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The Impact of Reduced Inflation Estimates on Real Output and Productivity Growth

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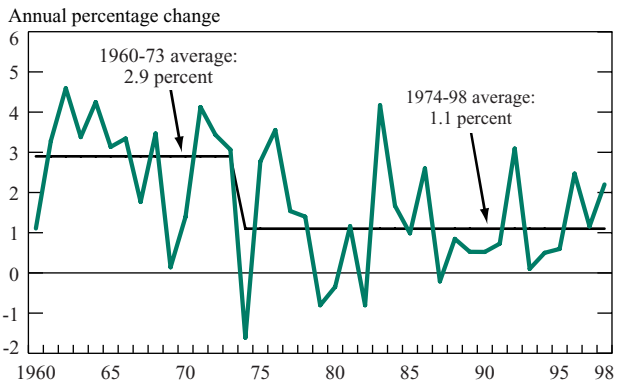
Despite posting their strongest sustained performance in many years, recent measures of output and productivity growth have still fallen short of their 1960-73 averages. Could data-measurement problems affecting the pricing of some services account for the inability of these widely tracked U.S. growth indexes to match their earlier rates?

Two key measures of U.S. economic growth—the annual rate of change in real output and in productivity—have improved considerably in recent years.[1] Between 1996 and 1998, growth in productivity in the largest segment of the economy, the private nonfarm business sector, averaged nearly 2 percent. This growth rate, the strongest sustained pace since 1983-85, appears to signal some fundamental improvement in the economy. Nevertheless, the growth trend for productivity has remained well below its 1960-73 average of nearly 3 percent (Chart 1).

Measurement difficulties provide one possible explanation for the failure of current growth rates to match those of the past. For instance, the aggregate data used to calculate GDP and productivity rates are based on samples drawn from surveys whose representation of the economy may, of necessity, be somewhat out of date. In today's rapidly changing economy, reliance on such data may lead to overly conservative estimates of growth.

The possibility that measurement problems are contributing to the shortfall in the growth numbers appears stronger when we consider the ongoing concerns about the measurement of inflation. Many economists and policymakers believe that the data used in the construction of the consumer price index (CPI) overstate prices. These concerns carry over to economic growth because, all else equal, an increase in reported inflation would decrease the reported rate of real output and productivity growth. Furthermore, an overstatement of inflation may be especially important in the services sector, whose contribution to the economy has grown steadily over the years. Not only are many services—such as medical care and financial services—inherently hard to price, but the nature of some of them has changed radically with the introduction of new technologies. These factors could be making it more difficult for government data to capture the true prices of services.

Chart 1
Productivity Growth in the Nonfarm Business Sector



Source: U.S. Department of Labor, Bureau of Labor Statistics.

This edition of *Current Issues* examines whether measurement problems can account for the inability of real GDP and productivity growth rates to rival the growth rates of 1960-73. Specifically, we consider technical problems associated with the pricing of certain hard-to-measure services. An overstatement of inflation in these services may be resulting in an understatement of real GDP and productivity growth.

We find that hard-to-measure services have accounted for a greater share of GDP over the years and that inflation has indeed been higher in these services than in other sectors of the economy. Moreover, reduced estimates of the inflation rate in these hard-to-measure services are found to raise recent output and productivity growth rates. However, despite these findings, the estimates also reveal that these growth rates would *still* have been much lower in recent years than in the 1960-73 period—even if an especially strong upward bias in service-sector inflation estimates had begun only after 1973. Therefore, it is difficult to attribute the inability of recent output and productivity growth rates to regain their 1960-73 pace solely to the inexact pricing of hard-to-measure services.

Inflation Measurement Problems and the Calculation of Economic Growth

Inaccurate inflation measures could affect the calculation of economic growth indexes because many index computations rely on the rate of inflation. For example, real output growth is defined as nominal spending growth less inflation; productivity growth is computed by the Bureau of Labor Statistics (BLS) as nonfarm business real output growth less the growth of worker-hours.

Concern over the accuracy of inflation measurements came to the fore in 1996. In its report to the Senate Finance Committee late that year, the Boskin Commission—an advisory group of scholars formed to examine the CPI—estimated that the index overstated growth in the cost of living by about 1 percentage point a year (Boskin et al. 1996). In the period since the report's release, the BLS has made extensive changes to its construction of the CPI.

