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A NEW ARCHITECTURE FOR THE U.S. NATIONAL ACCOUNTS: A REPLY TO ANDRÉ VANOLI

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In his review of *A New Architecture for the U.S. National Accounts* (Jorgenson *et al*., 2006), published in this issue (Vanoli, 2010), André Vanoli:

- Suggests that the methods for integrating and increasing the consistency of national accounts contained in the *New Architecture* volume and in the recent United Nations (UN) Friends of the Chair Working Group on Integration are only relevant to the United States and other decentralized statistical systems.
- Rejects the integration of national accounts with measures of productivity, as proposed in the *New Architecture* volume, the *System of National Accounts (SNA) 2008* (Inter-Secretariat Working Group on the National Accounts, 2009a, 2009b), the OECD's Manual *Measuring Capital* (Schreyer, 2009), and the EU KLEMS Growth and Productivity Accounts for 25 of the 27 European Union member countries, completed on June 30, 2008.[1]
- Rejects the use of satellite accounts to extend the coverage of the national accounts to near-market and nonmarket goods as detailed in the *New Architecture*, *SNA 1993* (Inter-Secretariat Working Group on the National Accounts, 1993), *SNA 2008*, the *System of Integrated Environmental and Economic Accounts* (SEEA) (United Nations, 2003), and several recent volumes by the U.S. National Academy of Sciences.

This response is directed to Vanoli's specific points and the broader issues that he raises about the future of national accounts. Vanoli suggests that integrated accounts are a common feature of any modern system of national accounts. Yet many nations' accounts—even those with a central statistical office—must combine data developed by a number of different statistical agencies for purposes

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[1]See O'Mahony and Timmer (2009) for further details.

other than the national accounts. The *New Architecture* volume offers a theoretical and statistical foundation for integrating and increasing the accuracy and relevance of all systems of national accounts.

In the *New Architecture* volume we argue that national accountants should address the long overdue need to integrate growth accounting with national accounting. This will increase accuracy of the data and its relevance to public and private decision makers trying to better understand the sources of growth. The integration has now been accomplished by the Bureau of Economic Analysis (BEA), which generates the U.S. national accounts, and the Bureau of Labor Statistics (BLS), the agency responsible for U.S. productivity statistics.[2]

The *New Architecture* volume outlines expansion of the scope of the national accounts to better understand the interactions between the economy and the environment, household production, health care, and other near-market activities. This is underlined by rapidly mounting concerns over the intersection between energy and the environment. Finally, we argue that the statistical procedures presented in the volume to achieve consistency and integration and the need to integrate "micro" and "macro" data are highly relevant to both centralized and decentralized systems.

NIPAs and the SNA

Section 2 of Vanoli's review focuses on Chapter 11 of the *New Architecture* volume, subtitled SNA-USA (Teplin *et al.*, 2006). This chapter integrates the U.S. National Income and Product Accounts (NIPAs) produced by BEA with the Flow of Funds (FOF) generated by the Federal Reserve Board (FRB). The integration takes place within the framework of the *SNA 1993*, hence the subtitle SNA-USA. The initial effort in the *New Architecture* volume has been followed by an annual and now quarterly updates, published on the BEA website and in the *Survey of Current Business*, the monthly BEA publication, and on the FRB website.

SNA-USA is not the only effort at BEA to provide the U.S. national accounts in a format based on the *SNA*. The U.S. national accounts are reported in this format on an annual basis to the OECD. The results are published in OECD's internationally comparable national accounts and are also available on the BEA website. Details on the U.S. accounts in *SNA 1993* format are provided by Mead, Moses, and Moulton (Mead *et al.*, 2004), three of the co-authors of SNA-USA in the *New Architecture* volume.

The U.S. is one of a handful of countries that have all seven of the key components on the *SNA*—from quarterly nominal and real estimates to quarterly nominal and real balance sheets—used by the United Nations Statistical Commission in assessing progress in implementing *SNA 1993*. The purpose of the *New Architecture* volume is to outline a program of improvements in the NIPAs, a program that is broadly consistent with the *SNA 2008* revision and the update of *SNA 1993*. The effort to improve and expand the national accounts is a worldwide undertaking that will continue indefinitely as new needs arise and new data sources become available.

[2]See Harper *et al*. (2009).

While the NIPAs differ somewhat in nomenclature and presentation from the SNA, the United States accounts are consistent with the SNA in the production of a complete set of income, expenditure, production, and balance sheet estimates.

