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Introduction

Dale W. Jorgenson, J. Steven Landefeld, and
William D. Nordhaus

From its inception, the Conference on Research in Income and Wealth (CRIW) has focused much of its attention on the U.S. national accounts, now officially entitled the National Income and Product Accounts (NIPAs). Notwithstanding this historical focus, the most recent CRIW volume devoted entirely to the national accounts was *The U.S. National Income and Product Accounts: Selected Topics*, edited by Murray Foss and published in 1983. This reported the proceedings of a conference held in Washington, DC, on May 3–4, 1979, more than a quarter of a century ago!

The present volume contains the proceedings of the conference “A New Architecture for the U.S. National Accounts,” held in Washington, DC, on April 16–17, 2004. The purpose of the conference was to initiate the development of a comprehensive and fully integrated system of U.S. national accounts. Attainment of this objective will require a great deal of effort, a substantial amount of time, and the collaboration of many individuals and institutions. It is important to emphasize that while this effort is in one sense a new architecture, in another it is the latest in a series of steps to update, supplement, and reconcile different components of our evolving system of national accounts.

The purpose of a new architecture is to integrate the existing systems of accounts, identify gaps and inconsistencies, and expand and integrate systems of nonmarket accounts with the core system. We are fortunate in building on a history of success. Samuelson and Nordhaus (2005, 429) and

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the Department of Commerce have characterized the gross domestic product (GDP) as one of the great inventions of the twentieth century.¹

America's economy is not only large and diverse but is also becoming increasingly interrelated with the rest of the world in both its current and financial accounts. The diversity of the U.S. economy is reflected in the decentralization of its statistical system. The major agencies involved in providing data and generating the accounts include the Bureau of Economic Analysis (BEA) in the Department of Commerce, the Bureau of Labor Statistics (BLS) in the Department of Labor, the Census Bureau (also in the Commerce Department), the board of governors of the Federal Reserve System, and the Statistics of Income (SOI) division of the Internal Revenue Service.

Without being exhaustive we can enumerate some of the major assignments of the leading contributors. The BEA has responsibility for the NIPAs, the core system of accounts. The BLS generates employment; wage and salary data; productivity statistics, including labor productivity and multifactor productivity; as well as almost all of the underlying price data. The board of governors produces the flow-of-funds accounts, including the balance sheets. The Census Bureau collects and reports much of the primary information through its business and population censuses and surveys. The SOI generates tax-based data and incomes used in calculating gross domestic income. In addition, many other agencies and private-sector organizations provide source data for the national accounts.

The NIPAs, the productivity statistics, and the flow-of-funds have different origins, reflecting different objectives and data sources. However, they are intimately linked. For example, the BLS multifactor productivity statistics employ data on output, income, and investment from the NIPAs. The flow-of-funds incorporates BEA data on investment and stocks of tangible and reproducible assets and the U.S. international investment position. An important part of the motivation for developing a new architecture for the national accounts is to integrate the different components and make them consistent.

Emerging measurement issues have also motivated reconsideration of the architecture of the national accounts. Examples would include attempts to understand the recent decline in saving and the rebound in productivity growth and potential economic growth. Alternative and sometimes inconsistent perspectives on these issues are provided by different data sources. In addition, ownership-based accounting for international transactions and linked micro and macro accounts continue to pose chal-

1. At a press conference on December 7, 1999, the Department of Commerce selected "the development of the national income and product accounts as its achievement of the century." See Landefeld (2000).

lenges. These are symptomatic of issues that need attention by the national accounting community.

The key elements of the new architecture are outlined in chapter 1, “Blueprint for Expanded and Integrated U.S. Accounts,” by Dale W. Jorgenson and J. Steven Landefeld. This chapter presents a prototype system of accounts that integrates the NIPAs with the productivity statistics generated by the BLS and balance sheets produced by the Federal Reserve Board. The system features GDP, as does the NIPAs; however, GDP and gross domestic income (GDI) are presented in both current and constant prices, together with multifactor productivity. Similarly, the BEA’s accounts for reproducible assets and the U.S. international investment position are extended to encompass a balance sheet for the U.S. economy.

