

# Preview of the Comprehensive Revision of the National Income and Product Accounts: BEA's New Featured Measures of Output and Prices

*As previously announced, BEA plans to release the results of its next comprehensive revision of the national income and product accounts (NIPA's) at the end of 1995. This revision will be the tenth of its kind; the last such revision was released in December 1991. Comprehensive revisions differ from annual NIPA revisions because of the scope of the changes incorporated and because of the number of years subject to revision. This year's comprehensive revision will include the elements of the annual revision covering 1992-94, which would usually have been published in this issue.*

*Major improvements that will be incorporated in this comprehensive revision include the following: The introduction of new featured measures of real output and prices, the implementation of an improved empirical basis for the estimates of depreciation and capital stocks, and the treatment of government purchases of structures and equipment as investment. As in the past, the revised estimates will also reflect other definitional and statistical changes, including the incorporation of newly available source data—such as the 1987 benchmark input-output tables, data from the 1992 Economic Censuses, and several annual surveys for 1993 and 1994—and of improved estimating methodologies.*

*This article discusses BEA's new featured measures of real output and prices. Forthcoming SURVEY OF CURRENT BUSINESS articles will address the other changes to be introduced in the comprehensive revision.*

*It is important to note that the estimates that result from the comprehensive NIPA revision will reflect the incorporation of new and revised source data and improved estimating methodologies, which mainly affect the current-dollar estimates, as well as the change in methodology used to calculate the featured measures of real output and prices.*

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WHEN BEA releases the results of its upcoming comprehensive, or benchmark, revision of the national income and product accounts (NIPA's) at the end of this year, the featured measures of real output and prices will be calculated using chain-type annual-weighted indexes. At present, the featured measures are calculated using fixed-weighted indexes, which are usually updated at the time of a comprehensive revision. The change in the featured measures recognizes the need in estimating real GDP and prices to use weights that are appropriate for the specific periods being measured.

Changes in the new featured measures of output and prices will be calculated using the weights of adjacent years. These annual changes are "chained" (multiplied) together to form a time series that allows for the effects of changes in relative prices and changes in the composition of output over time. In contrast, fixed-weighted

measures are calculated with a single set of weights over the entire time period. Use of fixed-weighted measures of real GDP and prices for periods other than those close to the base period results in a "substitution bias" that causes an overstatement of growth for periods after the base year and an understatement of growth for periods before the base year. For example, in the currently featured fixed-weighted measure of real GDP, which is based on 1987 prices:

- Real GDP growth is overstated by 0.7 percentage point in the second quarter of 1995: Growth was 0.5 percent according to the fixed-1987-weighted measure, compared with a decline of 0.2 percent according to BEA's alternative chain-type measure, which provides unbiased estimates of growth.
- During the current expansion, average annual real GDP growth is overstated by 0.5 per-

centage point; in past expansions, it is understated by about 0.5 percentage point.

BEA'S new featured measures will eliminate the inconvenience and confusion associated with BEA'S past practice of updating the weight and base periods—and thus rewriting economic history—about every 5 years. By minimizing substitution bias, the new measures of real GDP growth will also improve analyses of issues such as productivity, returns to investment, and the long-term growth potential for the econ-

omy. For example, projections of long-term economic growth based on the new measures will avoid the consistent overestimation of output inherent in forecasts based on out-of-date fixed-weighted measures. Likewise, analyses of long-term growth trends and changes in these trends will be free of the distortions caused by fixed-weighted measures.

The measures that BEA will feature are similar to the chain-type annual-weighted measures that BEA has been publishing in the SURVEY OF

### Note on Calculating Output and Price Indexes

Estimation of most components of gross domestic product (GDP) consists of two broad computational stages: (1) Estimation of current-dollar values, and (2) separation of the current-dollar values into a price-change element and a quantity-change element.<sup>1</sup>

In the first step, the current market values of spending for each component of GDP are determined from basic source data. That is, consumer spending on apples and oranges, on small appliances, on movie admissions, and on all of the other components of personal consumer expenditures are estimated using a variety of source data, such as retail sales data from the Bureau of the Census. These calculations are usually referred to as the "current-dollar" value of a component. Current-dollar values of all the GDP components always "add up" to current-dollar GDP.

Though many technical problems arise in computing current-dollar GDP and its components, it is conceptually straightforward: Current-dollar GDP is a measure of what is actually spent in the economy in a particular period. Measuring the change in current-dollar GDP is equally straightforward, conceptually, because it is, the actual change in spending that occurs in the economy between two periods.

