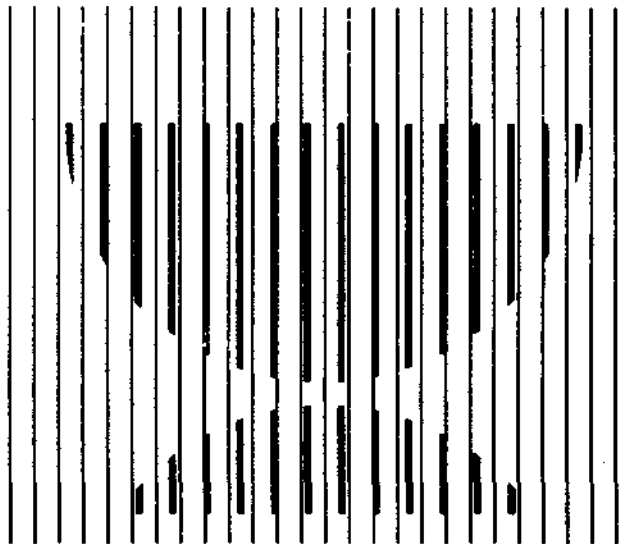# CBO
STAFF
MEMORANDUM

POTENTIAL EFFECTS OF NIPA REBASING
AND GPO REVISIONS IN 1990 AND 1991
ON PERCEPTIONS OF REAL GROWTH IN THE 1980s

April 1990

This Congressional Budget Office Staff Memorandum describes potential effects on perceptions of real growth in the 1980s of two major data revisions due this year and next: the rebasing of the data in the National Income and Product Accounts (NIPA), and the revisions of the gross product originating (GPO) data. Estimates are given for the magnitudes of the effects of the GPO revisions and the rebasing aspect of the NIPA revisions. The magnitudes indicated by these estimates, however, could be offset or reinforced by a multitude of factors that cannot currently be estimated.

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The National Income and Product Accounts (NIPA) will undergo a major revision in July 1991, and the gross product originating (GPO) data are scheduled for revision in May of this year and again in 1991. These revisions are likely to result in major changes in the growth rates of constant dollar ("real") measures, and those changes will affect perceptions of a number of major economic trends in the 1980s. This memorandum provides estimates of the likely effects of the May GPO revision and the rebasing aspect of the later revisions.

The revisions will affect perceptions of the last decade in four major ways:

o Real growth in gross national product (GNP) in the 1980s will be dampened by an average of about 0.2 percentage point a year, and the growth in the implicit price deflator will be pushed up by the same amount.

o Productivity growth will be held down by about the same amount as real GNP growth, and the magnitude of the acceleration in productivity growth in the 1980s over the 1970s will be reduced.

o The share of real gross investment in GNP will be held down, worsening the perception of the long-term prospects in the growth of the standard of living.

o The share of real GNP attributed to manufacturing in the 1980s will tend to be reduced and the nonmanufacturing share increased. Growth of manufacturing productivity in the 1980s will tend to be reduced by about 0.8 percentage point per year.

The NIPA data include the official measure of GNP and are the basic accounts for the nation's economic activity. The GPO data essentially allocate the aggregate economic activity indicated by the NIPA data by industrial sector, such as transportation, mining, various manufacturing categories, and so on. Revisions to these data are necessary as new data become available (some important data are not available until three years after the fact), as new classifications and definitions are introduced, as improved estimating procedures are developed, and as base periods are changed so that the data may better reflect recent economic developments.

The estimates for the effect of the NIPA revision discussed here are only for the effects of rebasing. The 1991 revision of the NIPA will incorporate all the other aspects of revisions mentioned above as well as rebasing, and these other changes may offset or reinforce the effects of the rebasing indicated in this memorandum.

Because the current methods for measuring real growth used by the Bureau of Economic Analysis (BEA) are so dependent on the choice of base period, the BEA has investigated alternative measures of real GNP. Although the primary measure of real GNP after July 1991 will be the 1987-dollar measure, the BEA probably will start to publish regularly an alternative measure based on a version of the Fisher "Ideal" index soon after the July release. As is explained further below, the Fisher "Ideal" measure would be preferable for long-term comparisons of real output and

productivity growth, but it would be clumsy when it is necessary to decompose real GNP into detailed expenditure components.