Jorgenson and Landefeld provide an overview of the current system of accounts and an explanation of the existing architecture. Chapter 1 also compares the NIPAs with the principal alternative, the international accounting guidelines in the *System of National Accounts* (United Nations et al., 1993; hereafter SNA). Finally, this chapter presents a brief history of the U.S. national accounts, beginning with the seminal work of Simon Kuznets at the National Bureau of Economic Research (NBER) and continuing through the most recent developments. These include the new seven-account system for the NIPAs, illustrated by table 1.1 of the chapter. The tables present the accounts for 2002, the year of the most recent benchmark revision.

Chapter 2, “The Architecture of the System of National Accounts: A Three-Way International Comparison of Canada, Australia, and the United Kingdom,” by Karen Wilson, provides a comparison among three systems of national accounts that implement the United Nations SNA. These systems are organized around the supply and use framework employed in constructing input-output accounts. Financial accounts and balance sheets are an integral part of the system in all three countries. However, the architecture is quite different from the U.S. national accounts, which emphasize the expenditure definition of GDP, the familiar $C + I + G + X$, personal consumption expenditures, gross private domestic investment, government expenditures, plus net exports.

Australia, Canada, and the United Kingdom have highly centralized statistical systems with a single agency in each country responsible for the system of national accounts. Table 5 in the paper summarizes and compares the sequence of accounts in the three countries. This begins with GDP and continues with income and expenditures and capital accounts. The financial accounts, including balance sheets, and the external accounts are integrated with the income and product accounts in all three countries. The SNA and the NIPAs are compared in greater detail in chapter 11.

The U.S. national accounts are not limited to the core system of accounts for market activity, centering on the NIPAs and including the productivity statistics and the flow-of-funds accounts. In chapter 3, “Principles of National Accounting for Nonmarket Accounts,” William D. Nordhaus considers the major conceptual issues in nonmarket accounting. This builds on the principles developed for environmental accounts in the National Research Council study, *Nature’s Numbers*, edited by Nordhaus and Edward Kockelenberg (1999). Nordhaus recommends the National Economic Accounts (NEA) as a guiding principle for the nonmarket accounts. Under this principle, nonmarket goods and services should be treated as if they were produced and consumed as market activities. The accounts would include a full set of current and capital accounts, modeled after those of systems of market-based accounts.

Nordhaus emphasizes that the single most important source of data for nonmarket accounts is the American Time Use Survey initiated by the BLS in 2003. An important challenge is evaluating the time used in activities not covered by labor markets. Nordhaus and James Tobin (1973) employed marginal after-tax labor compensation, and this approach has been adopted in most approaches to time valuation. Drawing appropriate boundaries is a central issue in augmented accounts for nonmarket activities. A narrow view could confine these boundaries to near-market goods and services, where there is a direct counterpart to market goods and services. A broad definition would also include personal goods and services for which there are no market transactions, but also public goods with benefits spreading over the entire community.

The Committee on National Statistics (CNStat) of the U.S. National Academies has recently published a comprehensive survey of nonmarket accounting, *Beyond the Market*, edited by Katharine G. Abraham, chair of the CNStat panel, and Christopher Mackie of CNStat (Abraham and Mackie 2005). This report is summarized by Abraham and Mackie in chapter 4, “A Framework for Nonmarket Accounting.” Like Nordhaus, Abraham and Mackie favor modeling nonmarket accounts on the core system of national accounts, preserving double-entry bookkeeping and relying on market transactions insofar as possible in the valuation of nonmarket inputs and outputs. An important goal is to include prices, quantities, and values for nonmarket activities that can be compared with corresponding estimates for market activities.

Beyond the Market recommends the development of “satellite” systems of accounts for nonmarket activity in five areas—household production, education, health, the nonprofit and government sectors, and the environment. The report makes specific recommendations for systems of accounts in each of these areas and presents detailed references to the relevant literature. Abraham and Mackie identify the American Time Use Survey (BLS 2004) as an important new source of data on nonmarket activity. This

could be exploited in many areas, including home production, investments in health and education, volunteer activity, and environmental accounting.