In the second step, the period-to-period change in current-dollar GDP, or in the current-dollar value of a GDP component, is separated into a price-change element and a quantity-change element. For example, a 10-percent increase in expenditures on oranges could result from (1) a 10-percent increase in the number of oranges purchased with no change in the price of oranges, (2) a 10-percent increase in the price of oranges with no change in the number purchased, or (3) some combination of price and quantity increase totaling 10 percent. The quantity-change element in a GDP component, or in GDP itself, has in the past usually been referred to as the "constant-dollar" increase in the component, or sometimes as the change in the "real" component of GDP or in "real" GDP. Calculation of the quantity-change component is usually carried out by a process known as "deflation."<sup>2</sup>

Though measuring the change in current-dollar GDP is conceptually straightforward, partitioning the change into price- and quantity-change elements is not. This partitioning is an analytic step, because aggregate price change and aggregate quantity change cannot be observed directly in the economy. Instead, aggregate price

and quantity changes must be calculated, and the calculation method is determined by analytic requirements.

In particular, it is important to recognize that real GDP is an analytic concept. Despite the name, real GDP is not "real" in the sense that it can, even in principle, be observed or collected directly, in the same sense that current-dollar GDP can in principle be observed or collected as the sum of actual spending on final goods and services in the economy. Quantities of apples and oranges can in principle be collected, but they cannot be added to obtain the total quantity of "fruit" output in the economy.

For this reason, real GDP must be computed by valuing the various components of GDP, using the prices of some period or periods. Real GDP is simply an index number—a computation, like the consumer price index or the price index for GDP, except that real GDP is an index number that measures *quantities*. Its computation cannot be determined by reference, or by analogy, to the methods used for the construction of current-dollar GDP.

In the past, measures of real GDP change were calculated by fixing the valuations of GDP components in some period (currently, the year 1987) and holding those valuations fixed over all years and quarters for which real GDP estimates are produced. This approach can be illustrated using a hypothetical two-commodity economy (exhibit 1) with total current-dollar spending of \$5.00 in year 1 and \$9.00 in year 2. If we take year 1 to be the "base" (or "weighting" or "valuation") period, then the prices in year 1 are used to value the quantities in both years and the changes in quantities from year 1 to year 2. This is shown in panel A. In the exhibit, the consumption of oranges fell in year 2 because the price of oranges rose rapidly, while the consumption of apples, whose price rose less rapidly, increased. With this calculation, the weighted-quantity-change measure for "fruit" increased by 20 percent.

There is no reason why year 1 must always be chosen as the weighting period. In the past, BEA has periodically shifted its weighting period—before December 1991, 1982 was used as the weighting year for measuring real GDP, and before December 1985, 1972 was the weighting year. Panel B shows what happens to the quantity measure if we shift the valuation, or weight year, to year 2.

If year 2 is used for valuation, the quantities in year 1 and in year 2 are calculated as before, but both sets of quantities are valued in year 2 prices, rather than year 1 prices. Using year 2 prices results in a 6-percent increase in quantities, substantially lower than the 20-percent increase that resulted from using year 1 prices.

This example illustrates a regularity that has often been observed in the calculation of real GDP. Moving the weighting period forward

1. There are a small number of exceptions to the description in the following sections, notably where extrapolators must be used because spending data are not available on a current basis. See "Annual Revision of the U.S. National Income and Product Accounts," SURVEY OF CURRENT BUSINESS 74 (July 1994): 26–27.

2. The quantity-change measure for GDP is probably the most widely used number from the NIPAS. For example, the first line of the monthly GDP press release reports the percentage change in real GDP.

CURRENT BUSINESS since 1992. These measures, which are calculated independently for each aggregate and detailed component, are currently expressed as index numbers and as percent changes. To facilitate sectoral, trend, and current-period analyses, BEA will expand presentations of the estimates to include contributions of changes in major components to the growth of real GDP and dollar-denominated series that are calculated from the featured output indexes.

The remainder of this article provides additional information about the substitution bias in

measures of real GDP and about the availability of the new measures. The accompanying note discusses the concepts and methods used in calculating output and price indexes.

**Substitution bias in real GDP**

In recent years, rapid changes in the composition of output and in relative prices have brought into question the longstanding methods that underlie real, or constant-dollar, GDP and other NIPA estimates. The currently featured constant-

**Note on Calculating Output and Price Indexes—Continued**

*Text continues from page 32.*

tends to reduce the quantity-change measure, because in general the quantities that have increased the most are those whose prices have increased, relatively, the least. To put it another way, the use of a more recent period of valuation tends to put a lower valuation on the quantities that have increased most rapidly. Thus, measuring the change in real GDP is subject to “weighting effects,” because the measure is sensitive to the valuation period, the period chosen for the weights in the calculating formula.