However, the Boskin Commission's findings shed little light on the impact of overstated inflation on reported economic growth. For example, the commission's estimate of a 1-percentage-point upward bias in the CPI does not necessarily suggest that growth in either real output or productivity is being understated by that amount. The reason is that the price data used to gauge real output can be quite different from the data used to measure the CPI.[2] Most notably, the price data used to calculate real output and productivity are not subject to a number of the problems that have affected the computation of individual prices in the CPI.

Another key factor to consider when examining inflation and growth indexes is the change in the bias in inflation. Even if the current data on real output and productivity are being substantially underestimated because of overstatements of price increases, one cannot assume that the true growth rates of GDP and productivity today are closer to the rates of the past. For such an assumption to be correct, the current overstatement of inflation would have to be larger than it was in the earlier period. For instance, if inflation throughout the economy (not just inflation reported in the CPI) had always been overstated by 1 percentage point, we could reasonably say that recent productivity growth has been around 3 percent, rather than the reported average of a little less than 2 percent. Based on this example, however, past productivity growth would actually have been higher than has been reported—around 4 percent in the 1960s. Thus, an analysis of the effect of inflation mismeasurement on the historical record of output and productivity growth rates should focus less on the *level* of the bias in inflation at some period in time and more on the *change* in the bias over time.

Changes in the Bias in Inflation

Several studies have investigated the level of the bias in the price data, yet relatively few have examined changes in the bias over time—perhaps because of the difficulty of making a good estimate of the bias in any period. However, it is plausible to think that, for many products, the inflation bias has not increased systematically over time. Procedures for estimating the price of goods have undergone many changes, in part as a result of efforts to address problems identified in price studies.[3] In general, when corrections to the price data are made and the real output data are adjusted, there is an attempt to correct as much of the historical data as possible. On the whole, then, it seems unlikely that the change in the bias in goods pricing in recent years is appreciably higher than it was in the past.[4]

For *some* services, changes in the bias in inflation have probably been minor. In transportation and communications, for instance, one can measure output and prices by observing the cost of standardized products, such as passenger miles or messages, respectively. Technological changes in recent years may have complicated the job of measuring real output and prices for these products, but corresponding changes have been made to some of the procedures used to compute the prices. Overall, there is little evidence that the bias in pricing these services has increased.[5]

However, the pricing of other services—such as medical care and financial services—is a more complicated matter. It is very hard to standardize, and therefore price, products in these sectors. Moreover, the

extraordinary pace of technological change in these sectors may have exacerbated pricing problems, despite the best efforts of government statisticians to address the changes. This argument is supported by the observation that the published productivity data for much of the services sector continue to be disappointingly low.[6] It is these hard-to-measure services that we now examine.

The Output Share of Hard-to-Measure Services

Could high and increasing inflation bias in some rapidly changing services sectors help explain why the reported growth rates for real output and productivity remain below the pre-1973 rates? That is, has this growth actually been higher in recent years than has been officially reported? To answer these questions, we need to determine what share of the economy is attributable to services that may have major pricing problems.

Table 1 provides a breakdown of current-dollar aggregate spending in 1997 (indented items sum to the heading above them). That year, services spending accounted for about 54 percent of GDP. A large portion of this spending fell into three categories: government compensation of employees, depreciation of government capital, and space rent (the imputed services provided by the housing stock). However, we can discount the services in these categories because they are not produced by the private nonfarm business sector; errors in their pricing therefore will not affect the productivity data for that sector. This leaves only 36 percent of 1997 GDP accounted for by actual purchases of services from the private sector, identified in the table as "other." A significant portion of these services ("all other services") consisted of items such as utilities and transportation; we can discount these services too because, as suggested earlier, their prices are probably not being measured any less accurately today than they were in the past.

