business, and government researchers.

Moving forward, there is also a need to fill the following gaps in our statistical coverage revealed by the recession and the period leading up to the recession:

- The increasing share of income going to those at the top, that for many households resulted in disconnects between their personal experiences and the reported growth in official statistics like GDP and disposable personal income.
- The failure of many of the existing macroeconomic and financial statistics to provide a consistent and clear set of new "leading" financial indicators on the unsustainability of trends in saving, spending, debt, and housing and equity prices.
- The lack of data on health care, the environment, education, and human capital and their increasing importance to the rate and sustainability of economic growth.

The introductory talk by Federal Reserve Bank (FRB) chairman Bernanke lays out a persuasive argument for extending the economic measurement beyond income, wealth, and consumption to encompass economic well-being and its distribution and determinants.

The first set of chapters in the volume addresses conceptual and empirical proposals for extending the accounts to better measure economic sustainability and welfare by extending the boundaries of national accounts. The chapter by former Council of Economic Advisors (CEA) member Abraham provides an inside look at how extended market and nonmarket estimates can be of importance in fact-based economic policy. The chapter by Jorgenson and Slesnick provides a theoretical and empirical methodology for incorporating distributional information into the accounts, along with Paul Schreyer and Erwin Diewert who develop a theoretical framework for valuing household production along the lines suggested by Nordhaus, Mackie, and Abraham in the 2006 volume. The fourth chapter in this set is by Christopher Carroll, who argues that in order to understand aggregate household spending behavior, it is necessary to augment the existing national accounts with satellite accounts that provide information at less aggregated levels.

Although there is a broad consensus about the usefulness of distributional information, the user is sometimes confronted with differences in evidence, depending on whether administrative or survey data is used. Part II of the volume addresses this issue. The chapters by McCully, Harris, and Sammartino as well as Fixler and Johnson offer practical solutions to the problems associated with reconciling tax, household, and business data on the distribution of income and spending and on filling gaps in coverage that have been the subject of over fifty years of research (including a two-volume NBER study of the issue in the 1940s directed by Milton Friedman). A related issue is covered by Alice Henriques and Joanne Hsu in the area of consumer finances, savings, and wealth.

Part III of the volume remains within the existing boundaries of national accounts and demonstrates how integrated economic accounts can provide consistent information for policymakers. The chapter by Cagetti, Holmquist, Lynn, McIntosh, and Wasshausen on the integrated macroeconomic accounts produced jointly by BEA and the Federal Reserve Board is the latest extension of the integrated accounts originally presented in the 2006 volume. The chapter illustrates the usefulness of such data for issues such as the evolution of household net worth and its role in the financial crisis, brings the US accounts closer into alignment with the framework laid out in the 2006 volume and to the SNA 2008, and lays out an agenda for further extensions of the financial sector. Fleck, Rosenthal, Russell, Strassner, and Usher showcase a prototype for US industry-level productivity accounts that have been developed by the BLS and the BEA. The chapter by Shrestha presents a framework for filling gaps in the financial data identified during the financial crisis.

The fourth set of chapters presents conceptual and empirical solutions to better capture medical-care costs, human capital, innovation, and the environment. Muller's chapter builds on work in environmental accounting by Nordhaus (and Rob Mendelsohn) and adjusts GDP for damages due to air pollution. Christian develops human capital estimates based on the framework developed by Jorgenson and Fraumeni, and Corrado and Hulten lay out the necessary steps in building an innovation satellite account. The chapters by Dunn, Liebman, and Shapiro, and by Gu and Morin illustrate the type of estimates that might be incorporated in health accounts extensions suggested by Mackie and Abraham in 2006. These papers provide concrete examples of how such values can be developed in consistency with national accounts and thereby provide key baseline data for better understanding such issues as the sources of growth in medical spending, the returns to investments in education, and the relationship between the environment and economic growth.

Summary of Papers

"Expanded Measurement of Economic Activity: Progress and Prospects" (Abraham)

In her remarks, Abraham provides an overview of recent efforts to expand economic accounting in order to improve the measurement of resource utilization and production in key sectors. These efforts include accounting for investment in education, accounting for investment in health, and improving the measurement of government output. Abraham notes that the growing interest in these topics within the statistical community has been paralleled by a growing interest among policy officials.

