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Inflation and Growth

In recent years, the Federal Reserve has stressed its long-run commitment to maintaining low inflation because it believes that persistent inflation imposes burdens that reduce economic welfare. A variety of such burdens have been identified in the economics literature. This *Weekly Letter* examines the argument that a lower rate of inflation increases the potential growth rate of the economy, and discusses the possible size of this effect. Since a policy to reduce inflation generally has some short-run costs because it requires a temporary slowing of economic activity, it is useful to estimate its benefits in the form of higher long-run growth.

How inflation might lower growth

Inflation might affect potential output in a number of ways. First, inflation may interfere with the efficiency of the price system and make it more difficult for households and firms to make correct decisions in response to market signals. It is often argued that when most prices are rising, economic agents find it harder to distinguish between changes in relative prices that require them to reallocate resources and changes in the overall price level that require no such microeconomic response. A widget-producing firm that observes that its customers are bidding higher prices for its widgets may interpret this as indicating a rise in the demand for its products, when it actually represents the effects of generalized inflation in which the prices of competing products (wadgets, wodgets, etc.) also are rising at the same pace.

Second, inflation imposes various costs on the economy that would disappear if prices were stable. The costs of changing prices and wage rates frequently, the search costs imposed on buyers and sellers when prices change often, and the costs of economizing on holdings of non-interest-bearing money ("shoe-leather" costs) are familiar examples.

Inflation also has differing effects on individuals. For example, the incomes of wage and salaried workers generally are adjusted for inflation only annually, whereas self-employed workers can alter the prices of their services more frequently.

Similarly, inflation, especially when it is unexpected, tends to benefit borrowers at the expense of lenders. Finally, because some parts of the tax code are indexed for inflation whereas others are not, generalized increases in prices have differing effects on individual tax-payers. As a result of these considerations, inflation often is perceived as causing unfairness, since some households and firms benefit and others are harmed.

However, whether or not these differential effects of inflation are unfair, they do impose real costs on society at large. They frequently add to the uncertainties that households and firms face, which may be undesirable even for those that turn out to benefit. And many activities that seek to reduce the impact of inflation on individuals may hurt the overall economy but yield no corresponding overall benefits. In an inflationary economy, for example, talented persons may devote their energies to developing strategies to avoid the deleterious consequences of inflation for themselves rather than to inventing new products and processes that would raise overall living standards. Unfortunately, many of these activities that aim to mitigate the effects of inflation are counted as additions to measured GDP, even though they may not add to welfare in any meaningful sense.

Finally, inflation may affect investors' saving and investment decisions, reducing the proportion of GDP devoted to investment and causing the economy to accumulate less productive capital. For example, when inflation is high, it usually tends to be more variable and so harder to forecast. Uncertain inflation makes it more difficult to deduce the real returns on investments from available market information. As a result, savers and investors often are less willing to enter into long-term nominal contracts or to invest in long-term projects. The reduced stock of productive capital that results from decreased investment will, in turn, imply lower levels of future GDP.

These considerations suggest that there are sound *a priori* reasons why persistent inflation might reduce the growth rate of GDP in the long run. A

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number of studies have investigated the sources of long-term growth using data from a cross-section of countries, and several have examined whether differences in growth among countries are related to differences in average rates of inflation. The results have been mixed, perhaps because it is difficult to isolate the impact of inflation on long-run growth.

Why the effects of inflation are hard to discern

The most obvious difficulty is that inflation is only one of many factors that may affect a country's long-run growth. For example, a country that saves a large share of its output and devotes it to investment in productive capital or to educating its workers is likely to enjoy a higher and more rapidly growing GDP than one that devotes most of its output to current consumption. Conversely, a country with a rapidly increasing population is likely to have lower GDP per worker because more of its saving is needed just to provide the *existing* levels of education and capital to the new entrants to its work-force and so less is available to increase the stocks of human and tangible capital *per worker*. Finally, many empirical studies find that countries with initially low levels of output tend to grow more rapidly than advanced countries, perhaps because they find it easier to adopt technologies that already are in use in more advanced economies or because their output levels are below the long-run equilibrium associated with their rates of saving and population growth.