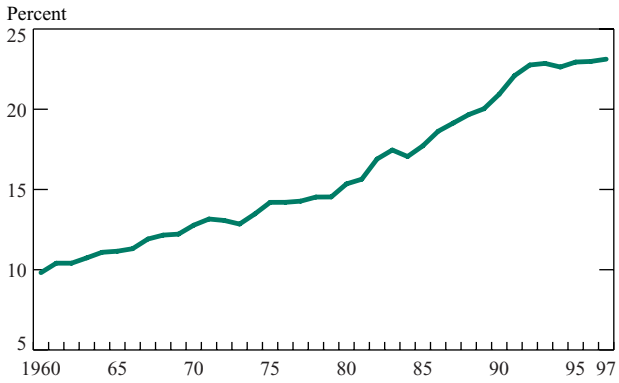
Table 1
1997 Composition of GDP

Sector	Amount (Billions of Dollars)	Percentage of GDP
Goods	**2,978.5**	**36.7**
Structures	**718.3**	**8.9**
Services	**4,414.1**	**54.4**
Government compensation of employees	780.2	9.6
Depreciation of government capital	128.3	1.6
Space rent	590.3	7.3
Other	2,915.3	35.9
Hard-to-measure components	1,875.2	23.1
Consumer	1,589.5	19.6
Medical care	843.4	10.4
Personal business	459.1	5.7
Educational	129.4	1.6
Religious and welfare	157.6	1.9
Government	179.0	2.2
Net exports	106.7	1.3
All other services	1,040.1	12.8
Total	**8,110.9**	**100.0**

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

Note: Indented items sum to the heading above them.

Chart 2
Hard-to-Measure Services as a Share of GDP



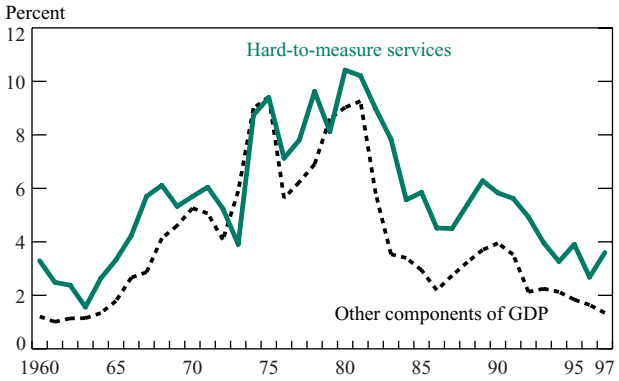
Source: Author's calculations, based on data from the U.S. Department of Commerce, Bureau of Economic Analysis.

This leaves us with a "hard-to-measure components" category, which contains services that account for roughly 23 percent of GDP.[7] As noted earlier, one could raise significant questions about the reliability of the price data for these services, such as financial and business services, medical care, and educational and charitable expenses.[8] These hard-to-measure services have accounted for a steadily increasing share of current-dollar GDP over the years (Chart 2). Significantly, the reported price data suggest that inflation has typically been much higher in these services than in the rest of the economy (Chart 3). Of course, the higher inflation rates could simply reflect a rapidly growing demand for these services. However, it is also possible to interpret the higher rates as evidence that a stronger upward bias exists in the reported prices of these services than in prices elsewhere in the economy.

Alternative Growth Estimates

Although the higher inflation rates for hard-to-measure services are suggestive of a pricing bias, we cannot attribute the decline in average output and productivity rates to problems in pricing unless we can establish either that the problems are large relative to those of the past, or that these services are now such a large part of

Chart 3
Sectoral Inflation Rates



Source: Author's calculations, based on data from the U.S. Department of Commerce, Bureau of Economic Analysis.

the economy that continuing price measurement problems will have very substantial effects on the aggregate data. As we keep these points in mind, our next step is to determine the effect of reducing the inflation biases (assuming they exist) on the time profile of real growth. To do this, we calculate the effects of alternative, reduced estimates of inflation in the hard-to-measure services sectors on the history of real GDP and productivity growth (Table 2). Our calculations rely on two alternative assumptions: (1) inflation in these sectors has in reality been equal to inflation in the rest of the economy; (2) inflation in the hard-to-measure sectors has been uniformly overestimated by 2 percentage points a year. The assumptions are roughly comparable, because the reported price increases for these hard-to-measure services have been, on average, about 2 percentage points higher than price increases for other goods and services.[9]

We should note that ours are not formal estimates of the amount of bias in the price data for these services. We are merely using alternative assumptions about inflation rates to approximate the additional real growth that would be reported by reducing (but not necessarily eliminating) the bias in these prices by a large, but perhaps plausible, amount. Certainly, there may be systematic upward bias in prices throughout the economy—growth may always have been significantly greater than the published data indicate. Nevertheless, our estimates aim to gauge the impact on reported real growth of an assumed amount of additional upward bias in a particular set of prices.