A major barrier to expanding the accounting for education, health, and government output is the lack of comprehensive source data. For example, few data sources exist that allow student outcomes to be monitored. Without such data sources, it is difficult to evaluate the performance of the education sector as a whole or of different types of educational institutions or programs. Similarly, the lack of comprehensive data on health care that allow health spending to be linked to patient outcomes makes it difficult to determine how to achieve better health outcomes at the lowest cost. The lack of evidence on outcomes resulting from government spending makes it difficult for governments to assess how to make efficient use of available resources. Developments that should improve the data available to measure education, health, and government output include the planned construction of student-level longitudinal data systems, the formation of the Health Care Cost Institute (which provides researchers access to a database including over five billion claims records from four large insurers), and guidance from the Office of Management and Budget to federal agencies calling for them

to demonstrate a commitment to expanding the use of evidence in carrying out agency operations, respectively.

Abraham briefly discusses aggregate measures of welfare and well-being. Proposed approaches to measuring well-being include adjusting the existing GDP measure by adding the value of household production and subtracting defense expenditures, developing composite indicators that weight measures for several individual dimensions of interest (e.g., the United Nations Human Development Index and the Genuine Progress Indicator), and developing aggregate measures of subjective well-being, such as global measures of life satisfaction or time accounts that track variation in time spent in pleasant or unpleasant activities. However, Abraham notes that aggregate well-being measures are intellectually interesting, but it is unclear if and how they will be used to guide policy decisions.

"Measuring Social Welfare in the US National Accounts"
(Jorgenson and Slesnick)

Jorgenson and Slesnick develop measures of individual and social welfare within a new architecture for the US national accounts. This new architecture comprises a set of income statements, balance sheets, flow of funds statements, and productivity estimates for the economy, and by sector, that are more accurate and internally consistent than the existing accounts. The new architecture makes it possible to avoid confusing the measurement of production and welfare, which was a key concern of the Stiglitz, Sen, and Fitoussi's 2009 "Report by the Commission on Measurement of Economic Performance and Social Progress."

Jorgenson and Slesnick present measures of the cost and standard of living and inequality that are integrated with the national accounts, in contrast to the BLS' Consumer Price Index and the Census Bureau's statistics on standard of living, poverty, and inequality. For the entire postwar period (1948–2010), the authors obtain a measure of the standard of living with a growth rate of 2.69 percent. Within this period, they find that growth in the standard of living peaked during 1948 to 1973 at 3.62 percent and then declined to around 2 percent after 1973. They find that all of the growth in equity over the postwar period occurred during the period 1948 to 1973. The surge in economic growth from 1995 to 2000 was largely offset by the sharp decline in equity.

The authors conclude by recommending that national statistical agencies develop satellite accounts as a first step to incorporating distributional information into the national accounts.

"Household Production, Leisure, and Living Standards"
(Schreyer and Diewert)

Household production is an important nonmarket activity that is largely outside the production boundary of the System of National Accounts

(SNA). The SNA generally excludes most services produced by households because there are no market prices available to value them. However, it acknowledges that for purposes of measuring economic welfare, it is useful to estimate the value of household production.

Most studies on how to value the services produced by households have used an input cost approach; the time household members spend on household production has been the primary focus of research. The two main methods to valuing labor input into own-account household production have been the opportunity cost approach and the replacement cost approach. Schreyer and Diewert develop a model of the household as producer and consumer that provides a theoretical justification for these two main methods. They provide justifications for the replacement cost approach but show that, for households that are active in labor markets, the opportunity cost method should be used when the purpose of valuing time spent on household production is to capture full consumption, as opposed to capturing only the value of own-account household production.

Schreyer and Diewert also develop a cost-of-living index for full consumption and full household income. Finally, they perform a cross-country comparison of full consumption across a selection of OECD countries and compare material living standards using the volume of full consumption per capita. They find that, on average, household production (and the equivalent additional consumption) with labor valued at replacement costs, adds about 50 percent to the value of actual final consumption, although there are significant variations between countries. They also find that the vast majority of countries improve their position against the United States when material living standards are measured using full consumption as opposed to actual individual consumption; for example, Norway's living standards become higher than the United States'.