Which calculation, panel A or panel B, is “correct”? There is no single answer to this question, because each year’s prices are equally valid for valuing the changes in quantities. A common sense approach to the weighting problem is to take an average of the panel

**Exhibit 1**

	Year 1		
	Expenditures	Quantity	Price
Oranges .....	\$3.00	30	10¢
Apples.....	\$2.00	10	20¢
<b>Total fruit.....</b>	<b>\$5.00</b>		

	Year 2		
	Expenditures	Quantity	Price
Oranges .....	\$4.00	20	20¢
Apples.....	\$5.00	20	25¢
<b>Total fruit.....</b>	<b>\$9.00</b>		

Panel A. Year 1 weighted quantity change measure for fruit  
 =  $[(20 \times 10¢) + (20 \times 20¢)] \div [(30 \times 10¢) + (10 \times 20¢)]$   
 = Hypothetical expenditure on fruit in year 2 using year 1 prices, divided by actual expenditure on fruit in year 1  
 =  $\$6.00 / \$5.00 = 1.20$

Panel B. Year 2 weighted quantity change measure for fruit  
 =  $[(20 \times 20¢) + (20 \times 25¢)] \div [(30 \times 20¢) + (10 \times 25¢)]$   
 = Actual expenditure on fruit in year 2, divided by hypothetical expenditure on fruit in year 1 using year 2 prices  
 =  $\$9.00 / \$8.50 = 1.06$

A and panel B calculations. Economic theory indicates that taking a geometric mean of the two measures is the preferred form of averaging. The geometric mean can be calculated by multiplying the panel A and panel B results together and then taking the square root—that is:  $\sqrt{1.20 \times 1.06} = 1.13$ . In the index number literature, this geometric average calculation of quantities is known as the “Fisher Ideal” index number.

BEA has adopted geometric averaging as the new method for calculating real GDP and for calculating measures of price change in GDP and its components. This method is presently employed in calculating the “chain-type annual-weighted” measures in NIPA tables 7.1–7.3 and 8.1.

Why is BEA changing its calculation method for real GDP? What are the advantages of the new calculating method over the old one? The main advantage of the old method is its simplicity: Only one set of valuations is necessary for calculating GDP for all periods. In the past, BEA has used one set of valuations (currently, those for 1987) to construct real GDP measures from the most recent period all the way back to 1929.

In addition, experience shows that the use of a single weighting period generally produces accurate measures of GDP as long as the periods being compared are close to the weighting period. The reason is that changes in relative valuations are usually small for periods close to the weighting period, so that “weighting” effects are also small.

The main disadvantage of using a single valuation period for calculating real GDP is that the measure becomes increasingly subject to “weighting effects” as the time between weighting, or valuation, period and the current period lengthens.

BEA’s new method of calculating real GDP has another advantage. It permits shifting the valuations on a year-by-year basis, which means that long-term growth, past business cycles, and productivity are measured in the valuations that are appropriate to the period being studied. For example, in the present 1987-weight calculating method, change in output in both the 1980–81 recession and the 1974–75 recession is measured in 1987 prices. In the new method, output change in these recessions will be measured in the prices that prevailed at that time—that is, the 1981–82 recession will be measured in prices of the early 1980’s, and the 1974–75 recession, in the prices of the mid-1970’s. Experience has shown that applying a single, fixed valuation to historical time periods tends to statistically dampen economic recessions and recoveries and also distorts the picture of long-term economic growth. Cyclical fluctuations in the economy are best measured using valuations that are appropriate to the period being studied rather than valuations from some distant period.

dollar estimates are expressed in 1987 dollars; that is, they value each component at its price in the base year, currently 1987. Use of the same fixed price weights over all time periods provides a set of indexes that convert to dollar-denominated measures in which the components add up precisely to the totals. BEA has featured such measures partly because many users consider this additive property to be useful; for example, it facilitates analysis of contributions to growth and provides flexibility in aggregating the detailed components. (It also facilitates verification of calculations using these detailed components.)

Within the index number literature, it has been long recognized that output measures that use fixed price weights of a single period tend to misstate growth as one moves further from the base period. This tendency, often called substitution bias, reflects the fact that the commodities for which output grows rapidly tend to be those for which prices increase less than average or decline. Thus, when real GDP is recalculated using more recent price weights, the commodities with strong output growth generally receive less weight, and growth in the aggregate measure is reduced. These recalculations provide more accurate measures of growth in current periods, because the weights more closely reflect the prices of the economy in current periods; for earlier periods, however, the recalculations provide less accurate measures of growth, because the weights are even further away from the prices appropriate to those periods.