This memorandum first discusses measures of real growth: why the BEA's current measures are so sensitive to the choice of base period, and why an index such as the Fisher "Ideal" is preferred for some uses. Following a brief review of how the last two rebasings of NIPA data affected real GNP growth, the memorandum covers the four major perceptions of the 1980s that are likely to be changed by the upcoming revisions.

MEASURES OF REAL GROWTH

Measures of the real growth of economic aggregates, such as GNP, are dependent upon how much weight is given to each of the components of the aggregate. The choice of the base period is essentially a choice of relative weighting of components, and it therefore affects the measure of growth.

The Sensitivity of the BEA's Measures of Real Growth to the Choice of the Base Period

The wide divergence in the levels of implicit deflators for the major expenditure categories in the last decade has caused the BEA's measures of real growth to be highly sensitive to the choice of the base period.[1] For example, the BEA's current measure of real GNP uses 1982 as the base year, and that measure indicates that real GNP grew by 4.4 percent in 1988. In the NIPA revision, however, the BEA will switch to 1987 as the base year, and the rebasing effect alone will reduce the official measure of real GNP growth for 1988 by about 0.4 percentage point.

The sensitivity of measures of real growth to the choice of base period is best illustrated by examining the effect computers have had on real GNP growth in recent years. Nominal purchases of computers grew rapidly in the 1980s, spurring nominal GNP growth. In addition, the deflator for computers has fallen sharply, so constant dollar, or real, purchases of computers have grown much more rapidly than nominal purchases. All deflators are set to be equal to 1.00 in 1982 in the NIPA, but the deflator for computers has fallen since that year while other deflators have increased on average. In constructing the deflator for computers, the BEA incorporates a quality adjustment to computer prices that has caused the deflator to trend sharply downward. As a result, the implicit deflator for computers is now about .35, that is, 35 percent of its 1982 level. The implicit deflators for other categories of expenditure average about 1.30. The low level of the computer deflator amplifies nominal dollar growth in computer purchases into substantially larger real, or 1982-dollar, movements. In essence, the weight given to a dollar of expenditure on computers in recent years is about four times that of other expenditures when real GNP is calculated.

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1.   Implicit deflators for categories of expenditure are essentially weighted averages of the price indices for the individual components of the expenditure categories, with the weights varying as the shares of the individual components change.

The weight given to the fast-growing computer sector in real GNP growth will be much smaller in the 1987-based data. Consequently, real GNP growth in general will be smaller than in the 1982-based data. In the 1991 revision, all implicit deflators will be set to equal 1.00 in 1987, so a one-dollar increase in any expenditure category will result in only one 1987-dollar increase in that year. Because the computer deflator continued to decline after 1987, the weight of computer purchases will again grow in the calculations of real GNP in 1988 and subsequent years, but the weighing will be only slightly greater than that for other expenditure categories--nothing like the huge differential that exists in recent years in the 1982-based data. In addition, computers will have a smaller weighing than other expenditure categories in the revision for the years before 1987, because the downward trend in the computer deflator implies that the computer deflator will be greater than 1.00 for those years, while the other deflators will be less than 1.00 on average.

Alternative Measures of Real Growth

Because no one base year is better than all others for all purposes, the BEA is investigating measures of real growth that are less sensitive to the choice of base year. In general, the use of a base period close to the period being examined yields the most useful measure of real growth rates for short time periods. Therefore, the 1982 base would probably be most useful for analyzing the early 1980s, but the new 1987 base would be preferred for recent years. Both measures could be misleading, however, when used to examine real growth over long time periods, such as the entire postwar period.

The theoretically exact measure of change in real output over long time periods cannot be calculated, but an index such as the Fisher "Ideal" index has been shown to be preferable to the standard procedure used by the BEA when long time periods are being examined. The Fisher "Ideal" is less affected by the choice of base year, essentially because it employs multiple base years.

