

# **Economic Measurement: Progress and Challenges**

By

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## **I. Introduction**

The national income accounts, together with the source data which they use, form the core of our economic measurement system. The development of the concepts and measurements of national income are among the most important achievements of modern economics, replacing the older notions of national wealth of the physiocrats and mercantilists for example.

Is national income and product, confined to market activity, the appropriate fundamental concept? Yes, but we ask a lot of national income and product accounting. It is used, most importantly, to gauge economic progress. How much better off are we than our parents or grandparents? Is the economy growing adequately, slowly, rapidly in recent years? And, are we at a cyclical turning point? The information requirements, of course, will differ depending on the question. Gaps in inventory measurement may be an appropriate resource claimant to those interested in cyclical issues whereas finding, identifying and incorporating new products and quality change more rapidly may be far more significant to long-term economic growth. We also tend to have a survivor selection bias in our concern with the speed with which new ideas and concepts are

incorporated into the national accounts and other data series. Superlative indexes, hedonic regression methods for quality change, and many others were much more obvious after some years of diffusion throughout the profession than at their inculcation. So, the gap between major suggested improvements and their adoption by statistical agencies can be extensive, often decades (Diewert, 1999).

Should national accounts be extended to non-market activity? Non-market work time is perhaps the most important area for supplemental information. Natural resources and the environment are close behind (Nordhaus and Kokkenlenberg, 1999). R&D capital, environmental capital, human capital, and other intangibles, etc., are high priority items but should be dealt with in the form of satellite accounting, so I applaud the BEA's recent initiatives in this direction. I come to this conclusion for a variety of reasons, not to suggest that technological capital and human capital are less important than tangible capital. In fact, perhaps quite the opposite, they are all complementary (Boskin and Lau, 2000), but that the issues in definition, classification, and measurements are still more problematic for these items than for traditional items, and therefore I believe they should not be added directly to the NIPA.

In short, my own view is that substantial improvements can and should be made in the traditional domain of the national accounts. Improvements in the core national accounts should not be sacrificed to a proliferation of satellite accounts. In principle, we should do both, and sufficient resources should be provided to accomplish these tasks.

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## II. Progress on the National Income Accounts

The Bureau of Economic Analysis has made numerous improvements in recent years, including changing the focus from gross national product (GNP) to gross domestic product (GDP), chain weighting, using technically improved (Fisher Ideal) price and output indexes, adopting the system of national accounts (SNA) and initiating work on a variety of satellite accounts. In the postwar period, BEA has responded to the large structural changes in the economy, and the need for greater detail and frequency of estimates (BEA, 1995).

The episodic major revisions include conceptual, classification and source data improvements. The 1999 revisions, for example, made two major and numerous minor improvements. The major improvements were the reclassification of software as investment (indeed, in many industries, it is the single most important investment) and the backcasting to 1978 of the geometric mean aggregator of price quotes to reduce lower level substitution bias (e.g., as suggested by Boskin et al, 1996, 1997). These two changes by themselves increased the real GDP growth by several tenths of a percentage point in the 1990's and 0.2 percentage points over the longer period. Cumulatively, that adds up to a major increase in real GDP by 1999.

What has been the usual result of the major revisions? Do they typically find more GDP? Are revisions unbiased in the sense they are as likely to be down or up? Abstracting from the historical issue of fixed weights, what about revisions to current dollar GDP? To examine this question, I have tried to weave together data on current dollar GDP for the last quarter century (going back even further requires still more heroic assumptions). Major revisions occurred in 1976, 1980, 1985, 1991, 1996, and 1999.

Table 1 presents the pieced together data on current dollar GDP, for selected years, by revision. Consider a specific year, say 1969. The first row shows a base calculation of GDP. Reading down the rows for that year shows the successive changes to current dollar GDP from the 1976, 1980, 1985, 1991, 1996 and 1999 major revisions, to the best extent I could ascertain them. Thus, 1969 current dollar GDP increases from \$915 billion to \$985 billion, a 7.7% increase from the successive revisions.

Finding an additional 7.7% of GDP with new source data, conceptual and classification changes seems quite remarkable. More remarkable still is the fact that the data are almost never revised down. In the underlying data, there are about 160 revisions to current dollar GDP for the various years. Only one of them is negative! Why are the current dollar revisions always positive? Are we continuously expanding the borders of GDP? Are the statisticians extremely conservative? Certainly, the revisions from the advance to the preliminary to the final quarterly GDP estimates do not suffer from nearly this degree of “one-sidedness.”

Table 2 puts the size of the revisions in perspective by calculating what the proportionate effect would be on 1999 GDP, assumed for these purposes to be \$9.25 trillion. Thus, the 1969 current dollar GDP upward revision of 7.7% would be about \$708 billion in today's economy. Alternatively, 1989's current dollar GDP was revised up by \$245 billion, or 4.7% from the 1991 revision to the 1999 revision; this equates to about \$432 billion relative to 1999 GDP. Finally, the 1998 GDP is revised up \$249 billion in the 1999 revision, about 2.9%, or \$271 billion relative to 1999 GDP.