The conceptual issues in designing capital accounts are discussed in Charles R. Hulten's paper, "The 'Architecture' of Capital Accounting: Basic Design Principles." Hulten outlines the standard model of capital introduced by the BLS (1983) in its multifactor productivity program. The key concepts are the flow of capital services and the user cost of these services. These complement the older concepts of the stock of capital and the price of assets, employed in the BEA's accounts for reproducible tangible wealth. Incorporation of capital services and user costs into the NIPAs would be an important step in the integration of the productivity statistics with the core system of accounts. This would also open the way to accounting for capital income, much of it imputed, in the household, non-profit, and government sectors.

Hulten employs a circular flow model (CFM) as the framework for capital accounting. Capital is a stock of productive assets for producers, as well as a store of wealth for consumers. Investment is defined as expenditure made with the intention of increasing future, rather than current, consumption. This leads to considering research and development and other intangible forms of investment as part of capital. It also focuses attention on the necessity of treating the cost of capital or user cost as an integral part of the production account for an integrated and consistent system of accounts. Gross output is the natural measure for the production sector, while net output is appropriate as a measure of welfare. Both are required in a complete system of accounts. Finally, the division between production and consumption suggests that capital should be identified both by the production sector where it is employed and the consumer sector where it is owned.

The most important barrier to an integrated and consistent production account at the industry level for the United States is the construction of consistent input-output and national income accounts. This important and challenging topic is the subject of three chapters. Chapter 6, "Integrating Industry and National Economic Accounts: First Steps and Future Improvements," by Ann M. Lawson, Brian C. Moyer, Sumiye Okubo, and Mark A. Planting, presents an initial integration of the BEA's annual input-output accounts with GDP by industry. Many countries produce integrated accounts by assuming that industry ratios of intermediate inputs to gross output do not change from the most recent benchmark input-output table. The BEA uses a very different approach, combining the available source data to estimate a balanced set of annual input-output accounts and GDP-by-industry accounts.

The integration of GDP-by-industry accounts with the annual input-output accounts is the latest in a series of improvements in the BEA's industry accounts. These include, first, resuming the publication of annual

input-output tables and accelerating their release to within three years after the reference year. Second, the GDP-by-industry accounts have been expanded to include gross output and intermediate input for all industries. Third, accelerated GDP-by-industry accounts are available with a lag of only four months after the end of the reference year. The BEA's long-run goal is to integrate GDP-by-industry accounts with the benchmark input-output accounts compiled every five years and the NIPAs, as well as the annual input-output accounts. Achievement of this objective will require several years of effort by the BEA, as well as the continuing participation and cooperation of other statistical agencies, especially the Bureau of the Census and the BLS, to further enhance the quality and timeliness of the underlying source data. Much more information is provided on initiatives already underway by Thomas L. Mesenbourg of the Bureau of the Census and Kathleen P. Utgoff, Commissioner of Labor Statistics, in their contributions to the panel discussion reported at the end of this volume.

Chapter 7, "Aggregation Issues in Integrating and Accelerating the BEA's Accounts: Improved Methods for Calculating GDP by Industry," by Brian C. Moyer, Marshall B. Reinsdorf, and Robert E. Yuskavage considers aggregate measures of GDP obtained from the GDP-by-industry accounts. These differ from the expenditure-based measure of the GDP featured in the NIPAs. An important conclusion is that differences in source data and methodology account for most of the differences in the growth of aggregate output. Few of the differences are attributable to the treatment of the statistical discrepancy or aggregation methods. Another important finding of the chapter is that the formula employed by the BEA for calculating the contributions of final expenditures to real GDP growth can be used to calculate industry contributions based on value added. With a consistent set of source data this formula would yield the same estimate of real GDP from the income side and the expenditure side.

The BEA's objective is a full integration of industry and expenditures accounts that reduces or eliminates the existing discrepancies. Chapter 7 identifies options for fuller integration of the industry accounts and the NIPAs and improvements in source data that will be required. The authors recommend using a consistent set of source data within the framework provided by balanced annual input-output accounts, together with the aggregation methods currently used by the BEA. This would require major improvements in the source data for gross output, final uses, and intermediate inputs. The Census Bureau has several initiatives in the 2002 Economic Census that would contribute to this goal. The BLS continues to expand and improve service-sector producer price indexes. However, incorporation of the new data and full integration will require substantial time and effort.