The Fisher "Ideal" index of change between any two years is the geometric mean of a Paasche index and a Laspeyres index.[2] This is basically the average of the weights in the initial year and the weights in the terminal year. The BEA may use a Fisher "Ideal" index in which the choice of the various initial and terminal years is based on NIPA benchmarking dates.[3]

Measures of real growth that use a fixed base have some advantages over Fisher "Ideal" measures. One important strength of the current, fixed-base method is that the sum of the constant dollar measures of the components of GNP equals constant dollar GNP. This additive property would not hold for the Fisher "Ideal" measure. The BEA could estimate real growth and levels of GNP and various components of GNP with Fisher "Ideal" measures, but the measures of the real

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2. A geometric mean of two numbers is the square root of the product of the numbers. A Paasche quantity index uses the terminal year as the base for calculating an aggregate index of quantity change, and a Laspeyres index uses the initial year as the base period.

3. See Allan H. Young, "Alternative Measures of Real GNP," *Survey of Current Business* (April 1989).

levels of the components would not necessarily add up to the measure of real GNP.

The Fisher "Ideal" estimates of real GNP growth over the last three decades discussed below are illustrations of what the BEA's alternative measures of real GNP growth may imply for the comparisons of growth over the decades. They were calculated by first rebasing the NIPA data to various years that appeared useful for analyzing trends in GNP growth and productivity growth (that is, 1960, 1973, 1979, and so on), and then using the rebased data to create the Paasche and Laspeyres indices of change between those years.

EFFECTS OF TWO PREVIOUS NIPA REBASINGS ON REAL GNP GROWTH

The last two revisions in the National Income and Product Accounts occurred in 1976 and 1985. In both cases, changing the base year alone resulted in a downward revision to real GNP growth in the 10 or 15 years before the revision. The downward effect of the most recent rebasing, however, was partially offset by other aspects of the revision.

The most recent rebasing, in which the NIPA base year was changed from 1972 to 1982, was released in December 1985. The average annual growth rate of real GNP for the period 1972 through 1984 was reduced by 0.2 percentage point--the net effect of a 0.4-percentage-point reduction as a result of the rebasing and a 0.2-percentage-point increase caused by other revisions. The major positive effect of that revision was the introduction of a new procedure for deflating computer output.

The previous rebasing, in January 1976, changed the base year from 1958 to 1972. The average annual rate of growth of real GNP for the 1958-1974 period was reduced by 0.2 percentage point in that revision. The BEA did not report the exact effect of the rebasing alone, but the bulk if not all of the 0.2 downward revision was apparently attributable to rebasing.

POTENTIAL EFFECTS OF THE 1991 NIPA REBASING

The rebased NIPA data will paint a less positive picture of the economy in the 1980s than do the current data. Real economic growth and productivity growth are likely to be revised downward, and nonresidential investment will not look as strong.

Growth of Real GNP, Final Sales, and the Implicit Deflator

The most important potential effect of the data revisions is the reduction in the measured growth of real GNP in the 1980s. Growth, whether measured by a 1987-based measure or a Fisher "Ideal" index, will be less than indicated by the current 1982-based measure.

Although only one measure of real growth is widely reported, the BEA currently publishes two measures of growth for GNP and the major components of expenditure. Those two measures are the official 1982-based measure (for which quarterly historical data exist back to 1947:I) and an approximation of a 1987-based

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measure (quarterly data from 1982:I).[4] Although the latter measure uses only 500 expenditure categories in calculating GNP compared with essentially 800 in the official data, it probably captures the full effect of rebasing for the years for which it is published.[5]

CBO estimated two measures for real final sales growth for the 1960-1988 period--one using 1987 as the base year and the other the Fisher "Ideal." The estimates were made for final sales because the data for rebasing inventories were not available.[6] The disaggregation was limited to only 18 expenditure categories, compared with the 800 used by the BEA. Although this restricts the usefulness of the results, the results are supported by the BEA's 1987-based measure and therefore appear valid.