We offer alternative estimates of growth for several periods: 1960-97, 1960-73, 1974-97, 1983-97, and 1992-97. This variety allows us to measure the effect on the historical real growth record of different assumptions about the start date of additional inflation bias in the price data for these selected services. We use 1974 because it corresponds to the start of the slower productivity era in the official data; 1983 and 1992 are starting dates for the last two economic expansions; for 1960-97, data availability determined the start date and the very preliminary nature of the 1998 data dictated the end date.

Our estimates reveal that, in general, a reduction in the rate of inflation in the rapidly growing, hard-to-measure services categories does raise recent growth rates. We find that both GDP and productivity growth since 1974 would have been, on average, about 0.5 percentage point higher if the inflation rates in these categories had been scaled back in line with our alternative estimates.[10] These are nontrivial adjustments.

Consider in particular how productivity growth would be affected if we assume that prices in the hard-to-measure services component grew at the same rate as other elements of nonfarm business output. In this case, annual productivity growth since 1983 would have averaged more than 2 percent, instead of less than 1½ percent. However, even this rather substantial change does not radically alter our view of the long-term dynamics of the economy. Even after the major upward revision to the post-1983 data, we would still find that the recent pace of productivity growth was considerably slower than the nearly 3 percent pace reported before 1974 in the published data.

Overall, our estimates reveal that both real GDP and productivity growth would have remained much lower in recent years than in 1960-73—even if the differential overstatement of inflation in these services had started

Table 2
How Reduced Inflation Rates in Hard-to-Measure Services Would Affect GDP and Productivity Growth

Inflation Rate	1960-97	1960-73	1974-97	1983-97	1992-97
	GDP Growth (Percent)				
Reported rate	3.2	4.2	2.6	3.1	3.0
Assumption 1[a]	3.5	4.3	3.0	3.5	3.4
Assumption 2[b]	3.5	4.4	3.0	3.5	3.5
	Productivity Growth (Percent)				
Reported rate	1.8	2.9	1.1	1.3	1.3
Assumption 1[a]	2.2	3.2	1.7	2.1	2.1
Assumption 2[b]	2.2	3.3	1.6	1.7	1.4

Sources: U.S. Department of Commerce, Bureau of Economic Analysis; U.S. Department of Labor, Bureau of Labor Statistics; author's calculations.

[a] Prices of hard-to-measure services grow at the same rate as other products.

[b] Prices of hard-to-measure services grow at a rate that is 2 percentage points slower than the published rate.

after 1973. (If the overstatement had begun before 1973, the earlier growth rates would have been higher, with the result that the inflation adjustments would produce even less narrowing of the gap.) As we suggested earlier, one cannot assume that continued low aggregate output and productivity growth relative to 1960-73 is an artifact of problems in pricing certain services unless the problems are believed to be very large relative to those of the past.[11] Of course, this conclusion applies only up to the present: As the share of these services in nominal GDP increases, any mismeasurement of their price inflation will have an increased impact on the aggregates.

Conclusion

Growth rates for real output and productivity have improved in recent years, and it is possible that the improvements will continue. However, we find it hard to attribute the inability of this growth through most of the 1990s to regain its 1960-73 pace solely to difficulties in the pricing of various hard-to-measure services—unless the pricing problems have widened to such a magnitude that the relative price of these services is now, in reality, declining. If problems in the price data in the rest of the economy are no worse than they were in the past, we conclude that it is difficult to blame technical problems in the computation of inflation for the continued failure of real output and productivity to display growth figures like those of the 1960s.

Our results suggest that improvements in the U.S. statistical system—with an emphasis on improved pricing of services—may not involve a radically different profile for aggregate growth, unless we believe that the improvements will raise the recent growth of nominal output relative to the past.[12] Rather than resulting in a fundamentally changed path for the real growth aggregates, an improved statistical system could well pay dividends in the form of a new understanding of the industrial sources of U.S. growth—a recognition, perhaps, that the share of real output and productivity growth produced by the services sector and other rapidly growing industries is greater than previously thought. It seems much less likely that we would see a major reconfiguration of the time path of the growth aggregates.

