
FRBSF WEEKLY LETTER

March 9, 1990

Unemployment and Inflation

The civilian unemployment rate in the United States has declined by nearly two percentage points in the past two years and now stands at 5¼ percent, the lowest rate in ten years. Many worry that because this rate is below the sustainable, "natural" rate of unemployment, pressure in labor markets eventually will cause inflation to rise.

These concerns stem from the "Keynesian" interpretation of business cycles, which posits that economic fluctuations result mainly from changes in the aggregate demand for goods and services. This interpretation has been challenged in recent years by "real business cycle" models. These models reflect the view that changes in technology, the supply of labor, and other aggregate supply factors primarily are responsible for fluctuations in economic activity.

The relative merits of these alternative interpretations of economic fluctuations are of concern to monetary policy makers. Supply-induced changes in economic variables often have different implications for the appropriate course of monetary policy than do demand-induced movements. For example, if the decline in the unemployment rate were due to an increase in aggregate supply, inflation actually might *decline*, in contrast to the Keynesian scenario outlined above.

In this *Letter*, we review the alternative views of economic fluctuations and discuss their implications for the current economic situation in the United States.

Sources of business cycles

Any complete model of the economy must incorporate the effects of aggregate supply. These fundamental supply factors include technological change, new ways to combine labor and capital more efficiently, growth in the working-age population and changes in the proportion of the population that chooses to work, changes in preferences for hours of work by the labor force, as well as changes in tax laws that may affect

decisions concerning work and investment in physical capital.

Keynesian models generally assume that these aggregate-supply factors evolve smoothly according to a simple trend, and accordingly generate a stable long-run average rate of growth in output. This long-run trend in output is called "potential GNP." Moreover, Keynesian models assume that the effects of supply factors on potential GNP can be neatly separated from the effects of demand factors, which determine the economy's fluctuations around its underlying path.

In Keynesian models, changes in aggregate demand lead to a short-run trade-off between inflation and unemployment. For example, Keynesians argue that an increase in aggregate demand leads to an increase in firms' demand for labor and to a lower unemployment rate. As firms bid for labor in a tightening market, they must pay higher wages, which are passed along as higher prices of goods and services. Thus, Keynesian models predict an inverse short-run relationship between inflation and unemployment; a fall in the unemployment rate, for instance, is followed by an increase in the rate of inflation. Of course, in the long-run, unemployment must return to its natural rate, which is determined by underlying conditions in the labor market and is consistent with potential GNP.

Keynesian models do ascribe a limited role to supply factors by allowing certain relative prices, such as the relative price of oil and the exchange rate temporarily to affect the rate of inflation at any given unemployment rate. However, the emphasis is on modeling the effects of demand factors.

Real business cycle models reverse the relative weights on demand and supply factors as causes of business cycles. In fact, much of this research finds that supply factors alone can explain both the basic trend and cyclical fluctuations in the U.S. economy. In contrast to the Keynesian view, real business cycle theorists argue that sudden

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technological change can induce cyclical movements in GNP because there are lags in the dissemination and implementation of a new technology which cause output to adjust only gradually to new, higher levels.

Supply shocks also can affect the relationship between unemployment and inflation. A technological advance in the production of a particular good, for example, can be characterized as a decline in the relative price of that good. This drop in relative price shows up initially as a decline in the overall rate of inflation. The subsequent gains in productivity as the new good is put to use also hold inflation down.

At the same time, implementation of the new technology may cause employment to rise and unemployment to fall, as the technologically-advanced good is produced and its productivity-enhancing effects raise real GNP and the demand for labor. Thus, a technology shock can produce reductions in both unemployment and inflation.

These alternative theories suggest different relationships between changes in unemployment and inflation. In particular, a decline in unemployment is a harbinger of higher future inflation in the Keynesian model and of lower inflation in the real business cycle model. It also is possible that both factors operate simultaneously, so that the observed inflation rate is a mix of the two.

Demand and supply

In assessing the relative importance of supply-versus demand factors as determinants of the relationship between inflation and unemployment, it is necessary to obtain measures of aggregate demand and supply. However, this is not a straightforward task.

Although fiscal and monetary policy are commonly held to be important determinants of aggregate demand, it is difficult to find accurate measures of each. The money supply often has been used as a measure of the Fed's monetary policy stance, but deregulation of the financial system has made this a poor measure of Fed policy. Similarly, major measurement problems make it difficult to obtain accurate measures of the stance of fiscal policy. For example, budgetary measures of fiscal policy do not include a measure of the "tax" imposed by inflation, nor

do they distinguish between current and capital expenditures.

Supply factors also are difficult to measure by direct observation. In principle, it may be possible to measure them directly through changes in labor productivity, but data on productivity have shortcomings of their own.