The five measures of real final sales growth for subperiods between 1960 and 1988 are shown in Table 1. The subperiods are shown using two different dates for the last business cycle peak, 1979 and 1981, because the economy did not fully recover from the 1980 recession by the date of the "official" business cycle peak in 1981. Using 1981 as a peak, therefore, causes the 1970s to appear worse than a true peak-to-peak trend growth line would indicate.

Because total expenditure was broken into only 18 categories, the Fisher "Ideal" index calculated here does not fully capture the extent to which the 1982-based data overstate recent growth. The BEA's published 1987-based data for real final sales for the years 1982 through 1988 were used to calculate a more accurate Fisher "Ideal" measure for the period 1981 through 1987. This calculation indicates that growth was 0.1 percentage point slower than the approximation to the Fisher "Ideal" made by CBO using only 18 categories. The Fisher "Ideal" results reported in the table incorporate the lower growth estimates for the 1980s.

A comparison of the 1982-based growth and the Fisher "Ideal" shows that the 1982-based measure makes the 1980s look better relative to previous decades than the Fisher "Ideal" would. The 1982-based data appear to overstate growth in the 1980s by about 0.2 percentage point, and understate growth in the two previous decades by about 0.1 or 0.2 percentage point. A comparison of the BEA's 1982-based and 1987-based measures shows that the 1982-based measure also makes the 1980s look better than does the 1987-based measure.

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4. A third measure, the chain output measure, can be calculated from BEA data, but that measure is not used here because it is not appropriate for long time periods. Although a chain index may be useful for comparing consecutive periods, it will tend to "drift"; that is, its bias will be magnified over time when the prices of subcomponents persistently diverge. The chain index probably overstates growth for the 1960-1988 period on average.

5. Strictly speaking, the BEA uses about 17,800 expenditure categories in its GNP calculations. All but about 800 of the categories, however, are extremely detailed categories of federal government purchases of goods and services. Failure to disaggregate to that level of detail for rebasing does not introduce any significant error.

6. Final sales is equal to GNP less inventory change.

TABLE 1.   GROWTH OF REAL FINAL SALES USING VARIOUS
            MEASURES (Annual averages)

	Published BEA Measures		CBO Estimates	
	1982 Dollars	1987 Dollars	Fischer "Ideal"	1987 Dollars
Subperiods Using 1979 as the Peak of the Last Business Cycle				
1960-1973	3.8	n.a.	4.0	4.0
1973-1979	2.7	n.a.	2.8	2.8
1979-1988	2.6	n.a.	2.5	2.4
Subperiods Using 1981 as the Peak of the Last Business Cycle				
1960-1973	3.8	n.a.	4.0	4.0
1973-1981	2.2	n.a.	2.3	2.2
1981-1988	3.1	2.9	2.9	3.0

SOURCES: Congressional Budget Office; Department of Commerce, Bureau of
          Economic Analysis.

NOTE: n.a. = not available.

Since nominal values are unaffected by the choice of base year, rebasing will of course have a mirror effect on the growth of the implicit GNP deflator. The growth of the deflator will be revised upward for the 1980s and downward for previous years.

After July 1991, when rebased NIPA data are used, CBO's forecasts of the growth of the deflator for 1991 and subsequent years will tend to be slightly higher than now, because a 1987-based deflator will tend to grow more rapidly in those years than one based on 1982. Although the difference may be considered small-- about 0.2 percentage point per year--CBO's estimates of many categories of outlays will be affected.

The revision of the growth of the implicit deflator will not cause a reassessment of inflation in the 1980s. The implicit GNP deflator is widely viewed as a poor measure of inflation, in part because of its sensitivity to the choice of base year. Therefore, economists' perceptions of inflation are based on other measures such as the consumer price index (CPI), which will not be affected by the NIPA revision. (Note, however, that many wage contracts and other indexing formulas are still based on the implicit deflator. The revision may induce a more widespread recognition of the problems of such indexation.)