Notes

1. Real output, or GDP, is measured by the U.S. Commerce Department's Bureau of Economic Analysis; productivity, or output per worker-hour, is measured by the U.S. Labor Department's Bureau of Labor Statistics.

2. Steindel (1997a) compares the CPI and output price indexes.

3. One of the most noteworthy changes, in the 1980s, was the introduction of hedonic pricing of computers in the GDP data. This method of pricing is designed to capture the value of various product components to the user. More recently, techniques for pricing individual food items were enhanced. For an overview of changes in pricing procedures and their impact on the historic record of GDP growth, see Council of Economic Advisers (1998).

4. A number of authors, including Nakamura (1998) and Reinsdorf (1998), have pointed out that revisions made in the late 1970s to the construction of the CPI appear to have resulted in an upward bias of about 1.5 percentage points a year in the food at home component from 1978 to the mid-1990s. However, one could argue that the longstanding practice in CPI computation of removing the cost of mandated pollution control equipment in motor vehicles and seasonal pollution control additives in gasoline from the prices of these products has, all else equal, helped introduce a downward bias in the corresponding CPI components. Since January 1999, these costs have been included in the CPI.

5. For example, new procedures for the pricing of cellular phone services were incorporated into the National Income and Product Accounts in 1998; the new price series has been used to modify the real output of the communications industry back to 1995 (Seskin 1998). A case can therefore be made that the bias in communications price data is smaller from 1995 on than it was before 1995.

6. Corrado and Slifman (1999), for example, point to the oddly slow growth of productivity in the noncorporate sector of the economy. We should note that although there are many services in this sector, the sector is by no means representative of services as a whole, nor is it clear that all of its data problems are related to pricing.

7. This list of of hard-to-measure services is, of course, arbitrary, although Griliches (1994, note 15) produces a list that is virtually the same as ours. However, Griliches includes housing, which does not enter into the productivity data. Kroch (1991), who also discusses the relative difficulty of measuring the prices of different types of services, provides a similar list of spending categories with more significant measurement problems.

8. Financial services are not specifically listed, but they are included in the personal business, government, and net export categories. Note that spending on financial services enters directly into GDP when it is made by households or governments or as part of foreign trade.

9. The Boskin Commission provides some evidence to support our assumptions. For example, it estimated that medical care inflation in the CPI was overstated by 3 percentage points a year and personal financial services inflation was overstated by 2 percentage points a year. The commission did not supply a formal estimate of the bias in the other hard-to-measure categories in Table 1. Although the commission's point estimates are taken from the middle region of ranges, the assumption that 2 percentage points is an upper bound on the differential bias in the hard-to-measure services in the National Income and Product Accounts data is plausible, given the commission's finding that the probable bias in the CPI from individual pricing problems was less than 1 percent (other parts of the CPI bias come from the index's aggregation procedures, which are not at issue here), and recent changes in the pricing of medical care in the National Income and Product Accounts data. Berndt et al. (1998) provide a recent comprehensive review of the measurement of medical prices, but they do not estimate the overall bias in this sector.

10. The availability of 1997 data and revisions to 1995-96 data resulted in slightly higher estimates of the impact of alternative inflation assumptions in recent years than in Steindel (1997b).

The productivity adjustment is almost surely exaggerated, since it was made assuming that all outlays in the hard-to-measure categories were produced in the nonfarm business sector. Many medical, educational, religious, and welfare services are produced in the nonprofit sector of the economy.

11. Sichel (1997), Carlson and Schweitzer (1998), and Triplett (1999) reach similar conclusions.

The fairly substantial difference between the two alternative assumptions in the last two columns of the productivity growth half of Table 2 reflects the combined effect of two factors: the very large share of nonfarm output credited to hard-to-measure services (now more than 40 percent) in recent years and an inflation divergence between hard-to-measure services and the rest of nonfarm output averaging more than 2.5 percentage points a year in the recent periods.

12. It is possible that corrections to measured inflation—and the subsequent changes to reported real growth—cannot be made to the entire historical record. If such changes affect only part of the record, the more recent growth figures could look substantially stronger relative to those in the more distant past—but this would in part reflect a break in the consistency of the data over time.

The discussions in the Boskin report (Boskin et al. 1996) and Griliches (1994) of the possibility of including quality-of-life measures in price and output measures may be viewed as outlines of ways to redefine nominal and real output, and could potentially change the output measures' growth paths.

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