Federal Reserve Bank of Cleveland

Productivity Measures and the "New Economy"

by John B. Carlson and Mark E. Schweitzer

[T]wo broad trends, globalization and information technology, are undermining the old order, forcing business to restructure. ... These trends can combine in powerful ways to raise Americans' standard of living, create jobs, spur entrepreneurial effort—and do all this without boosting inflation. To the believers in the New Economy, we have here the magic bullet—a way to return to the high-growth, low-inflation conditions of the 1950s and 1960s. Forget 2% real growth. We're talking 3%, or even 4%.[1]

Stephen B. Shepard, editor-in-chief, *Business Week*

Optimism abounds. Just look at indicators like consumer sentiment and the stock market. The good feelings partly reflect the persistent underlying strength of the U.S. economy, which surprised many observers by expanding almost 4 percent in the last 12 months. Over the past two years, the economy grew at an average annual rate of more than 3.5 percent, clear evidence for Stephen Shepard that a "New Economy" is here. No economy, however, can sustain a more rapid expansion than this unless its workforce continues to grow quickly or its workers become increasingly productive. Given that employment is expected to grow around 1 percent, Shepard's view implies that trend productivity growth must more than double the 1.2 percent average rate it posted during the past 25 years.[2]

The New Economy's detractors, though surprised by the recent surge in economic activity, point to measures of productivity—most often labor productivity, computed as the ratio of real output to hours worked.[3] They note that over the recent expansion, labor productivity has not grown noticeably faster than its post-1973 trend rate. Meanwhile, advocates like Mr. Shepard counter that our ways of measuring productivity understate its true gains.

It is quite likely that productivity has been and continues to be understated. But so what? If the point is to explain the unusual combination of low inflation and high growth, then an appeal to mismeasured productivity is no help at all. Correcting the measurement problem just means that inflation is even lower and growth even higher.[4]

The real question at hand is whether mismeasurement has masked an increase in trend output growth.[5] To answer it, we must establish that measurement difficulties are generating an ever larger bias over time. This *Economic Commentary* carefully develops several possible explanations for the underestimation of productivity growth in order to evaluate the effects of each on output and inflation.

Measuring Productivity

Although the concept of labor productivity (real output per hour of work) is simple, the published number is the result of some challenging calculations.[6] Measuring real output requires computing both the total dollar output in the domestic economy (nominal GDP) and a corresponding price index to convert the nominal measure to a real (that is, inflation-adjusted) value.[7]

The U.S. economy's extraordinary performance in recent years has led many observers to claim we are witnessing a "New Economy," in which trend output growth has accelerated to a much higher rate than any we have experienced over the past quarter century. They also argue that measurement problems have masked the signs of productivity's acceleration. We find scant evidence to support such claims.

Conventional measures of *nominal* GDP try to sum the value added of all businesses and households, a calculation that requires collecting highly detailed information on diverse production processes. *Real* GDP is computed by dividing nominal GDP by prices, which are generally collected using survey methods.

Productivity can be calculated for the aggregate economy or for particular sectors or industries. We have selected nonfarm business sector productivity, the most widely cited measure. Earlier in this decade, much attention was focused on the fact that this measure's growth rate declined sometime around 1973. Between the second quarter of 1960 and the third quarter of 1973, nonfarm business productivity increased at an annual rate of 3.0 percent. Since then, the same measure has increased at an average annual rate of 1.1 percent. A large body of literature, some of it relevant to the current debate, has tried to assess how far mismeasurement could account for the slowdown.[8]

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Mismeasuring Nominal Output

The first possible source of error we consider is the official measure of nominal output, gross domestic product. GDP is derived by summing the dollar value of expenditures on consumption, investment, government purchases, and net export values. It is conceivable that some nominal expenditures are not recorded.

As a cross-check, we can compute GDP by adding up measured income, including rents, interest payments, and dividends. These data are obtained from alternative sources, including the IRS. In fact, the Commerce Department's Bureau of Economic Activity (BEA) calculates both expenditure-based and income-based measures. Though it designates the expenditure-based measure as the official one, the BEA publishes the discrepancy between the two (figure 1).