"Representing Consumption and Saving without a
Representative Consumer" (Carroll)

This chapter argues that, in order to understand aggregate household spending behavior, it is necessary to augment the existing national accounts with satellite accounts that provide high-quality information at less aggregated levels. These satellite accounts would need to include measures that reflect the microeconomic heterogeneity in expenditures, income, assets, debt, and beliefs among households and that are consistent with aggregate statistics in the existing National Income and Product Accounts.

Carroll argues that the existing data sources are inadequate for answering key questions about household spending behavior. Microeconomic representations of households' choices should be based on the household's dynamic budget constraint, but existing data sources measure only pieces of that budget constraint, or provide only snapshots of households' balance sheets. Furthermore, the quality of the existing data has been deteriorating.

Carroll identifies some promising strategies to obtaining more complete and dynamic microeconomic data on households' balance sheets, including negotiating with the Federal Reserve Board to expand the scope of the existing Survey of Consumer Finances and collecting financial records kept by households using personal financial accounting software.

"Integration of Micro- and Macrodata on Consumer Income and Expenditures" (McCully)

McCully examines macroeconomic and microeconomic sources of information on household income and expenditures. The BEA produces macro-estimates of personal income and outlays that are part of the US national accounts. The Current Population Survey from the Census Bureau and the Consumer Expenditure Survey program from BLS are household surveys used to produce microeconomic estimates of household income and expenditures. The Current Population Survey collects detailed data on household income and on health insurance coverage. The Consumer Expenditure Survey collects data on direct household expenditures, as well as on household income and financial assets.

Although the National Income and Product Accounts (NIPA) estimates of household income and expenditures are generally considered to be more accurate and broader measures than estimates derived from the household surveys, they have no distributional information. McCully reconciles the differences in these estimates through the integration of microeconomic data from household surveys with national accounts data, developing measures of income distribution and of other breakdowns of household income and consumption for the years 2006 and 2010 that are consistent with national accounts values and definitions.

McCully finds that the share of disposable household income accounted for by the lowest quintile increased from 4.9 percent in 2006 to 5.4 percent in 2010, while the share accounted for by the highest quintile decreased from 48.4 percent to 47.1 percent. For all income groups, there was a significant increase from 2006 to 2010 in the share of income accounted for by government social benefits and other transfers. In particular, the share of income accounted for by government social benefits and other transfers for the lowest quintile increased by 8.4 percentage points. McCully also finds that the consumption shares by income quintile show much less dispersion than for disposable income. Mean expenditures per household for the highest quintile were slightly more than twice as high for the top quintile as for the lowest quintile, compared with a disposable household income ratio of nearly 9 to 1.

"Trends in the Distribution of Household Income, 1979–2010"
(Harris and Sammartino)

Harris and Sammartino examine changes in the distribution of household income in the United States between 1979 and 2010 using Statistics of Income (SOI) data from the Internal Revenue Service and Current Population Survey (CPS) data from the Census Bureau. Because each data set lacks certain types of information needed for estimating and comparing household income over time, each SOI record is statistically matched to a corresponding CPS record on the basis of demographic characteristics and income. This results in a new record that takes on the demographic characteristics of the CPS record and the income reported in the SOI.

Using this approach, the authors find that income after transfers and federal taxes (or "after-tax income") rose much more rapidly between 1979 and 2007 for households at the higher end of the income scale than for households at the middle and lower end of the income scale. As a result, the distribution of after-tax household income was substantially more unequal in 2007 than in 1979, with the share of income received by the top 1 percent more than doubling over the period and the share received by low and middle-income households declining.

The primary reason for the growing inequality in the after-tax income distribution was that higher-income households increased their share of market income (i.e., income measured before government transfers and taxes). The two factors that accounted for this increase were: (a) an increase in the concentration of each source of market income, including labor income, business income, capital gains, capital income, and other income; and (b) a shift in the composition of that income that reflected increases in the share of income coming from capital gains and business income.

