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New Estimates of the Recent Growth in Potential Output

The level and growth rate of potential output are important considerations in determining monetary policy. Loosely defined, potential output is the amount produced when labor and physical capital are at levels of utilization that create no pressure on inflation to change—the so-called "natural" levels of utilization. If an economy is operating below its potential level, the slack in resources slows price inflation. Conversely, inflation is likely to increase if output is above potential. Of course, over time, actual output also cannot generally *grow* faster than potential output without increases in inflation. In this way, the growth rate of potential output determines how fast the economy can expand in a sustainable way, and is thus an important speed limit for the economy that policy should respect.

Estimating the growth rate of potential output for the entire economy with any degree of certainty is difficult. This *Weekly Letter* provides some simple, broad-brush estimates by means of Okun's Law, which is an often-used empirical regularity between the growth rates of actual and potential output and changes in the actual and natural rates of unemployment. In particular, I consider how the new "chain-weighted" measure of Gross Domestic Product (GDP) may change estimates of the recent trend in potential output. The chain-weighted measure of output appears to be consistent with a slower increase in recent potential output than the traditional fixed-weighted series. Indeed, I estimate that chain-weighted potential output has grown at about a 2 percent annual pace during the first half of this decade—almost one-half of a percentage point slower than on a fixed-weighted basis.

Okun's Law

In its most common form, Okun's Law simply states that, over the business cycle, output and unemployment tend to move in opposite directions and roughly in proportion to one another; specifically, the cyclical change in the unemployment rate, that is, its change minus any change in the natural rate of unemployment, is proportional to the difference between the growth rates of potential and actual output. (Recent discussions are provided by Braun (1990) and McNees (1991).) In theory, there is no reason why Okun's Law should hold. Fluctuations in labor productivity, the average workweek, and labor force participation could each drive wedges between the movements in output and unemployment. In practice, however, the fluctuations in these other series are well-correlated with movements in the unemployment rate. For example, the average workweek tends to fall as unemployment rises (perhaps because firms try to hoard employees through downturns by reducing hours worked instead of firing workers).

The rule of thumb for the factor of proportionality in Okun's Law is one-half; that is, if output grows 1 percentage point faster than the growth rate of potential for one year, the unemployment rate falls by about 0.5 percentage point. The percentage variation in real output is thus twice as large as the percentage-point fluctuations in the unemployment rate. This reflects the fact that fluctuations in productivity, the average workweek, and labor participation tend to damp movements in unemployment.

Estimates of potential output

With a few assumptions, Okun's Law can be used to estimate the growth rate of potential output. First, I will assume that this growth rate is fairly constant. This is probably not too bad of an approximation over short periods of time (Rudebusch 1993); consequently, I will limit my data sample from 1980 onward.

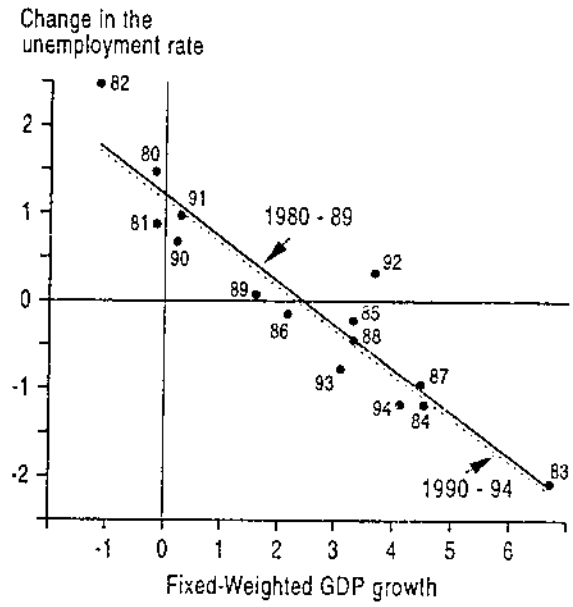
Second, I will make an assumption about changes in the natural rate of unemployment. Many have argued that changes in the composition of the labor force, especially the effects of the entrance and aging of the large baby-boom cohort in the labor market, induced significant changes in the natural rate. Most notably in the 1980s, the labor force share of younger workers, who generally have the highest unemployment rates, fell

dramatically. The general contour of several published estimates (for example, Weiner 1993) suggests that the natural rate fell by about one-half of a percentage point during the 1980s but has changed little so far in the 1990s as the demographic composition of the labor force stabilized.

With these assumptions, an estimate of the growth rate of potential output can be obtained by comparing the change in the unemployment rate to the percent change in actual output. Figure 1 demonstrates this exercise. The vertical axis measures the change in the quarterly average unemployment rate (excluding the annual 0.05 percentage point decrease in the natural rate during the 1980s), and the horizontal axis measures the percent change in fixed-weighted real GDP. (These changes are measured from fourth quarter to fourth quarter of adjacent years.) The slope of the solid line gives the factor of proportionality in Okun's Law. Here that slope is estimated to be almost exactly one-half, supporting the usual rule of thumb.