Chapter 8, "Integrating Expenditure and Income Data: What to Do with the Statistical Discrepancy?" by J. Joseph Beaulieu and Eric J. Bartlesman,

is the third chapter dealing with integration of the industry accounts and the NIPAs. This chapter compares the expenditure estimates of GDP with value added estimates derived by adding over industries. This comparison is carried out within the framework of annual input-output accounts derived from a variety of source data. The initial estimate is converted into a final estimate by eliminating the statistical discrepancies. This requires methods for “balancing” the accounts; the results enable the authors to identify possible improvements in the underlying source data that would be useful in setting priorities.

Beaulieu and Bartlesman show that conflicting measurements of deliveries to final demand and value added in a few problem industries explain most of the aggregate statistical discrepancy. Many of the industry-level statistical discrepancies arise from personal consumption expenditures. These are associated with specific industries such as trade, finance and insurance, chemicals, petroleum refining, rubber and plastics, and communications industries. In addition, the machinery and instruments industry contributes to the statistical discrepancy in private fixed investment. Finally, there are significant issues in the measurement of value added in the mining and health services industries. Beaulieu and Bartlesman propose methods for combining expenditure and income data to create an integrated data set.

A more specific agenda for designing a new architecture for the U.S. national accounts would include an integrated production account presenting the GDP and GDI, as in the NIPAs. Both would be given in current and constant prices, as in the BLS multifactor productivity statistics. These would be extended to the industry level by introducing gross output and intermediate input by industry, as in the BEA’s annual input-output accounts. The production account is the subject of chapter 9, “An Integrated BEA/BLS Production Account: A First Step and Theoretical Considerations,” by Barbara M. Fraumeni and Robert E. Yuskavage of the BEA and Michael J. Harper and Susan G. Powers of the BLS. The authors compare data sources employed in the BEA production accounts and the BLS productivity accounts and discuss the methodology required to integrate the two systems.

Chapter 9 is an important first step in collaboration between the BEA and BLS. This chapter describes a framework for the production account based on Jorgenson, Gollop, and Fraumeni (1987). This framework incorporates data on the production of commodities by individual industries, as well as the interindustry flows available in the input-output accounts. Data in current prices are deflated by commodity prices and aggregated to provide measures of real input and output and productivity by industry. The chapter presents an integrated and consistent aggregate production account for U.S. private business and private nonfarm business sectors. Finally, the chapter documents and presents alternative measures of industry

output available from the BEA and BLS. These comparisons could be used by the two agencies in reconciling and eliminating the remaining differences. The chapter identifies the conversion of the NIPAs and the productivity statistics to the North American Industry Classification System (NAICS) as an important opportunity to achieve more thorough going integration.

John R. Baldwin and Tarek M. Harchaoui present Statistics Canada's system of integrated production and productivity accounts in chapter 10, "The Integration of the Canadian Productivity Accounts within the System of National Accounts: Current Status and Challenges Ahead." This provides a paradigm for measuring productivity within a system of national accounts based on the SNA. The industry-level estimates are based on gross output and intermediate input from the input-output accounts in current and constant prices. Capital and labor inputs are defined in a similar manner to the BLS multifactor productivity program, but cover the whole of the Canadian economy. The Canadian system of productivity accounts has important implications for an integrated and consistent production account in the U.S. system of national accounts, but differences between the NIPAs and the SNA would have to be eliminated in order to use the Canadian accounts as a model.

Baldwin and Harchaoui emphasize the advantages of integrating the productivity accounts with the national accounts. This requires a consistent set of data on outputs and inputs that conforms to the system of national accounts. These data help to eliminate the common difficulty of "different stories," like those arising from differences between the BEA and BLS industry data. The construction of productivity accounts also provides an important quality check on data from the national accounts and helps to identify and fill data gaps. A system of productivity accounts integrated with the system of national accounts enhances the national accounts through improvements in accuracy, coherence, relevance, and interpretability. Baldwin and Harchaoui conclude by calling for the integration of productivity accounts into the United Nations SNA framework.