Further, Vanoli is incorrect in his assertions regarding the top-down nature of the NIPAs, their lack of integration, and their stagnation for half a century. As exemplified by the original set of U.S. national accounts developed by Simon Kuznets (1934), the U.S. national accounts are a conceptually consistent set of accounts built from the bottom-up on an industry by industry basis that were later developed on a detailed product, income, regional, and legal structure basis. The NIPAs have also been continuously updated since their inception in the 1930s and have been a leader in the introduction of innovative measurement techniques in order to remain relevant by reflecting changes in policy needs and in the structure of the economy.[3]

Moreover BEA has also devoted considerable resources to updating the NIPAs to incorporate the quantitatively important advances outlined in each version of the SNA. In the most recent revisions of the SNA, key advances in measurement, including chain indexes, quality-adjusted prices, especially for IT products, capitalization of software, and the measurement of financial services, have been implemented in the NIPAs.

NIPAs and the Industry Accounts

The second topic discussed by Vanoli is integration of the NIPAs and the extensive industry accounts produced by BEA. This integration is considered in the five chapters of the *New Architecture* volume devoted to the industry accounts. As Vanoli points out, this is an issue for all systems of national accounts. The proposals of Richard Stone that ultimately became the *SNA 1968* (United Nations, 1968) were intended to integrate then-existing systems of national accounts with flow of funds data and with industry data in the form of input–output tables. This worthwhile objective has proved to be very challenging and few countries have managed to achieve it.

BEA has a long history of national accounting for individual industries, including the development of gross product by industry, the preparation of benchmark input–output tables that coincide with economic censuses every five years, and the publication of annual input–output tables. The history of these programs is discussed in the individual chapters of the *New Architecture* volume and in greater detail in articles posted on the BEA website. Although the conceptual basis for the industry accounts is the same as the NIPAs, the data sources differ in important ways. The NIPAs focus on current economic reporting and aggregate trends in growth while the industry accounts attempt to capture long-term changes in the underlying structure of production.

Recently, BEA has made major improvements in the industry accounts by reinstituting annual input–output tables, linking gross product by industry with the input–output accounts, and accelerating the production and publication of

[3]For an overview of the continuous updating of the NIPAs to reflect policy needs and changes in the economy, see Landefeld (2000).

industry statistics, including experimental measures of quarterly GDP. Donahue *et al.* (2010) have described the most recent results in the June 2010 *Survey of Current Business*. This provides a consistent time series of annual input–output tables that is integrated with the five-year benchmark input–output tables. Earlier BEA had presented estimates of GDP by industry that are integrated with the annual input–output accounts.

The Bureau of Labor Statistics and the Bureau of the Census have devoted substantial resources to providing better source data on prices and intermediate inputs that underlie the industry accounts. The focus of much of this work has been on service industries in line with the growing importance of these industries. The substantial scope of the industry accounts has increased the need for careful consideration of how the new data sources and new statistical results are integrated with the core system of national accounts.

Many countries employ a production approach to estimating GDP and balance their accounts and sub-accounts to achieve consistency. This is often done through judgment or the use of balancing items, such as the operating surplus, where residual inconsistencies are allocated. The decentralized U.S. system has multiple business registers and different agencies produce parts of the U.S. national accounts. This leads to inconsistencies. These differences are inherent in any system that uses multiple methods and source data to measure the national product as accurately as possible.

As Vanoli points out, much of the *New Architecture* volume focuses on methods for integrating the U.S. national accounts. This integration has increased the internal consistency of the U.S. accounts, employing methods that are designed to increase accuracy as well as consistency. For example, rather than allocating the statistical discrepancy between BEA's GDP by industry estimates and the final expenditures measure of GDP judgmentally, BEA has developed a statistical methodology for allocating the discrepancy that is transparent and replicable by BEA's users.

The U.S. accounts feature expenditure and income estimates, with production and balance sheet estimates published less frequently and with a lag. Estimates from these accounts are different in appearance from the SNA and may seem to be disconnected because of inconsistencies among the various estimates. Although these measures produce the same general picture of economic activity, they can vary in important respects. A central point of the *New Architecture* volume is to suggest means of increasing consistency and integration that do not rely on "forcing" industry and other detailed estimates to equal aggregate control totals by judgmentally adding residuals to various components.

The NIPAs are carefully followed by financial markets and policy-makers around the world, who have come to expect a high degree of transparency and consistency between the U.S. GDP and its components and the monthly and quarterly source data used in its estimation. These users depend on being able to replicate the U.S. GDP estimate for their clients, and consensus estimates based on these forecasts form the basis for market expectations. Any deviations from these expectations resulting from judgmental adjustments to the data that appear inconsistent with the underlying source data are quickly called into question by users.