As the recent swing in the statistical discrepancy shows, the official, expenditure-based measure has been increasing less rapidly in the 1990s. The implications for nonfarm business productivity are illustrated in figure 2. Since the last business-cycle peak, the income-based measure has expanded about 0.2 percent faster annually than the official one.

While many consider this difference significant, it is important to remember that the income-based measure itself is not perfect. The BEA, for example, must estimate unreported income. As new data become available, both the income and the product accounts are revised, which typically reduces the discrepancy. Thus, it is likely that the early income-based measure overstates true output. For example, with scanty information on which side of the accounts is more accurate, the Council of Economic Advisers assumes that nominal output mismeasurement understates productivity growth by half the difference implied by the discrepancy (0.1 percent by our calculation).

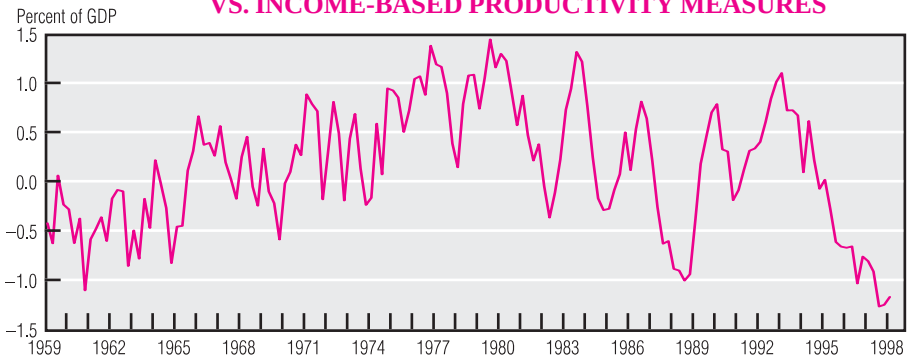
Mismeasuring Prices

Although most economists appreciate the difficulties associated with measuring prices, their estimates of the degree of mismeasurement vary widely. A special commission on the consumer price index (CPI) was formed in 1995 to evaluate the nation's price statistics. It concluded that the change in the CPI overstates the cost of living by 1.1 percentage points per year (with a plausible range of 0.8 to 1.6 percentage points). The commission also recommended a number of procedural changes, some of which were already in the works.[9]

Since 1995, the Bureau of Labor Statistics has made several methodological changes to reduce measurement bias. Table 1 reports the implication of past and proposed changes to improve the accuracy of the CPI. Significantly, the percentage-point effects are not of the same magnitude for changes in the CPI and in productivity. The potential for mismeasuring the CPI has garnered the most attention, but the GDP price index, which is used to calculate nonfarm productivity, is based on much the same underlying data as the CPI and so is subject to some of the same criticisms. Generally, improvements that reduce the measured change in the CPI will raise the measured growth rate of real GDP (and hence productivity) to a lesser extent. The reasons for this are, first, that procedures for deflating nominal GDP may already incorporate new methods; and, second, that most investment goods are not affected by changes in the CPI.

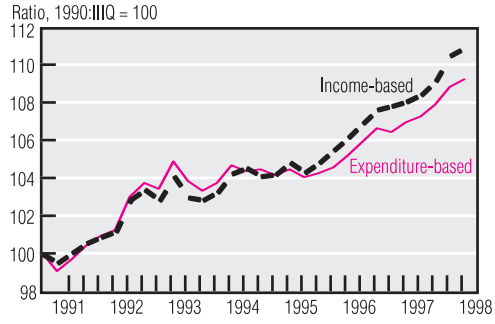
The new methods reduce CPI "bias" by more than two-thirds of a percentage point, but reduce productivity "bias" by less than one-quarter of a percentage point. These estimates suggest that methodological improvements account for very little of the increase in measured productivity over the past two years. Although the CPI bias may be substantial, few of its sources could account for an increasing bias in measured productivity. Rather, as table 1 shows, efforts to eliminate the sources of price bias have already reduced the bias in productivity measurement.[10]

FIGURE 1 STATISTICAL DISCREPANCY; EXPENDITURE-BASED VS. INCOME-BASED PRODUCTIVITY MEASURES



SOURCE: U.S. Department of Commerce, Bureau of Economic Statistics.