These revisions are large. They are one-sided. They are the result of much hard work by the BEA. We all agree they are major improvements. Whether there is a simple explanation for the paucity of downward revisions remains to be seen. I believe it would be quite insightful if BEA performed a more thorough analysis of this issue, going beyond the calculations in Table 1 to examine the revisions to real GDP, inflation, etc. I suspect much of the upward revision would carry through to real GDP and real GDP growth.

The BEA has an ambitious agenda for further improvements to the national accounts (see B. Moulton, 2000). It needs intellectual, organizational and financial resources to carry out this agenda, let alone to consider the far more ambitious tasks suggested by Nordhaus (2000) and myself below.

To the additional future challenges we now turn.

### **III. Improving the NIPAs**

Improving the accuracy of our core economic statistics can be quite consequential both for private decision-making and for public policy. Even small or modest errors, if they cumulate and compound, can make an immense difference from private decision making, to the federal budget, and monetary policy, to citizens' understanding of economic reality (Boskin and Jorgenson, 1997).

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We are doing a relatively better job at measuring the more traditional sectors of the economy than those that are evolving rapidly. This has profound ramifications for the allocation of statistical agency resources in the information age. A strong case could be made that funds need to be provided, or freed up from other use, for more conceptual work, more R&D so to speak, on better measures of the hard-to-measure, conceptually difficult, rapidly evolving sectors of the economy and fewer resources, if necessary, to the data on easier to measure traditional sectors of the economy.

Among the many important problems in the rapidly changing economy from the standpoint of the statistical system (although I should emphasize that almost every one of these is the flip side of a coin that produces immense benefits for the vast majority of Americans) are the following:

## **1. The growth of hard-to-measure services.**

The American economy has produced more services than goods for more than 50 years, and the percentage continues to grow. The growth of services primarily reflects the shift in demand as people become richer, live longer, and technology has enabled us to provide those services, such as greatly improved medical care. Many services are even more difficult to measure than traditional goods. Perhaps the most difficult problems revolve around health care, where we tend to count procedures or measure outlays, rather than define specific outcomes, and measure and price these accordingly. When arthroscopic surgery replaces invasive surgery, or medication replaces the need for surgery, fundamental change is going on that greatly improves the quality and lowers the real price of repairing a knee or ulcer, but these are beyond the scope of the current statistical system to measure in a timely and accurate fashion.

## **2. New Products.**

It is not just the generic growth of services, but there is a very rapid pace of introduction of new products. To be sure, many of the new products are quite similar to the old ones, and an even larger number are marketed as new when they contain virtually no substantive change at all. But the fact is that many important new products are introduced not only every year, but every month. To take a few examples in the last couple of decades, cellular telephone service has freed up some segments of the population from spatial confines; working mothers can keep in touch with an aged parent

or a sick child as they commute to work, etc. VCRs have greatly enhanced the range of options for movie viewing and shifting entertainment and informational sources to more closely accommodate the time schedules of different households; microwave ovens have greatly assisted in reducing the time necessary to prepare meals which has been enormously important, especially in an age when the fraction of two-earner couples has risen substantially; the personal computer has revolutionized many business and household processes and procedures; the Internet provides new forms of communication, such as email, for example, for parents to keep in touch with children away at college, etc. We do not do a very good job of identifying, measuring and estimating the value of and pricing new products as they enter into our economy. It is quite likely that a substantial fraction of the improvements in standards of living have come by the generation of new products over time, not just by producing and consuming more of what we always produced and consumed. Otherwise, we would all be spending radically higher fractions of our incomes on bread and potatoes. Obviously, new products are not new to the last decade or two, nor to the information age. But it appears that the introduction of new products has become a steady, if not perfectly predictable, feature of the information age and new ways to locate them, estimate their value and price them must be a major priority for our statistical system.

### **3. Quality Improvements.**

Some products improve, others may deteriorate, but on balance, the overwhelming bulk of products experiences either quality improvements or stays the same. Improvements in



dimensions such as energy efficiency, safety, durability, etc. are the hallmark of a large number of products, perhaps most importantly in consumer electronics (Gordon, 1990). These improvements appear to be systematically underreported in our statistical system despite the attempts of our statisticians to keep up with the explosive pace of quality change (Gordon and Griliches, 1997).

#### **4. Technology and Innovation.**

Much of the new products and quality change comes from technology and innovation and the technology moves so rapidly that in some sectors of the economy it is impossible for our statistical agencies, which are geared to decadal revisions, biennial updates, etc., fully to keep up. If it is true that this is a source of a large fraction of improvements in standards of living in the United States, far greater attention needs to be paid to this sector. Correspondingly, the technology and innovation may obsolesce not only the existing products we are counting or pricing, but also some of the methods we use to collect information on them. The technology and innovation may mean that products are distributed in a way that we do not measure well, such as Internet commerce. And the technology may ultimately provide the opportunity to collect more and better data inexpensively, e.g., direct data on actual transactions.