The availability of timely data on corporate profits, for example, dramatically reduces the scope for judgment in balancing the statistical discrepancy between GDP and GDI. The use of direct observations on quarterly corporate profits and source data for estimating the other components of business income implies that residual discrepancies between GDP and GDI cannot be included in the SNA operating surplus, as in many systems of accounts. As noted in the *New Architecture* volume, users of the U.S. accounts, including BEA's blue-ribbon advisory committee, have advised that the statistical discrepancy not be balanced unless it is done using statistical techniques that are transparent and replicable by users and that increase the accuracy of the accounts.

The chapters in the *New Architecture* volume on integration provide suggestions for the United States and other countries on how they can both increase consistency *and* accuracy while maintaining transparency for users. While a handful of nations with truly centralized statistical systems may be able to design or redesign their entire systems of statistical data collections (surveys and administrative data) to minimize inconsistencies, most nations do not have that option. The results from household and establishment surveys, administrative and survey data, tax-based and financial-based accounting data must be reconciled. Biases in tax and survey data (both over the business cycle and in trend growth) must be removed and inconsistencies between aggregates from national samples and subaggregates from smaller samples must be corrected.

All nations use some combination of benchmarking, interpolation, extrapolation, temporal adjustment, and adjustments to fulfill accounting identities to obtain consistency in their accounts. The statistical methods in the *New Architecture* volume offer suggestions on how other nations with centralized and decentralized systems can improve the consistency and accuracy without the very large cost of a comprehensive redesign of their national data collection systems.

The U.S. system values internal consistency, but places a high value on transparency in its concepts and methods and on the consistency of its estimates with the rich monthly, quarterly, annual, and comprehensive census data available. BEA regularly publishes its source data, assumptions, and methods. It also publishes statistical discrepancies between its various measures to help users of the data in assessing the relative accuracy of those measures.

NIPAs and the Production Account

After reviewing SNA-USA and integration of industry data with the national accounts, Vanoli turns to the production account in current and constant prices proposed in the *New Architecture*. As readers are well aware, the production account presents output as measured by the Gross Domestic Product and input as measured by Gross Domestic Income in both the NIPAs and the SNA. GDP is measured in current and constant prices in both systems. In chapter XVII of *SNA 1993* this treatment was extended to labor input. The incorporation of measures of capital input in constant prices into *SNA 2008* was approved by the United Nations Statistical Commission at its February–March 2007 meeting in New York City.

In chapter 20 of *SNA 2008*, "Capital services and the national accounts" (p. 415), estimates of capital services are described as follows: "By associating these estimates with the standard breakdown of value added, the contribution of capital and labor to production can be portrayed in a form ready for use in the analysis of productivity in a way entirely consistent with the accounts of the System." Paul Schreyer, head of national accounts at the OECD, published a new OECD Manual, *Measuring Capital*, in 2009. This Manual provides detailed recommendations for implementation of capital stocks and capital services in current and constant prices.

The *New Architecture* volume proposes a production account that encompasses capital and labor inputs as well as investment and consumption goods outputs in both current and constant prices. The measures of capital input in constant prices are consistent with chapter 20 of the revised SNA and the OECD Manual, *Measuring Capital*. It is important to emphasize that these measures are also consistent with the NIPAs. The volume of input is a quantity index of capital and labor services, while the volume of output is a quantity index of consumption and investment goods. Productivity is the ratio of output to input.

The issues involved in measuring productivity were considered at length by a Statistical Working Party of the OECD Industry Committee, chaired by Edwin Dean, former Associate Commissioner of the U.S. Bureau of Labor Statistics for Productivity and Technology. The results were summarized in the OECD *Productivity Manual*, also written by Schreyer (2001). Chapter 5 of the OECD *Productivity Manual* describes in detail how to measure capital services. This has been greatly expanded in Schreyer's (2009) OECD Manual, *Measuring Capital*. As Schreyer indicates, the new Manual was instigated by the Canberra II Group on the Measurement of Non-Financial Assets and has been endorsed by the OECD National Accounts Working Party, as well as the United Nations Statistical Commission.

The innovations in the *New Architecture* volume are far-reaching and lead to measures of income and expenditures, as well as measures of saving and investment, in current and constant prices. Like productivity and capital input in the production account, these measures are consistent with the NIPAs and the SNA. One crucial example will serve to illustrate the disjunction between Vanoli's discussion of capital measurement and the consensus that has emerged from the deliberations of the Canberra II Group. Chapter 1 of the *New Architecture* volume presents prototype accounts for the total economy. Vanoli asks, "Would exactly the same methods be used at the level of individual industries?"

In fact, production accounts for individual industries have been prepared by 25 of the 27 members of the European Union, as well as the United States, by the EU KLEMS project. This project was funded by the European Commission under the Sixth Framework Programme of the Research Directorate General and was completed on June 30, 2008. The methodology for constructing aggregate and industry-level measures of productivity within a consistent framework is presented in detail in Schreyer's OECD *Productivity Manual*.