Productivity Growth

Productivity growth in the current business cycle may not be as good as the current data indicate, and this result would affect estimates of potential GNP growth. Both the Fisher "Ideal" and the 1987-based measures of real output indicate that productivity growth in the 1980s was not as strong as the current data indicate.

The estimates of productivity growth shown in Table 2 are based on the differences between the various measures of real growth in final sales shown in Table 1. For example, final sales growth in the 1979-1988 period is 0.2 percentage point less using the 1987-based measure than when the 1982-based measure is used; therefore, productivity growth for that period using the 1987-based measure is also reduced by 0.2 percentage point. Thus, as can be seen in the upper panel of Table 2, the pickup in productivity growth from the 1970s to the 1980s is reduced from 0.7 percentage point (the increase from 0.6 to 1.3) to 0.4 percentage point when 1987-based measure is used, and to 0.5 percentage point when the Fisher "Ideal" measure is used.

Because estimates of potential GNP growth are based on recent productivity trends, potential GNP estimates will be affected by the data revision. CBO is currently using 1.4 percent as the trend growth rate of nonfarm business productivity for the calculation of potential GNP for the 1990-1995 period, and the Administration is using 1.9 percent. The new data may indicate that even CBO's estimate is somewhat optimistic.

7

TABLE 2.   GROWTH OF NONFARM BUSINESS PRODUCTIVITY
            USING VARIOUS MEASURES (Annual average)

	Current 1982-Based Measure	Estimated Fisher "Ideal" Measure	Estimated 1987-Based Measure
Subperiods Using 1979 as the Peak of the Last Business Cycle			
1960-1973	2.5	2.7	2.7
1973-1979	0.6	0.7	0.7
1979-1988	1.3	1.2	1.1
Subperiods Using 1981 as the Peak of the Last Business Cycle			
1960-1973	2.5	2.7	2.7
1973-1981	0.5	0.6	0.5
1981-1988	1.5	1.3	1.3[a]

SOURCES: Congressional Budget Office; Department of Commerce, Bureau of
          Economic Analysis.

a.   Based on difference between the BEA's 1987-based measure and BEA's 1982-
     based measure of real final sales growth.

<u>Real Nonresidential Investment as a Share of Final Sales</u>

The share of nonresidential investment in real final sales will appear to have deteriorated more in the 1980s in the rebased data than in the current data. Since investment is a partial indicator of the future growth of living standards for U.S. residents, the revisions may worsen the perception of the future growth of living standards.

The current 1982-based data indicate that real nonresidential investment was a slightly higher share of real final sales in 1988 than in 1979, but in 1987 dollars the 1988 share is a full percentage point lower than the 1979 share (see Figure 1). Assessments of the 1980s investment performance have been muddied by uncertainty about which measure of investment should be used. The data revisions will make it more difficult to maintain that the 1980s investment performance has been good, because even the gross measures are likely to indicate only a mediocre performance in the 1987-based data (and, if such data are published, in a Fisher "Ideal" measure as well).

EFFECTS OF THE GPO REVISION AND THE NIPA REBASING ON THE MEASUREMENT OF THE MANUFACTURING SECTOR

The gross product originating data, which are essentially value-added by industry, will undergo two revisions in the next year and a half, and both revisions are likely to reduce the measured rate of growth of real manufacturing value-added in this business cycle.[7] The magnitude of the revisions is uncertain, but the first revision (in May of this year) could reduce the manufacturing growth rate by more than 0.5 percent per year since 1979, and the second revision (in 1991) may further reduce the growth rate by 0.3 percent. The average annual growth rate of manufacturing from 1979 to 1987 is currently reported to be 2.4 percent.

The likely reduction in the reported growth of real manufacturing value-added implies that the revisions will also reduce the measured rate of growth of manufacturing productivity, as well as the share of manufacturing in real GNP.