Until recently, this bias (and the associated revisions in growth rates due to weight and base-year shifts) was small enough to be safely ignored. Two developments contributed to the need to investigate alternatives. First, beginning in the 1970's, changes in the prices and quantities of the energy and food components of GDP were large enough in certain periods for the choice of price weights to significantly affect the measurement of change in real GDP. Second, computer prices declined at an average annual rate of 17 percent during 1982–87, while computer output increased at a 34-percent rate; as a result, computers caused significant revisions in the GDP estimates when the weights and base period were updated. For example, when BEA shifted the weights and base period from 1982 to 1987 as part of the 1991 comprehensive NIPA revision, computers contributed significantly to the downward revision of 0.2 percentage point in the annual growth rate of real GDP for 1977–90.

In the late 1980's, BEA initiated a research program to investigate alternative measures of output and prices.<sup>1</sup> In April 1992, BEA published two alternative measures of annual change in real GDP for 1959–90, and in March 1993, BEA began publishing them for quarterly changes. The two alternative measures are not based on the price weights of a single year; rather, they are indexes that account for changes in relative prices over the periods for which growth rates are computed. In the chain-type annual-weighted quantity index, the weights are from adjacent years; in the benchmark-years-weighted quantity index, the weights are from adjacent benchmark years—about 5-year intervals.<sup>2</sup>

Comparisons of BEA's alternative chain-type annual-weighted real GDP measure with BEA's currently featured fixed-1987-weighted measure indicate the degree of substitution bias in the fixed-weighted measure (chart 1).<sup>3</sup>

1. For a discussion of this research, see the following SURVEY articles: Allan H. Young, "Alternative Measures of Change in Real Output and Prices, Quarterly Estimates for 1959–92" in March 1993; Allan H. Young, "Alternative Measures of Change in Real Output and Prices" in April 1992; Jack E. Triplett, "Economic Theory and BEA's Alternative Quantity and Price Indexes" in April 1992; and Allan H. Young, "Alternative Measures of Real GNP" in April 1989.

2. For recent periods, modified procedures are used to calculate the alternative measures, because annual weights for the most recent year are not available. For the currently published chain-type measure, the estimates beginning with the third quarter of 1993 are calculated using 1993 weights—that is, they are calculated using a fixed-1993-weight formula. For the currently published benchmark-years measure, the estimates beginning with the third quarter of 1992 are calculated using weights for 1992 and 1993. For additional details, see pages 32–33 of the March 1993 SURVEY.

3. For recent periods, the substitution bias in prices is smaller than that in output. For example, the rate of increase in prices—as measured by the fixed-1987-weighted measure of gross domestic purchases prices—is overstated by 0.2 percentage point in the second quarter of 1995, compared with the 0.7-percentage-point overstatement in real GDP. In 1993 and 1994, the rate of increase in prices is also overstated by an average of 0.2 percentage point.

CHART 1

Annual Change in Real GDP:  
Comparison of Alternative Measures

Percent



U.S. Department of Commerce, Bureau of Economic Analysis

- For 1959–87, BEA's featured measure of annual growth in real GDP is understated by an average of 0.3 percentage point.
- Between 1987 and 1992, there is no significant substitution bias evident in BEA's featured measure of real GDP growth.
- In 1993 and 1994, BEA's featured measure of real GDP growth is overstated by an average of 0.6 percentage point.

For business cycle analysis, use of a chain-type index presents a more accurate picture of the strength of expansions and the depth of contractions. It also ends what has appeared to have been the "gradual smoothing" of changes in these periods that resulted largely from the lower rate of growth attributable to successive updating of the base period in the fixed-weighted measures.<sup>4</sup>

- Since the recession trough of the first quarter of 1991, average annual real GDP growth has been overstated by an average of 0.5 percentage point (chart 2). For the five economic expansions between 1960 and 1990, real GDP growth is understated by an average of 0.5 percentage point. As a result, comparisons of the strength of the current expansion with that of past expansions using the present

fixed-weighted measures may be overstated by as much as 1 full percentage point.

- The average annual rate of decline in real GDP during the six contractions between 1960 and 1991 is understated by an average of 0.3 percentage point.