The transition toward a knowledge-based economy, with knowledge, particularly scientific and technological, playing a larger role throughout the economy is a hallmark of the U.S. economy. Simultaneously, economists have focused increasingly on the role

of technology, human capital, R&D, innovation and ideas in understanding contemporary economic growth. The measurements of these factors and activities are incomplete, at times primitive, at best piecemeal. Renewed attention must be placed on improving science and technology indicators, human capital flows and stocks, and the like.

## **5. Time use.**

The changing time use of households is also enormously important. We have episodic survey information on this, but it is clear that how, why and when households spend their time doing what is of enormous importance in evaluating economic performance. The amount of hours worked, child rearing, shopping, etc., changes within the economic environment. For example, the widespread changes in retailing in recent years to malls and discount outlets leads to lower prices, and perhaps also some decline in correlative services. Much more, more frequent, and better data on household uses of time are enormously important. This is especially important with respect to evaluating healthcare outcomes. A more expensive procedure that saves a week in the hospital, three weeks lost work, and a year of rehabilitation needs to be evaluated properly. Equally important is expanding the information on worker mobility and job transition.

## **6. The Growth of International Trade.**

The growth and changing mix of international trade are also important. The foreign trade penetration or average propensity to export or import of the American economy has

doubled in recent decades. This has been a source of growth for the United States and the world, as trade is a large positive sum game. But the decline of tariffs and non-tariff barriers has decreased the availability of statistics that were more readily available when international trade was more heavily regulated.

## **7. New firms.**

One of the great successes of the American economy is an environment that generates many new firms and jobs. The new firms are important not only because some of them become large and produce important products and employment opportunities, but because they also provide competition for existing firms, thereby forcing existing firms to innovate and lower costs so that consumers benefit from lower prices. Our information about the “birth and death” of firms is spotty at best.

## **8. Financial Innovation and Changing Payment Methods.**

Financial innovation and changing methods of payment make it much harder to track transactions in the economy. The Internet was mentioned above, and as Internet commerce becomes widespread, this will be a strong example, but there are numerous other examples.

## **9. Changes in the Organization of Production and Distribution.**

The changing organization of production and distribution, especially with respect to time, space and required physical inputs, make measurement more difficult. People are not only spared the necessity of physically having to go to, say, a bank or other financial institution to conduct financial transactions, but the same is increasingly true of other forms of economic activity and these are much more likely to fall through the cracks in our measurement system.

### **10. Capital Accounts.**

The major improvements in capital accounts made by BEA over the years have been quite helpful. In addition to the satellite accounts underway or suggested above for R&D capital, human capital, etc., the accounts for reproducible capital could be improved in several directions. We should move beyond simple depreciation as the cost of using capital to include interest as a cost of using durable capital inputs and estimate capital gains and losses as well. There are serious issues of implementation such as ex ante expected vs. ex post actual capital gains, the depreciation rate to use in the user cost formula, the appropriate interest rate, etc.

### **11. Demography.**

We all learn the first week of Economics 1 that demography is the most important foundation of the economy. Demography is endemic in the national accounts, both explicitly and implicitly. While demographic changes are not likely to be a source of

interest or concern to those interested in the NIPA for short-run cyclical information, they are among the most important influences on longer term trends. The trend to much earlier retirement evident until the mid-1980's, despite large increases in the life expectancy of the elderly; shorter work weeks (again until recently); changes in family size and composition; higher median ages; and changes in female labor force participation are but some of the trends that must be analyzed to convert measured GDP into a more consistent measure of material well-being.

Demography is buried deeply into the source data as well. For example, construction of the disaggregated price indexes for consumption relies on episodic household surveys to obtain expenditures for representative households, but the representative household is not independent of these demographic trends.

It would be helpful if a supplemental analysis was provided periodically along with the NIPA to help elaborate these issues, perhaps done jointly with the Census Bureau, and including equivalence scales and dependency ratios.

#### **IV. Conclusion**

Progress in any and all of these areas will be neither quick nor easy. It will demand intellectual, organizational and financial resources. Whether improvements in the areas listed above will also lead systematically to an expansion of measured GDP, as have previous major revisions, remains to be seen. The economic and statistics professions

need to broadly support the efforts at BEA, BLS and the other statistical agencies. I have no doubt that the social benefit cost ratio from the improved quality of economic statistics is likely to be extremely high. First, because the cost to make sensible changes is likely to be quite modest, perhaps negligible in the long term. And, second, because a myriad of social and private benefits will flow from a consistently more accurate and timely set of economic statistics.

[Add TABLES]

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