"Accounting for the Distribution of Income in the
US National Accounts" (Fixler and Johnson)

There is considerable disagreement regarding the relationship between inequality and growth. As stated in a recent OECD report (OECD 2012, 14), "Despite a vast theoretical literature on the link between inequality and growth, no general consensus has emerged and the empirical evidence is rather inconclusive."

The focus of this chapter is to have comparable measures of growth and inequality in order to evaluate the relationship between them. The chapter examines the distribution and movement of household income, as measured by personal income, and how it influences the movements of gross domestic income (GDI), and hence GDP. As proposed by the BEA (BEA 2012, 47), Fixler and Johnson undertake "a decomposition of personal income that presents median as well as mean income and other measures of the distribution of income across households."

Fixler and Johnson provide methods to produce a median personal income (and its Gini coefficient) that is more consistent with the national accounts measure of personal income. These methods yield a variety of results on the growth of median income and inequality depending on the definition of income used and the method used to obtain the distribution. The authors show that adjusting for underreporting in household survey (Current Population Statistics) data yields a larger level and increase in the trend of the mean and median between 1999 and 2010. This, in turn, yields a larger increase in inequality. The authors use distributional information from the IRS' Statistics of Income (SOI) to perform a further adjustment that allows for different households having different levels of underreporting for each source of income. This results in a lower increase in inequality between 1999 and 2009 (the latest year for which SOI data are available). Including imputed employer- or government-provided health-care benefits in the measure of personal income decreases inequality, as such benefits are more likely to accrue to low-income households.

The authors also provide applications of their results to calculating a social welfare function and evaluating fiscal multipliers.

"Analysis of Wealth Using Micro- and Macrodata:
A Comparison of the Survey of Consumer Finances
and Flow of Funds Accounts" (Henriques and Hsu)

Researchers use different types of household balance sheet data to study different aspects of life cycle saving and wealth accumulation behavior. Macrodata from the Flow of Funds Accounts (FFA) are produced quarterly and are available in a timely manner, but they can only be used to study the behavior of the household sector as a whole. Microdata from the Survey of Consumer Finances (SCF) are available every three years and only with a lag, but they can be used to address questions that involve differences in behavior over time and across various types of households.

Henriques and Hsu find that, despite the very different approaches to estimating household net worth, the FFA and the SCF data sets show the same general patterns of wealth changes over the past twenty-five years. Levels of net worth are nearly identical in the period 1989 to 1998. Beginning in 2001 and through 2010, the SCF estimates of net worth exceed the FFA estimates by approximately 20 percent. The gap that emerged in the early twenty-first century is a combination of higher values for tangible assets in the SCF, in particular noncorporate business equity and owner-occupied housing, and larger values of liabilities in the FFA, especially for consumer credit. These areas of divergence between the SCF and FFA appear to be largely attributable to methodological decisions used in the production of the data, but they do not dramatically alter one's perceptions of household wealth dynamics leading up to and following the Great Recession.

"The Integrated Macroeconomic Accounts of the United States"
(Cagetti, Holmquist, Lynn, McIntosh, and Wasshausen)

The integrated macroeconomic accounts (IMAs), produced jointly by BEA and the Federal Reserve Board (FRB), present a sequence of accounts that relate income, saving, investment in real and financial assets, and asset revaluations to changes in net worth. They were developed as part of an effort to further harmonize the BEA's National Income and Product Accounts and the FRB's flow of funds accounts. This chapter provides background information on the IMAs and on their construction. It describes the usefulness of the IMAs, including for analyzing the evolution of household net worth and its components, a set of series that has appeared frequently in discussions of the causes and effects of the recent financial crisis. Some of the challenges associated with integrating nonfinancial and financial data sources are also discussed. These data sources include the current and capital accounts statistics from BEA's National Income and Product Accounts and the financial account statistics from FRB's flow of funds accounts. In the final section, the chapter describes future plans for improving the IMAs, including a proposed framework and methodology for breaking out the financial business sector into three subsectors: (a) central bank, (b) insurance and pension funds, and (c) other financial business.