The point at which this line crosses the horizontal axis—that is, where the unemployment rate does not change—gives an estimate of the growth rate of potential output. This is because if the unemployment rate is stable, actual output must be growing at the same pace as potential output. At points below (above) the horizontal axis, unemployment is falling (rising), and the economy is growing faster (slower) than potential. Over the whole sample from 1980 to 1994, such an Okun's Law estimate of the growth rate of potential is 2.4 percent, which is in the usual range of estimates. In Figure 1, the growth rate of potential is allowed to take on different values during the period 1980–1989 and during 1990–1994. The solid line is based on the earlier sample and intersects the horizontal axis at 2.5 percent. The dotted line is based on the later sample and intersects at 2.3 percent. These numbers are very close; indeed, statistically, there is a four out of five chance that there has been no change in the growth rate of fixed-weighted potential output across the two samples. Thus, on a fixed-weighted basis, potential output appears to have been growing at a fairly steady pace during the past 15 years.

Figure 1
Okun's Law with Fixed-Weighted GDP



Chain-weighted potential output

The estimates of potential output given above use the traditional fixed-weighted or constant-dollar series on real GDP. During 1995, the Bureau of Economic Analysis (BEA) has started to promote a new chain-weighted measure of real output. The chain-weighted series provides a better answer to the question of how to add up all the diverse goods and services produced in the economy at each point in time even when the general level of prices is changing.

The traditional fixed-weighted real GDP series values each product at its price in 1987—the base year—rather than at the price actually paid. This measure of output thus eliminates the increase in the level of nominal spending that occurs because of general inflation in the price level. There is, however, a significant shortcoming: a fixed-weighted measure uses the levels of *relative* prices in 1987 for valuing various goods and services in all other years. Thus, if in 1987, five computers cost as much as one car, the fixed-weighted GDP series uses this five-to-one relative price to add up computers and cars in every year.

To understand the flaw in this procedure, assume that in 1987, five computers were produced, so the value of this computer output was equivalent to the value of one car. Also assume that by 1995 the price of computers fell, so ten computers cost as much as one car, and the output of computers rose, so ten computers were being produced. Of course, in 1995 relative prices, it is still the case that "one car's worth" of computers is being produced in 1995. However, in the fixed-weighted measure with a 1987 base year, the ten computers produced in 1995 are worth the same as two cars. Thus, in some sense, the use of a 1987 base year overstates the amount of real computer output in 1995. Such a bias in measuring output that

is not produced in the base year is typical of fixed-weighted measures. The bias is reduced with the new chain-weighted measures of real output, which, in essence, use a sequence of base years, and nearly contemporaneous relative prices, to value output. (See Motley (1995) for details.)

Figure 2 examines Okun's Law using the chain-weighted measure of real output. The slopes of the solid and dotted lines are unchanged at one-half, so the magnitude of the tradeoff in Okun's Law appears unaffected. Also, over the whole sample from 1980 to 1994, the estimate of the growth rate of potential (not shown) is 2.4 percent, as for fixed-weighted GDP. However, allowing the growth rate of potential to change between the 1980s and the first four years of the 1990s yields striking results. The solid line for the earlier sample crosses the horizontal axis at 2.6 percent, while the dotted line for the later sample crosses at only 2 percent. This represents a dramatic slowing in the growth rate of potential output. Statistically, there is only a one in six chance that there has been no change in the growth rate of chain-weighted potential output across the two samples. Thus, there is a definite possibility that the growth rate of potential output fell at the start of this decade.

Such a drop in the growth rate of potential would not be too surprising. Growth in the labor force has slowed significantly so far in the 1990s, as both working-age population growth decreased and the labor force participation rate flattened out. This slowdown could easily have subtracted a half of a percentage point from the potential output growth rate. Using the fixed-weighted aggregate output measure, an apparent increase in the growth rate of productivity in the 1990s offsets this decline; however, this acceleration in productivity is just the spurious result of measuring each year's output (particularly computers) with 1987 relative prices. That is, higher recently measured productivity growth on a fixed-weighted basis did not reflect higher efficiency gains through increased use of computers, as some have argued; instead, ironically, it merely reflected the mismeasurement of computer output. (See Oliner and Wascher (1995).) On a chain-weighted basis, there is no significant change in productivity growth in the 1990s, so the weak labor force growth damps the growth of potential.

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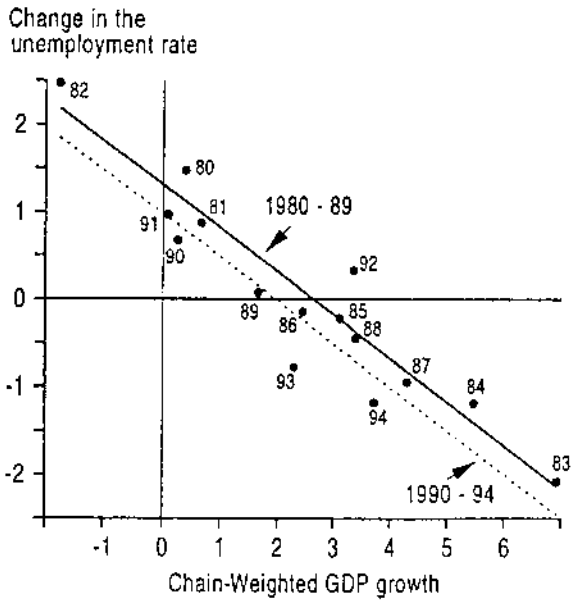
Figure 2
Okun's Law with Chain-Weighted GDP



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