Use of BEA's new featured measure will provide a more accurate picture not only of overall growth during past business cycles, but also of the growth of the individual components of GDP and their contribution to overall growth. For example, use of the chain-weighted index lowers the average contribution of producers' durable equipment (PDE)—which includes computers—to real GDP growth in the current expansion from 38.9 percent to 32.4 percent and raises the contribution of PDE in the five economic expansions between 1960 and 1990 from 10.7 percent to 13.3 percent.

For productivity analysis, use of a chain index has a significant effect on assessments of the magnitude of the slowdown in labor productivity (real output divided by hours worked) and in the growth of potential output since the early 1970's.<sup>5</sup> The chain-type measure shows an average real GDP growth rate of 4.1 percent for 1959–72 and 2.5 percent for 1973–94, while the fixed-weighted measure shows 3.7 percent and 2.4 percent, respectively (chart 3). Thus, use of the chain index shows that the slowdown in real GDP growth since 1972 was 1.6 percentage points, 0.3 percentage point more than indicated by the fixed-weighted index.

For investment analysis, the use of single-year weights has significantly overstated the impact of recent investment in computers in relation to investment in other types of assets. For example, in 1977, a small mainframe computer may have cost \$800,000, over 18 times the \$43,000 cost of a new single-family home. By 1987, technological innovation had reduced the cost of a computer system with the same capacity as the 1977 mainframe to \$80,000, less than the \$102,000 average cost of a new home. Today, that same system may cost as little as \$30,000, less than one-fourth the cost of a new home. Use of relative prices from 1977, or even 1987,

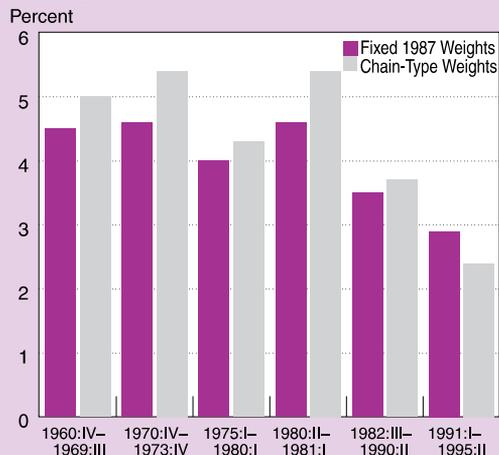
5. The Bureau of Labor Statistics (BLS) prepares annual measures of multifactor productivity and quarterly measures of labor productivity for major sectors. Since July 1994, the annual BLS measures of multifactor productivity have been prepared using a chain-type annual-weighted output series provided by BEA. In late 1995 or early 1996, the quarterly labor productivity series also will be prepared using new measures of output in the nonfarm business sector based on the chain-weighted real GDP. This change will be discussed in a forthcoming article in the *Monthly Labor Review*. The effects of using chain-type measures for productivity analysis were also discussed on page 97 of the 1995 *Economic Report of the President*.

compared with 0.6 percentage point for output. The smaller overstatement in prices occurs mainly because for goods with falling relative prices—such as computers—changes in output have been so much greater than changes in prices.

4. Because contractions are shorter than expansions, it should not be assumed that the effects of the introduction of chain-type measures will offset one another.

## CHART 2

### Rates of Change in Real GDP: Comparison of Alternative Measures During Economic Expansions



will significantly overstate the relative value and impact on the economy of the explosive growth in computers that has occurred since the late 1970's. Thus, in 1987, the purchase of a new computer had a "real" value roughly equal to a new home, but use of this relative price to value such an investment in 1995 overstates by fourfold the value and impact of that investment—in terms of jobs, wages, profits, and intermediate products—relative to investments in homes and in other capital goods.

Analyses of particular periods can also be significantly affected by substitution bias, especially in periods far from the base period or when the components that grow the most are those whose relative prices have declined the most. Since the third quarter of 1994, differences among the measures of change in real GDP have widened; the average quarterly change at an annual rate in the chain-type index is 0.8 percentage point less than the average change in the currently featured fixed-weighted index (chart 4).