<u>Revisions to the Gross Product Originating Data</u>

Annual GPO data are normally published by the Bureau of Economic Analysis in July, but the BEA withheld publication in July 1989 because of criticisms of its methods. The BEA acknowledged that two major criticisms were valid: (1) the method of adjusting the 1972 data to force the value-added by industry to sum to the independently determined total GNP inappropriately forced the constant dollar manufacturing share down in the early 1970s; and (2) the manufacturing input prices do not adequately reflect true input prices, largely because domestic price measures are inappropriately used as proxies for prices of imported inputs. Although the BEA agreed that both problems should be corrected, it is currently working on only

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7. Real value-added by industry is the difference between the real gross value of the materials and services an industry buys from other industries, and the real gross value of the goods and services it sells.

Figure 1.
Nonresidential Fixed Investment as a Share of Final Sales
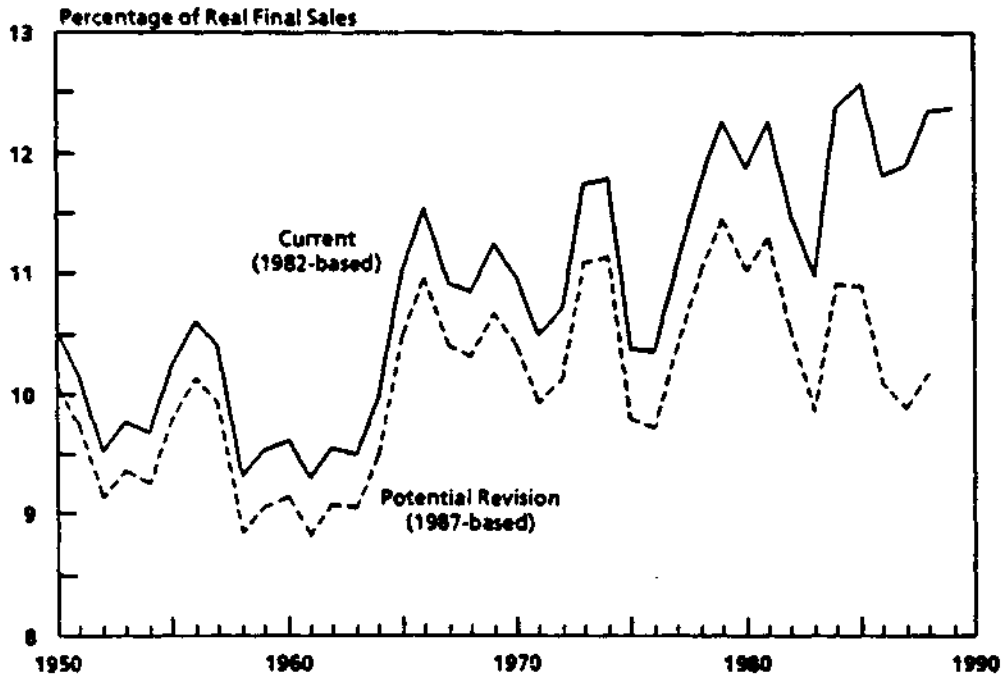
SOURCES: Congressional Budget Office; Department of Commerce, Bureau of Economic Analysis.

the second problem--the development of better data on input prices. An interim revision of GPO data from 1977 through 1988, scheduled to be released in May 1990, will incorporate better data on import prices and a number of other methodological improvements.[8]

The May release may result in a downward revision of growth in real manufacturing output of about 0.5 percentage point per year for the 1979-1985 period. This figure is drawn from a statement by the BEA in the July 1988 *Survey of Current Business*.

In 1991 the GPO data will be revised again in concert with the NIPA revisions. This revision will probably cover 1977 to the present, but it will use improved estimates of the interindustry purchases of intermediate materials, and, of course, the data will be forced to be consistent with the revised NIPA aggregates.

The 1991 revision is likely to reduce further the real growth in manufacturing output because of the change in the base year from 1982 to 1987. The reduction will be greater than the reduction in GNP growth discussed above because the vast bulk of value-added in the design and construction of computers is in the manufacturing sector. Manufacturing value-added growth will be lowered by perhaps 0.3 percentage point per year (in addition to the 0.5-percentage-point drop resulting from the May 1990 revision). Value-added growth in the service sector will tend to be revised upward because the real cost of service-sector inputs for computers will be lower in the 1987-based data than in the current 1982-based data. The upward tendency in the revision of growth in the service sector, however, will be offset by the general downward revision in GNP growth discussed above.