FIGURE 2 ALTERNATIVE PRODUCTIVITY MEASURES



SOURCES: U.S. Department of Commerce, Bureau of Economic Statistics; and U.S. Department of Labor, Bureau of Labor Statistics.

Why does this matter? We compare economic statistics to their historical patterns to establish what levels we should expect. Statements that we have achieved a new economic order imply that our current status has *improved*, yet even a very large bias would do nothing to support this claim (if it has always been there). Eliminating the biases in national price indexes will raise productivity estimates moderately over the coming years. However, it is doubtful that these biases have hidden the rise of a New Economy: The fact that problems have been addressed over the years suggests that today's bias is probably no bigger than in earlier periods. Indeed, it may even be smaller.

The Unmeasurable Sector

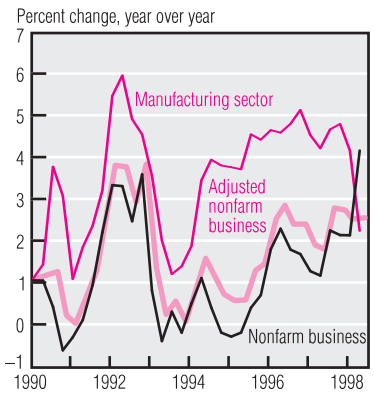
Alternatively, the issue of correct price measurement can be viewed as a problem concentrated in the service sector. The key industries cited in many accounts of the New Economy are those involved in information technology, primarily in the service sector. Unfortunately, it is inherently difficult to meas-

TABLE 1 ESTIMATED EFFECTS OF CHANGES IN CPI MEASUREMENT METHOD

Change in method	Year introduced	Percentage point effect on percent change in CPI	Percentage point effect on percent change in Productivity
Pre-1998		**–0.28**	**0.06**
Generic prescription drugs	1995	–0.01	0.0
New food products	1995	–0.04	0.0
Owner's equivalent rent formula	1995	–0.10	0.0
Rent composite estimator	1995	0.03	0.0
New products	1996	–0.10	0.6
Hospital services index	1997	–0.06	0.0
1998 and after		**–0.41**	**0.14**
Personal computer hedonics	1998	–0.06	0.00
Updated market basket	1998	–0.15	0.02
Geometric means	1999	–0.15	0.09
Rotation of items	1999	–0.05	0.03
Total		**–0.69**	**0.20**

SOURCES: President's Council of Economic Advisers; U.S. Department of Labor, Bureau of Labor Statistics; and Federal Reserve Bank of Cleveland.

FIGURE 3 PRODUCTIVITY GROWTH



SOURCES: U.S. Department of Labor, Bureau of Labor Statistics; and authors' calculations.

ure changes in quality—and hence consistent price changes—in this sector.

The service producers' share of total employment has risen from 60 percent in 1950 to 80 percent today. Even since 1990, the share has gone up 3 percentage points. This development might imply that productivity was increasingly understated over time as the least measurable producers came to represent a larger and larger share of the economy.[11]

To assess the plausibility of applying this explanation to the current business cycle, we calculate a hypothetical measure of productivity which assumes that manufacturing—a well-measured sector—maintains its share of output. Figure 3 compares this calculation with nonfarm business productivity since the second quarter of 1990. The hypothetical measure increases 0.46 percentage point faster at an average annual rate than that of nonfarm business productivity.

If anything, our hypothetical example sets an upper bound on the potential contribution of an increasingly unmeasurable gap. It assumes that during an investment boom, productivity growth in the more expansive service sector is as high as that in manufacturing. There are reasons to suspect that manufacturing's productivity growth may have been exceptional, given that sector's booming capital expenditures.[12] Thus, our estimate suggests that more precise measures of the service sector would add no more than half a percent to productivity growth. Though this is substantial, it won't generate a 4 percent trend growth rate. Note that the issue remains the difficulty of measuring price appropriately and is thus not independent of general price mismeasurement estimates.

Conclusion

The performance of the U.S. economy in recent years has been extraordinary. Since 1995 we have witnessed rapid output growth, declining inflation, falling unemployment, and record profit growth. This favorable constellation of events has convinced some observers that structural changes like globalization and information technology developments have created a new era in which we can expect a permanently higher trajectory for U.S. output growth. To be sure, the recent stellar performance was not widely anticipated, which suggests that the received wisdom about the potential economic growth rate may have been too pessimistic. Nevertheless, when we look at productivity growth for the current expansion to date, things do not look so exceptional.