The final topic in developing new architecture for the U.S. national accounts is an integrated and consistent system of financial and income accounts. This is presented in chapter 11, "Integrated Macroeconomic Accounts for the United States: Draft SNA-USA," by Albert M. Teplin in collaboration with Susan Hume McIntosh, and Michael G. Palumbo of the Federal Reserve Board; Genevieve Solomon of the Federal Reserve Bank of Dallas; Rochelle Antoniewicz of the Investment Company Institute; and Charles Ian Mead, Brent Moulton, and Karin Moses of the BEA. This paper integrates the NIPAs and the U.S. international investment position generated by BEA with the flow-of-funds accounts produced by the Federal Reserve Board. Fuller integration would involve harmonizing sector

boundaries, exploiting the same data sources, and treating transactions uniformly. The chapter presents a prototype integrated and consistent system that resolves many of these issues and identifies others for future work. Larry Slifman of the Board of Governors comments on the different meanings of integration, especially in the work of Teplin and his colleagues and Beaulieu and Bartlesman.

Chapter 11 provides integrated financial and income accounts for 1985–2002, based on official data as of June 10, 2004, and a few unofficial estimates by the authors. These accounts are presented for seven sectors—households and nonprofit institutions serving households; nonfinancial, noncorporate businesses; nonfinancial corporate businesses; financial businesses; federal government; state and local governments; and the rest of the world. Each sector has production and income accounts in current prices, a capital account giving data on accumulation, a revaluation account, and a balance sheet account. Relative to current publications of the BEA and the Board of Governors, the integrated accounts go considerably further in implementing the United Nations SNA. The new accounts also advance the goal identified by Richard and Nancy Ruggles (1982) of integrating the NIPAs, the U.S. international investment position, and the flow of funds.

A final methodological issue, the integration of micro and macro accounts for capital, is discussed by Randy Becker, John Haltiwanger, Dan Wilson, Ron Jarmin, and Shawn D. Klimek in chapter 12, “Micro- and Macrodata Integration: The Case of Capital.” This chapter focuses on the empirical basis for the allocation of investment flows by industry and by asset. New information collected in the Census Bureau’s Annual Capital Expenditures Survey (Bureau of the Census 2004; hereafter ACES) will enhance the empirical foundations for capital accounts at both aggregate and industry levels. This information will also facilitate the integration of micro- and macrodata for investment, capital stocks, and capital services.

A key theme of chapter 12 is that inconsistencies between industry and asset measures of capital and firm and establishment measures reflect dramatically different methodologies. Estimates of investment by industry and asset are constructed from commodity flow data for capital goods. The perpetual inventory method is employed in constructing estimates of capital stocks. An important empirical issue is the basis for the allocation of investment and capital by industry. The ACES provides direct evidence on investment by firms and establishments and these have been incorporated into the most recent benchmark table of capital flows by industry and asset. The chapter identifies a number of obstacles to reconciliation of the industry and asset data with firm and establishment data, such as the limited asset detail available from business surveys and the enormous sample rotation, especially for younger businesses. Finally, the chapter recommends

integration of micro and macro approaches to capital measurement and re-design of surveys to generate better microdata on investment flows and capital stocks.

We conclude that the Conference on a New Architecture has accomplished the objective of initiating the lengthy process that will be required to produce an integrated and consistent system of U.S. national accounts. This process will involve steps within the BEA to integrate the components of the core system of accounts—the NIPAs, the input-output accounts, and the international accounts. It will also involve collaboration between the BEA and BLS on an integrated and consistent production account and between the BEA and the Federal Reserve Board on integrated and consistent income and expenditures, capital, and wealth accounts. An open question that deserves immediate attention is how to create an institutional framework for successful interagency collaboration within the highly decentralized U.S. statistical system. The requisites for ongoing collaborations are obviously very different from those for one-time efforts through interagency task forces. These issues are addressed in greater detail by Abraham and Landefeld in their contributions to the panel discussion.

The institutional framework for collaboration on satellite systems of accounts is a less urgent matter, but also requires attention. The BEA has already established collaborative relationships in the areas surveyed by Jorgenson and Landefeld, but many unexploited opportunities remain, such as those identified by Abraham and Mackie. A third area that must be addressed by the national accounting community is international harmonization through implementation and revision of the SNA. This is the focus of the chapters by Teplin and his colleagues and by Wilson. The next objective for the national accounting community will be to set priorities and a schedule for accomplishing the goal identified in this volume: creating an integrated and consistent system of U.S. national accounts.

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