Although computers are often an important factor behind the substitution bias and usually explain most of particularly large differences, they are not the only source of this bias. For example, computers account for about three-fifths of the overstatement of real GDP in the fourth quarter of 1994 and about three-fourths of the overstatement in the first quarter of 1995. In some quarters, they are not a factor. Over the

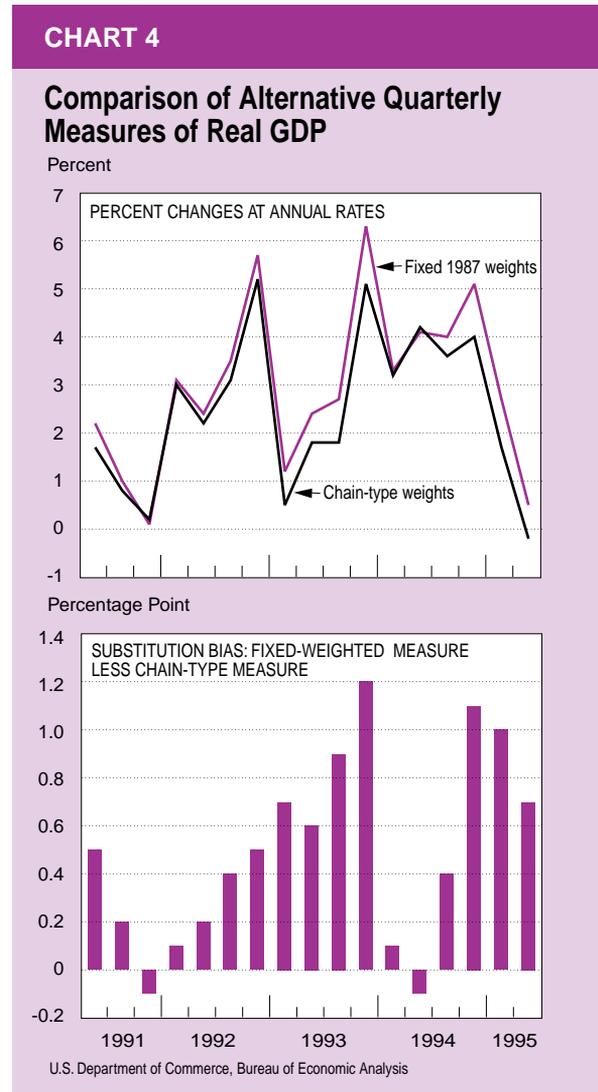
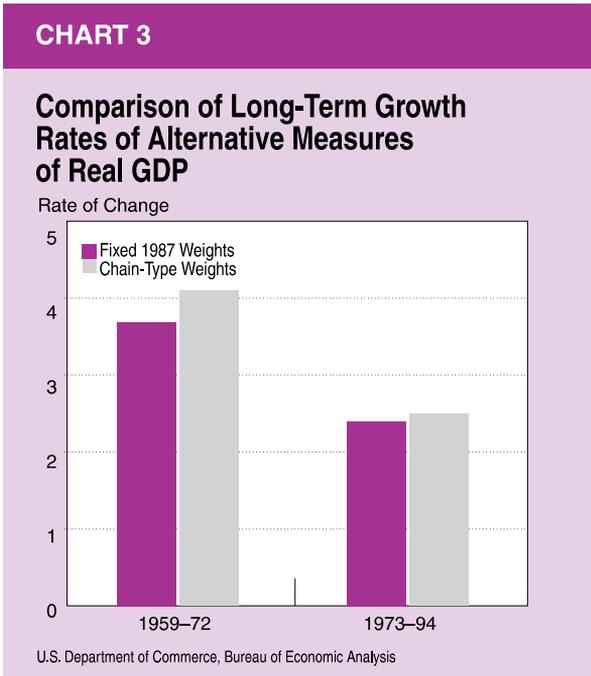
recent expansion, they have accounted for about three-fifths of the overstatement.<sup>6</sup>

**Presentation of the new featured measures**

BEA's alternative measures of real GDP and GDP prices are now published monthly in tables 7.1, 7.2, and 7.3 (index numbers) and in table 8.1 (percent changes) in the "Selected NIPA Tables" section of the SURVEY. Since November 1994, the alternative measures also have been available online from STAT-USA on the third working day after the release of each quarterly GDP estimate.<sup>7</sup> A few months ago, to assist users in adapting to the new measures, alternative indexes for almost all the detail for which constant 1987-dollar estimates are shown in the "Selected NIPA Tables"

6. For information about the difference in the second quarter of 1995, see the "Business Situation" article in this issue.

7. BEA's economic information is available online through subscription to STAT-USA's Economic Bulletin Board or Internet service. For more information, call (202) 482-1986.



were added to the set of estimates available from STAT-USA. Beginning with the release of preliminary GDP estimates for the second quarter of 1995 on August 30, 1995, selected alternative measures series will be included in the news release, and the more detailed alternative measures series will be available from STAT-USA at the same time as the "Selected NIPA Tables."