Capital (K) and labor (L) inputs at the industry level are defined in an analogous manner to the measures of these inputs for the economy as a whole.

Intermediate inputs are divided among energy (E), materials (M), and services (S) in the EU KLEMS project. For the major European countries accounts are available for 72 industries covering the period 1970–2007. The EU KLEMS Growth and Productivity Accounts were compiled by a consortium of 18 research units in Europe, working in collaboration with national statistical offices. Similar systems of growth and productivity accounts are available for Australia, Canada, Japan, Korea, and the U.S.

Vanoli's objections to the production account proposed in the *New Architecture* were fully debated by the Canberra II Group, which is part of the SNA revision, and were rejected by the United National Statistical Commission in 2007. Measures of capital services in current and constant prices were incorporated into *SNA 2008*. National accounting practice is now evolving rapidly in the direction outlined in the *New Architecture* volume. Current practice is consistent with Schreyer's OECD *Productivity Manual* of 2001 and his more recent OECD Manual, *Measuring Capital*, of 2009.

The framework in Chapter 1 of the *New Architecture* volume (Jorgenson and Landefeld, 2006) provides a justification and theoretical foundation for production account estimates recommended in *SNA 2008* and the EU KLEMS Growth and Productivity Accounts. This framework was endorsed in a recent report to the U.S. Secretary of Commerce by the Advisory Committee on Measuring Innovation in the 21st Century Economy (2008). This blue ribbon panel recommended such an integrated framework "for identifying and measuring innovation in the national economy." BEA and BLS have accepted this recommendation, and Harper *et al.* (2009) have published an aggregate production account within the NIPAs that includes measures of capital and labor services in current and constant prices, as well as productivity. This is available on the BEA website and will be updated annually.

Extension of the Accounts to Nonmarket Accounting

Finally, Vanoli has concerns about the treatment of nonmarket accounts in the *New Architecture* volume. He objects to the use of market valuation based on economic theory in nonmarket satellite accounting as being too uncertain. He suggests that cost-based estimates or physical units be used instead; and he wonders whether putting these estimates in satellite accounts is appropriate. These issues were addressed in two chapters in the *New Architecture* volume: Chapter 4, "Principles of National Accounting for Nonmarket Accounts (Nordhaus, 2006), and Chapter 5, "A Framework for Nonmarket Accounting" (Abraham and Mackie, 2006)

In Chapter 4, "Principles of National Accounting for Nonmarket Accounts," William 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 Kokkelenberg (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, and use of market or near-market prices.

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 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 5, "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.

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. The bottom line in these chapters is that there are both theoretical and empirical grounds to begin the development of nonmarket accounts. They suggest, however, that the core accounts should continue to cover primarily market transactions, and further that many of the constructs and data of nonmarket accounts are too experimental to be included in the core accounts at the present time.

An important goal is to include prices, quantities, and values for nonmarket activities that can be compared with corresponding estimates for market activities. We recognize the difficulties raised by valuation, particularly for public goods. Yet, a particularly important and challenging set of nonmarket accounts is those for pollution and similar externalities. Academic research indicates that the external damages from pollution are substantial, perhaps in the range of 1–5 percent of GDP per year. While there are sectoral estimates of the damages from pollution, to date there is very little work concerned with putting these in the framework of the national accounts. This would involve measuring marginal damages and using those as "prices" in a set of nonmarket accounts. An important issue is the industrial source of pollution damages and correction of conventional value added measures to include the external damages that are not currently calculated. An intriguing question is whether some industries might actually have negative total value added when pollution damages are added to costs.

Another issue raised by Vanoli concerns the use of market prices versus consumers' surplus. This is addressed in both Chapters 4 and 5. There are three reasons why market prices or marginal valuations should be used. First, using marginal valuation makes the nonmarket accounts consistent with the market accounts. Second, using estimates of consumer surplus in the accounts gets into the "zero problem"—that consumer surplus for many items might be unbounded. Third, if analysts choose to use a total utility approach rather than a marginal valuation approach, it would require specifying a social welfare function and using that consistently across all sectors—all of which is quite a different approach from conventional or even unconventional social accounting.

Conclusion

We are very grateful to André Vanoli for the careful effort he has made to review our volume on *The New Architecture for the U.S. National Accounts*. The major topics he has discussed—methodology for integration of national accounting data, the role of industry accounts, the new production account we have proposed, and the treatment of satellite accounts—have been debated by generations of national accountants. His viewpoint largely reflects the stance of *SNA 1993* in which he played a major role. As a consequence of the publication of the *New Architecture* volume and *SNA 2008*, many long-standing controversies have been resolved and a very significant convergence of views has occurred. We are confident that this will be followed by further standardization of national accounting practice, a goal that we share with Vanoli.

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