"A Prototype BEA/BLS Industry-Level Production Account for the United States" (Fleck, Rosenthal, Russell, Strassner, and Usher)

Gross domestic product (GDP) by industry statistics provide detailed information on the industry sources of aggregate value added growth, but do not include estimates of the contributions of capital and labor inputs and multifactor productivity (MFP) to economic growth. It captures the part of output growth that cannot be explained by changes in the combined contribution of capital, labor, energy, materials, and services inputs (KLEMS). The official MFP measures for the United States provide information on components of economic growth in the market economy, but they do not report detailed information on the nonmarket economy. While these two sets of statistics share a common economic accounting framework, they are prepared by two separate agencies. The GDP statistics are published by the Bureau of Economic Analysis (BEA), US Department of Commerce, and MFP and labor productivity statistics are published by the Bureau of Labor Statistics (BLS), US Department of Labor.

This chapter builds on the GDP by industry statistics produced by the BEA and the capital, labor, and MFP statistics produced by the BLS to assemble a consistent industry-level production account for the United States that is consistent with GDP. This set of accounts allows one to decompose the industry contributions of inputs and MFP to the sources of GDP growth at the aggregate level.

The initial results of the prototype account show that over the period 1998 to 2010, capital accounted for about 60 percent of US economic growth, labor accounted for about 10 percent, and MFP accounted for about 30 percent of growth. In forty-eight out of sixty-three industries, at least one KLEMS input to production was a more important source of real gross output growth than was MFP.

"Toward the Development of Sectoral Financial Positions and Flows in a From-Whom-to-Whom Framework" (Shrestha)

The global crisis of 2008 highlighted the need to understand financial interconnectedness among the various sectors of an economy and between them and their counterparties in the rest of the world. In addition, the financial interconnectedness is also to be understood as an integral part of the linkages between real and financial economies. Although the System of National Accounts (SNA) provides an overarching framework for the development of such macroeconomic statistics, application of this kind of analysis has been hampered by the lack of adequate data.

This chapter reviews the attributes of the SNA as a framework for integrated macroeconomic accounts, explores application of SNA principles for developing data on intersectoral financial linkages, reviews some important experiences that will be of use in the development of fully integrated macroeconomic accounts, and outlines activities and steps to implement sectoral accounts and balance sheets, including sectoral financial positions and flows in a from-whom-to-whom framework in the future.

"Toward the Measurement of Net Economic Welfare: Air Pollution Damage in the US National Accounts—2002, 2005, 2008" (Muller)

Time-series environmental accounting estimates rates of growth (or contraction) in the stocks of valuable natural resources and the magnitude of environmental damage from market production. Including these measures into augmented accounts is a critical step in closing the gap between the current production-based measures of output and a more complete picture of national economic welfare.

In this chapter, Muller employs environmental accounting methodology to measure the gross external damage (GED) due to air pollution emissions in the US economy in 2002, 2005, and 2008. The chapter measures three indices: the GED, the ratio of GED to value added (GED/VA), and net value added (NVA), defined as value added minus the GED. Each of these indices is computed for each sector of the US economy in 2002, 2005, and 2008. Real GED is estimated to be $480 billion in 2002, $430 billion in 2005, and $350 billion in 2008. Most of the reduction in GED from 2005 to 2008 is due to fewer emissions in the utility, manufacturing, agriculture, and transportation sectors. The GED/VA begins in 2002 at 0.054, drops to 0.039 in 2005, and then declines significantly to 0.03 in 2008. The empirical

time-series estimation of environmentally adjusted value added (EVA) is an important augmentation to standard measures of growth. From 2002 to 2005 VA grew at an annual rate of 2.76 percent. Over the same period EVA grew at 3.07 percent. Between 2005 and 2008 VA grew at 1.118 percent while the EVA increased by 1.47 percent. Thus, the reduction in the GED over these time periods results in growth rates in the EVA greater than VA by about 0.30 percent.