An alternative approach to direct measurement is to statistically estimate aggregate demand and supply shocks using aggregate economic data. Professors Olivier Blanchard and Danny Quah of the Massachusetts Institute of Technology have developed such a method. This method extracts information about these shocks by estimating a statistical model under the assumptions that supply shocks may have long-run effects on "real" variables like real GNP, while demand shocks have only temporary effects. In contrast to most earlier research on the issue, this method is agnostic about Keynesian and real business cycle theory; it has the advantage that it permits both supply and demand factors to affect inflation and unemployment. As a result, the relative importance of these two factors can be estimated.

We used this technique to estimate demand- and supply-induced movements in the unemployment rate. This research is described in detail in this Bank's Fall 1989 *Economic Review*. Using data from 1948 to 1988, we found that both demand and supply shocks have a significant effect on the unemployment rate. A positive demand shock leads immediately to a relatively large reduction in the unemployment rate. The unemployment rate continues to decline for approximately a year, but gradually moves back up to its original level within about three years. A typical supply shock has a smaller effect on the unemployment rate than a typical demand shock, but the effects of the supply shock are more persistent. The unemployment rate falls gradually following a positive supply shock, with the maximum effect occurring after two years and the unemployment rate returning to its original level after four years.

Inflation/unemployment trade-off?

To see how demand and supply shocks affect the relationship between the unemployment rate and inflation, we decomposed movements in the unemployment rate into those caused by the two kinds of shocks and compared each of these components to the inflation rate.

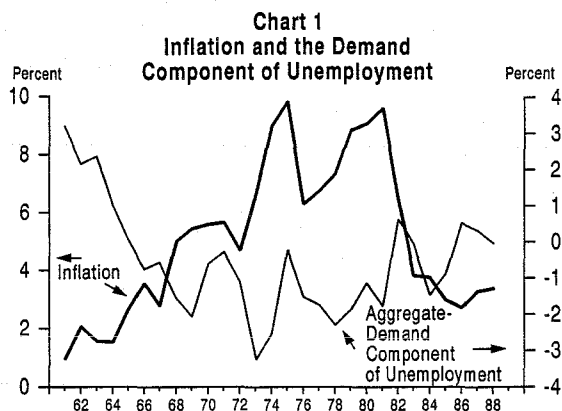
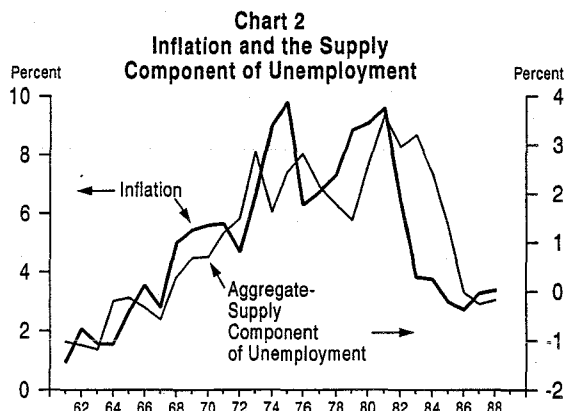


Chart 1 compares the demand-induced changes in the unemployment rate with the rate of inflation from 1961 to 1988. The chart reveals the expected negative correlation. For instance, aggregate demand pressures reduced the unemployment rate almost continuously from 1961 to the early 1970s, and this decline was mirrored in the rising rate of inflation. During the 1980s aggregate demand pressures have been more balanced, and the inflation rate has declined.

Chart 2 shows the supply-induced component of the unemployment rate and the rate of inflation. As expected, we find a positive correlation between the two. The rise in inflation during the 1970s was accompanied by supply-induced increases in the unemployment rate, and the fall in inflation during the 1980s was accompanied by supply-induced decreases in the unemployment rate.

Implications

Both demand and supply shocks appear to have affected the unemployment rate and inflation. Moreover, the observed relationship between movements in these important variables depends upon which shock has the largest influence in any given period. When demand shocks dominate, inflation and unemployment tend to move in opposite directions; when supply shocks dominate, they move in the same direction.



This implies that one cannot predict future inflation from a given rate of unemployment unless one knows which factor caused the rate to move away from its long-run trend. If unemployment is low because of supply factors, we may see lower inflation.

Our work suggests that the relatively low unemployment rate that currently prevails in the U.S. was the result of both positive demand and supply shocks. Expansionary fiscal policy, which has resulted in record federal budget deficits, is a likely candidate for the demand shock. For the supply shock, a number of observers have suggested that the reduction in marginal tax rates and the deregulation of a number of industries have enhanced the productivity of the U.S. economy. Another possibility is that rapid advance in computer technology in recent years has raised productivity.

Whatever the sources of these shocks, the presence of the demand shock suggests that there is inflationary potential in today's low unemployment rate. Nonetheless, inflation may not accelerate because supply shocks appear to be putting downward pressure on inflation at the same time.

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