Manufacturing and Nonmanufacturing Productivity Growth

The revisions to productivity growth by sector will be similar to those for value-added by sector. The GPO revisions may cause average annual growth in manufacturing productivity for the 1979-1988 period to be revised downward substantially--from 3.4 percent to 2.6 percent. Productivity growth in the nonmanufacturing sector, however, is unlikely to be changed significantly because the downward revision in productivity growth in manufacturing is likely to account for virtually all of the downward revision in the total economy's productivity growth.

Real Manufacturing Output as a Share of GNP

Current GPO data indicate that the manufacturing share of real GNP in 1987 was equal to its share in 1979 (21.8 percent) and above the postwar average (21.3 percent), but the revisions may change that assessment. If the revisions have the

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8.   The other improvements include the following: the estimates of the interindustry purchases of intermediate materials on which the GPO data are based will be partially updated using annual industry data; more detail will be included on costs for services; service-sector input prices will better reflect true costs (gross output prices of the supplying industry will be used instead of value-added prices); and double deflation will be extended to 80 percent of the economy instead of being confined to manufacturing, railroads, farms, and electric and gas utilities.

effects discussed above, the manufacturing share of GNP in 1987 will be about one percentage point below the 1979 share when 1987-based measures are used (see Figure 2). Although one percentage point appears small, a revision of that magnitude would require a reassessment of numerous studies of the strength of the manufacturing sector in the 1980s.

Figure 2.
Manufacturing as a Share of Real GNP
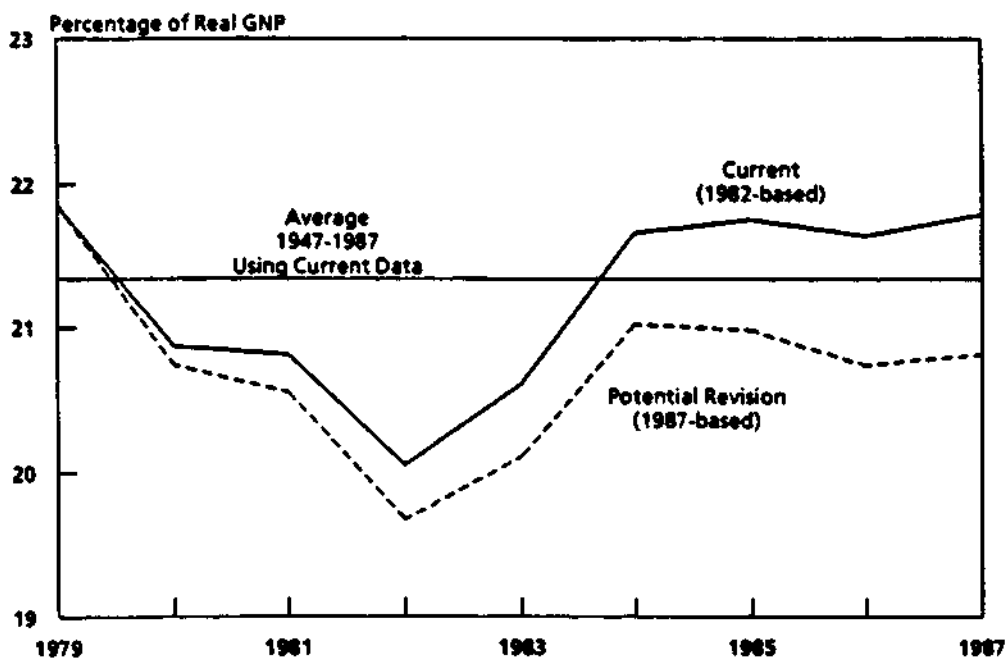
SOURCES: Congressional Budget Office; Department of Commerce, Bureau of Economic Analysis.

NOTE: The estimate for the potential revision is set equal to the current data for 1979. Thus, the figure illustrates only how the revision may affect the measurement of the growth of the manufacturing share since 1979.