"Human Capital Accounting in the United States:
Context, Measurement, and Application" (Christian)

Christian's (2010) human capital account for the United States measured the human capital stock and human capital investment in both nominal and real terms over the period between 1994 and 2006. The account broke down net human capital investment among five components: investment from births, depreciation from deaths, investment from education net of the aging of enrolled persons, depreciation from the aging of nonenrolled persons, and a residual component that takes into account both migration and measurement error.

This chapter updates Christian's (2010) work to the year 2009, refining the underlying data and putting the account into international context by reviewing applications in the rest of the world. It also measures the sensitivity of human capital measures to alternative assumptions about income growth rates, discount rates, the treatment of taxes, smoothing and imputation of labor force and school enrollment data, and the valuation of nonmarket time. It concludes with an application to the measurement of the output of the education sector.

"Measuring the Stock of Human Capital for International
and Intertemporal Comparisons" (Liu)

Despite the wide interest in human capital, there has been no agreement on how to measure its stock. A variety of indicators have been used by analysts to measure the stock of human capital; these indicators include average school years, shares of the population having reached various levels of educational attainment, measures of people's competencies, expenditures in the education system, and lifetime earnings. This diversity of approaches has made it difficult to draw policy implications from comparisons of the stock of human capital across countries and highlights the need to develop broader and more consistent methodologies.

The OECD human capital project was launched in order to identify common methodologies for measuring the stock of human capital for comparative analysis and to implement these methods using existing OECD data. This chapter summarizes the outcomes of the first phase of the project and shows the feasibility of applying the lifetime income approach to measuring human capital for comparative analysis across countries and over time

using categorical data that are typically available within the OECD statistics system.

In this chapter, monetary estimates of the stock of human capital were computed for fourteen OECD countries (Australia, Canada, Denmark, France, Israel, Italy, Korea, the Netherlands, New Zealand, Norway, Poland, Spain, the United Kingdom, and the United States), and one nonmember country (Romania). These estimates indicate that the estimated value of human capital is substantially larger than that of traditional physical capital. Ratios of human capital to nominal GDP are in a range from around eight to over ten across the countries included in the study. The distributions of human capital by age, gender, and education show that men dominate women in terms of their human capital holdings. In addition, people with higher education are better off than those with lower education, and the same is true for younger people compared to their older counterparts, although the detailed patterns vary across countries.

Volume measures of the stock of human capital were developed for all fifteen countries included in the study. Temporal volume indices, including the volume of human capital per capita, were developed for twelve of the countries. These temporal volume indices show that human capital volume increased for all twelve countries during the observed period, but that in some countries, the volume of human capital in per capita terms fell. For countries that experienced increases in the volume of human capital per capita (Italy, Poland, Spain, and the United Kingdom), the positive contribution from education was larger than the negative effect from population aging. For countries that experienced broadly stable volumes of human capital per capita (Australia, Canada, France, and New Zealand), these two effects almost cancelled out each other. For countries that experienced decreases in the volume of human capital per capita (Israel, Korea, Norway, and the United States), the contribution from age exceeded that from education.

The chapter concludes that the lifetime income approach, by bringing together the influence of a broad range of factors (demography, mortality, and educational attainment, as well as labor market aspects) allows comparing the relative importance of these factors and drawing useful policy implications from the estimates.

"Developing a Framework for Decomposing Medical-Care
Expenditure Growth: Exploring Issues of Representativeness"
(Dunn, Liebman, and Shapiro)

Despite the importance of health-care spending to economic growth in the United States, there are many areas within this sector in which the understanding of expenditure growth is incomplete. This is especially true of the commercial health-care sector, where the primary data sources are often nonrandom convenience samples (i.e., available claims data from

contributing insurers and employers). The goal of this chapter is to better understand issues related to using convenience samples to obtain nationally representative estimates of the various components of expenditure growth. The authors find similar qualitative findings by applying a multitude of strategies, including weighted and unweighted estimates. In general, they find that prevalence and service price are the key drivers of spending growth, with utilization per episode being flat. However, they also find that estimates that incorporate population weights tend to be more aligned with national benchmarks of expenditure and price growth.