When BEA introduces the new featured measures of output and prices for the comprehensive NIPA revision, additional information will be made available to facilitate their use. (The change in the featured measure will not affect the availability of any current-dollar NIPA estimates; implicit price deflators will also be available.) Index numbers, which will be calculated with 1992 as the base period, and percent changes will be available at the same level of component detail now shown for the constant-1987-dollar series in the "Selected NIPA Tables." Summary tables showing the chained dollar-denominated indexes and the contributions of the major components to the growth in real GDP will be available for recent periods in the GDP news release. More detailed dollar-denominated indexes based on both the new featured measure and on fixed-1992 weights will be made available from STAT-USA shortly after the news release.

BEA also will present tables showing the contributions of the major components to the growth in real GDP for periods of particular interest to users. Users will find that they can easily prepare close approximations of contributions to real

GDP growth or to the growth of other aggregates. Table 1 shows how to estimate these contributions to real GDP growth using the last cyclical expansion as an example.<sup>8</sup> First, the levels of real GDP and its major components for the initial quarter are set equal to the published current-dollar levels. Second, corresponding dollar series for the second quarter of 1990 are computed by extrapolating (multiplying) the third-quarter 1982 level for each component by the percent change in the chain output index for that component. Finally, the contribution of each component to the change in GDP is calculated as the ratio of the dollar change in each component to the dollar change in GDP. Table 2 presents approximations of the contributions of the major components to the growth in real GDP for each economic expansion since 1960.

In addition to a table that shows contributions of the major components to the growth in real GDP, BEA will also provide constant-dollar denominated series using both the new featured measure and the fixed-1992-weighted measure.<sup>9</sup> Because the formula used to calculate the new featured measure uses weights of more than

8. The methodology used to estimate the component contributions to the rate of growth of GDP is a close approximation, as indicated by the "residual" line in table 1. The tables of component contributions that BEA will present as part of the comprehensive revision will use exact formulas for attributing growth to the components of GDP or of other aggregates.

9. For the forthcoming comprehensive NIPA revision, 1992 will be used as the base period for preparing constant-dollar series at the most detailed component level, because 1992 is the latest year for which the current-dollar estimates will not be subject to revision until the next comprehensive NIPA revision. These detailed series provide the inputs used for calculating the chain-weighted measures.

Table 1.—Calculation of Component Contributions to Real GDP Growth Using Chain-Type Annual Weighted Indexes

Line		Current-dollar levels	Chain-type annual-weighted indexes		Average annual rate of change	Dollar-denominated levels	Contribution to change in dollar series (percent) <sup>2</sup>
		1982:III	1982:III	1990:II		1990:II <sup>1</sup>	
1	Gross domestic product .....	3,164.2	82.0	108.4	3.7	4,182.5	100.0
2	Personal consumption expenditures .....	2,073.1	81.6	107.1	3.6	2,721.8	63.7
3	Durable goods .....	235.2	63.8	109.2	7.2	402.3	16.4
4	Nondurable goods .....	777.5	86.2	104.8	2.6	945.8	16.5
5	Services .....	1,060.4	83.4	108.0	3.4	1,373.4	30.7
6	Gross private domestic investment .....	509.4	72.2	103.9	4.8	732.8	21.9
7	Fixed investment .....	507.4	74.9	102.7	4.2	695.8	18.5
8	Nonresidential .....	405.0	83.9	108.9	3.4	525.6	11.8
9	Structures .....	172.8	104.2	105.9	.2	175.7	.3
10	Producers' durable equipment .....	232.2	73.4	110.4	5.4	349.4	11.5
11	Residential .....	102.4	53.1	89.3	6.9	172.1	6.8
12	Change in business inventories .....						
13	Exports of goods and services .....	279.0	79.5	139.7	7.5	490.4	20.8
14	Less: Imports of goods and services .....	309.3	62.5	111.7	7.8	552.8	23.9
15	Government purchases .....	612.0	81.5	105.5	3.4	791.8	17.7
16	Federal .....	268.0	78.7	99.6	3.1	339.1	7.0
17	State and local .....	344.0	83.8	110.0	3.6	451.2	10.5
18	Residual (line 1 less lines 2, 6, 13, and 15 plus line 14) <sup>3</sup> .....	0				-1.5	-1

1. Equals the third-quarter 1982 current-dollar level for the component times the change in the chain-type index for the component.