Some advocates argue that the mismeasurement of productivity has masked the arrival of the New Economy. Our assessment, however, does not suggest that improved measures would have shown productivity growth accelerating much more sharply, either recently or in the future. Thus, we conclude that the mismeasurement hypothesis is a weak reed to lean on when arguing that the economy is on a permanently higher path of growth.

By the same token, our assessment does not indicate that the present favorable conditions are about to end. Although financial crises in Asia may cloud the horizon, the domestic economy continues to be robust.[13] However, if we are truly experiencing a New Economy, then productivity should accelerate on a *consistently measured* basis. Whether this will happen remains to be seen.

Footnotes

1. See Stephen B. Shepard, "The New Economy: What It Really Means," *Business Week*, November 17, 1997, p. 39.

2. This figure is based on an assumed annual rate of employment growth (1.25 percent) consistent with long-run population growth and labor-force participation rates.

3. The points made in this *Economic Commentary* could also be demonstrated in terms of total factor productivity, but we chose to focus on labor productivity, a less complicated measure.

4. The issue has been compared to measuring a car's speed with a broken speedometer (see Paul Krugman, "Speed Trap: The Fuzzy Logic of the 'New Economy,'" *Slate Magazine* at www.slate.com/Dismal/97-12-18/dismal.asp [posted December, 18, 1997]). When you find that your speedometer is understating velocity by, say, 10 miles an hour, does this mean that your car suddenly accelerates? Clearly not, though your *perception* of the car's speed may have changed. A fixed, uncorrected degree of productivity measurement error cannot help explain today's good economic news, which is already incorporated in today's productivity

estimate. Moreover, only the change in the measurement error is relevant for comparisons to historical periods that very likely were also mismeasured.

5. It is unclear whether projections by New Economy advocates are based on measurement catching up with reality or an underlying but unmeasurable expansion. Either way, accelerating growth camouflaged by poor measurement is the argument's linchpin.

6. There's relatively little controversy about measuring total employment or average hours. Each series is compiled from at least two independent surveys in a way that allows cross-checking for accuracy. The Bureau of Labor Statistics (BLS) collects hours data from a sample of business establishments (Current Employment Statistics Survey) and a sample of households (Current Population Survey). Most of the employment and hours information used in the productivity measures is derived from the establishment survey, but the BLS often compares the two surveys' results.

7. The published nonfarm business productivity number excludes several hard-to-measure sectors of the economy that are included in the official GDP tally.

8. See for example, Zvi Griliches, "Productivity, R&D, and the Data Constraint," *American Economic Review*, vol. 84, no. 1 (March 1994), pp. 1–23.

9. The Commission's findings are reported in the May 1997 issue of the *American Economic Review.* Others have arrived at lower (and a few at higher) estimates. See, for example, Michael F. Bryan and Stephen G. Cecchetti, "The CPI as a Measure of Inflation," Federal Reserve Bank of Cleveland, *Economic Review*, vol. 29, no. 4 (Quarter 4 1993), pp. 15–24.

10. Bryan and Cecchetti (see footnote 9) estimate that CPI bias has declined substantially since 1981.

11. Griliches (see footnote 8) originated this argument to explain the productivity slowdown after 1973. See also Daniel E. Sichel, "The Productivity Slowdown: Is a Growing Unmeasurable Sector the Culprit?" *Review of Economics and Statistics*, vol. 79, no. 3 (August 1997), pp. 367–9. Sichel estimates that only about 0.23 percent of the productivity slowdown between 1973 and 1990 can be attributed to this phenomenon.

12. Note that our calculation includes all services, not simply those focused on information technologies. It has frequently been remarked that for many service-sector workers, such as barbers and classical musicians, technology yields few productivity gains.

13. Even though the current business cycle has not shown exceptional rates of productivity growth, its endurance is remarkable. For a comparison, see Mark E. Schweitzer, "Productivity Gains during Business Cycles: What's Normal?" Federal Reserve Bank of Cleveland, *Economic Commentary,* forthcoming.

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