"Experimental Measures of Output and Productivity in the Canadian Hospital Sector, 2002 to 2010" (Gu and Morin)

The volume of output of the hospital sector in the existing Canadian System of National Accounts is measured by the volume of inputs. This approach to measuring output assumes that there is no productivity growth in the hospital sector.

The goal of this chapter is to develop an experimental index of output for the Canadian hospital sector that can be compared with inputs in order to measure the productivity performance of the hospital sector. It uses the approach outlined in the OECD Handbook on the measurement of the volume output of education and health services and constructs a direct output measure of the hospital sector in Canada. The volume index of the output of the hospital sector is estimated from aggregating the number of inpatient cases and outpatient cases using their cost share as weights. It also examines two potential sources of bias in this cost-weighted volume index: substitution bias and aggregation bias. The analysis reveals a large substitution bias in the volume index when inpatient treatment and outpatient treatment of the same medical disease or condition are aggregated using their respective unit costs as weights. The volume index of the hospital sector output corrected for substitution bias increased 4.3 percent annually during the 2002 to 2010 period. Labor productivity based on the direct output measure increased 2.6 percent annually over the period.

"Innovation Accounting" (Corrado and Hulten)

National accounting practice has traditionally linked inputs of capital and labor to the output of consumption, investment, net exports, and government with no explicit account being taken of the innovations in technology and the organization of production that led to a greater quantity of output from a given base of inputs (or improvements in the quality of the inputs and outputs). Corrado and Hulten have found in previous research that innovation investment, or "intangibles," has been the largest systematic driver of economic growth in business sector output over the last fifty years and that US businesses currently invest more in intangibles than they do

in traditional fixed assets. Despite the importance of intangibles, most are excluded from national and financial accounting practice.

This chapter describes some of the steps involved in building a more comprehensive national innovation account as a satellite to the main national accounting framework, with a primary focus on business intangible capital and its measurement. The authors find that, when the asset boundary is extended to include investments in innovation, capital deepening becomes the dominant factor explaining the growth of labor productivity (measured as output per hour). Intangible capital deepening alone explains about 1/4 of the growth in output per hour since 1979 and nearly 1/3 since 2000. The importance of the quality dimension of intangible investment is also discussed. This issue has been largely absent from previous literature on intangibles.

Summary of Statistical Agency Panel Remarks

Steven Landefeld describes how the chapters contained in this volume highlight ways in which the BEA and other statistical agencies can address the urgent need to update and extend economic statistics in the face of daunting budgetary challenges in the United States and abroad. He suggests that through new source data methods and source data statistical agencies may be able to cut and improve at the same time. Examples drawn from the conference papers include: (a) collaborative work on the integration of micro- and macrodata in developing more timely, comprehensive, and consistent estimates of the distribution of income and spending; (b) coordination in the development and use of new financial data collections for both regulatory and statistical purposes; and (c) use of existing health insurance records to improve and expand existing measures of medical-care prices, output, and productivity.

Shirin Ahmed discusses efforts at the US Census Bureau to fill data gaps in services, intellectual property, offshore production, and capital spending. She also underlined the importance of sharing data between the BEA, BLS, and Census Bureau, while protecting the confidentiality of that data. Such sharing has the potential of significantly improving accuracy and consistency, and increasing efficiency. Finally, Shirin discussed the need to build upon and expand the collaboration between the BEA, BLS, and Census Bureau in the current budget environment. These updates and extensions to the US statistical infrastructure produced by the Census Bureau are key to efforts to update and extend the existing accounts.

John Ruser described work underway at the Bureau of Labor Statistics that will address a broad range of the challenges raised by the chapters included in this volume. These include efforts to improve the Consumer Expenditure Survey, update and expand data on medical-care prices and

output, the development of integrated industry-level production accounts, and the addition of a well-being model to the American Time Use Survey.

Finally, Adelheid Burgi-Schmelz provided an international agency perspective by discussing efforts at the International Monetary Fund to play a leadership role in efforts to plug data gaps revealed by the financial crisis. She described the G-20 and the IMF Data Gaps Initiative and the collaborative work underway around the globe to five major systemic issues raised by the G-20 report.

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