2. Equals the dollar change of the component divided by the dollar change of GDP (multiplied by 100).

3. Because of the method used in calculating the change in business inventories, chain-type indexes cannot be constructed for it. Thus, the residual can be calculated only at the major component level.

one period, the corresponding constant-dollar denominated series will not be additive. Nevertheless, for years close to the base year, the detailed components of these dollar series will be useful because they will be virtually additive (that is, the sums of the detailed-component dollar series will be very close to the independently calculated aggregates). However, as one moves away from the base period, the additivity of the components of the series will diminish. For the fixed-1992-weighted dollar series, the components will be additive in all periods. However, as one moves away from the base period, the substitution bias in the aggregate fixed-weighted measures will grow, and these measures will

present an inaccurate picture of economic activity in those periods. As a result of these problems, BEA's chain-weighted annual indexes and tables of contributions will provide a better basis for assessing long-term growth in the economy and for comparing business cycles.

As part of the comprehensive revision, BEA is working on developing methods for calculating chain-weighted estimates of inventory investment that facilitate the evaluation of the impact of inventories on changes in real GDP. As part of its research on alternative measures, BEA is also working on developing capital stock estimates that will be consistent with the new chain-weighted measures of output and prices. 

Table 2.—Component Contributions to Real GDP Growth and to the Rate of Change of Real GDP

Line		Percent of total growth				
		1960:IV–1969:III	1970:IV–1973:IV	1975:I–1980:I	1980:II–1981:I	1982:III–1990:II
1	<b>Gross domestic product</b> .....	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
2	<b>Personal consumption expenditures</b> .....	<b>61.7</b>	<b>55.7</b>	<b>57.2</b>	<b>39.5</b>	<b>63.7</b>
3	Durable goods .....	13.8	19.0	11.1	20.3	16.4
4	Nondurable goods .....	20.3	12.9	18.2	6.0	16.5
5	Services .....	27.8	23.9	27.5	13.3	30.7
6	<b>Gross private domestic investment</b> .....	<b>25.0</b>	<b>42.3</b>	<b>36.1</b>	<b>57.3</b>	<b>21.9</b>
7	Fixed investment .....	19.4	25.6	30.4	25.9	18.5
8	Nonresidential .....	16.0	18.8	23.6	14.7	11.8
9	Structures .....	3.9	2.8	7.6	4.4	.3
10	Producers' durable equipment .....	12.3	16.3	15.8	10.4	11.5
11	Residential .....	3.5	7.2	7.4	11.3	6.8
12	Change in business inventories .....	.....	.....	.....	.....	.....
13	<b>Exports of goods and services</b> .....	<b>6.4</b>	<b>11.9</b>	<b>16.5</b>	<b>4.0</b>	<b>20.8</b>
14	<b>Less: Imports of goods and services</b> .....	<b>9.3</b>	<b>6.3</b>	<b>16.6</b>	<b>4.8</b>	<b>23.9</b>
15	<b>Government purchases</b> .....	<b>16.4</b>	<b>-3.3</b>	<b>7.0</b>	<b>3.7</b>	<b>17.7</b>
16	Federal .....	6.7	-8.6	3.1	1.8	7.0
17	State and local .....	9.6	5.5	3.9	1.9	10.5

Line		Contribution to growth rate (percent)				
		1960:IV–1969:III	1970:IV–1973:IV	1975:I–1980:I	1980:II–1981:I	1982:III–1990:II
1	<b>Annual growth rate:</b> Gross domestic product .....	5.0	5.4	4.3	5.4	3.7
2	<b>Contribution to growth rate:</b> Personal consumption expenditures .....	3.1	3.0	2.5	2.1	2.3
3	Durable goods .....	.7	1.0	.5	1.1	.6
4	Nondurable goods .....	1.0	.7	.8	.3	.6
5	Services .....	1.4	1.3	1.2	.7	1.1
6	Gross private domestic investment .....	1.2	2.3	1.5	3.1	.8
7	Fixed investment .....	1.0	1.4	1.3	1.4	.7
8	Nonresidential .....	.8	1.0	1.0	.8	.4
9	Structures .....	.2	.2	.3	.2	0
10	Producers' durable equipment .....	.6	.9	.7	.6	.4
11	Residential .....	.2	.4	.3	.6	.3
12	Change in business inventories .....	.....	.....	.....	.....	.....
13	Exports of goods and services .....	.3	.6	.7	.2	.8
14	Less: Imports of goods and services .....	.5	.3	.7	.3	.9
15	Government purchases .....	.8	-.2	.3	.2	.6
16	Federal .....	.3	-.5	.1	.1	.3
17	State and local .....	.5	.3	.2	.1	.4

NOTE.—The method used to estimate the component contributions is described in the text and in footnote 8 on page 37.