To isolate the impact of inflation on growth, we also must estimate the effects of these (and other) systematic influences, in order to judge what, if any, additional explanatory power inflation provides. Unfortunately, there is no fully accepted model of economic growth that can serve as a baseline for estimating the additional effects of inflation. Although most economists agree that factors such as the saving rate and the population growth rate are important determinants of overall growth, they are far from unanimous on the precise mechanisms through which their effects are felt.

In addition to variables that received economic theory suggests should be related to long-term growth, there is a vast array of factors that might plausibly have an influence. Political stability, the size of the financial sector, openness to world trade, and the size of the government sector all have been suggested as potential influences on

growth. Each of these factors may be measured in a variety of ways. Econometricians may be tempted to search the data to find the set of variables that were most closely related to growth in the past. The problem is that statistical relationships that are uncovered by such "data-mining" but that have no genuine causal basis are unlikely to hold up in the future. Moreover, some of these "plausible" variables may be statistically related to inflation so that their inclusion may obscure the link between inflation and growth.

Another serious problem is that even if inflation does reduce long-run economic growth, this effect may be difficult to detect in the data because there also may be short-run links that obscure the long-run relation. In the short run, real growth may be *positively* related to inflation because fluctuations in GDP reflect variations in aggregate demand. In a cyclical upswing, increasing demand may raise real output while it also bids up prices by putting greater pressure on resources. As a result, we may observe a positive relation between real GDP growth and inflation in the short run, even though there is a negative relation over the long haul.

Any long-run relation between inflation and growth also may be obscured if the world is affected by supply shocks that influence prices and/or real output by differing amounts in different countries. Indeed, the observed negative across-country correlation between long-run inflation and growth might be due to a small number of major supply shocks that affected the levels of prices and of output in a significant group of countries. For example, if a worldwide increase in the price of oil were to permanently raise the *level* of prices and lower the *level* of output by more in some countries than in others, a cross-country comparison over a longer period that included the oil shock years might detect a negative correlation between the average *growth rates* of prices and output, even if there were no causal relation between these two growth rates.

Dealing with the statistical problems

Recent research at this Bank (Motley 1993) has attempted to deal with these problems in a variety of ways. This research used a model of economic growth that economists previously have found helpful in understanding differences in experience among countries (Solow 1956, Mankiw, Romer, and Weil 1992). This model emphasizes the key role of the rates of saving and population

growth as the fundamental determinants of long-run growth, since these factors ultimately determine the supplies of capital and labor.

This model was expanded to include the effects of differences in rates of inflation. Inflation was assumed to influence long-run growth by affecting the pace of "technological change," a portmanteau term that includes the effects of all variables apart from the supplies of the factors of production. This choice of theoretical framework implies that although technological change is affected by inflation, it is otherwise exogenous and so is independent of the saving and population growth rates.

No other variables apart from those suggested by this theoretical model were included in the empirical analysis. This limitation avoids the temptations of data mining, but it implies the risky assumption that economic growth is driven by the same fundamental forces in countries with widely diverse environments.

The statistical problem of separating the longer-run effects of inflation on potential GDP from any short-run business cycle relation between prices and output was dealt with by examining growth and inflation over a long period that spanned several business cycles. This makes it more likely that the results represent a long-run relationship. At the same time, the possibility that any long-run correlation between inflation and growth actually represents the influence of a few supply shocks was examined by estimating cross-section equations over a series of shorter time periods in addition to the cross-section covering a longer span. Finding a negative cross-section relation between inflation and real growth in several time periods of varying length might constitute evidence that it represents a true causal relation rather than the effect of supply shocks that affected countries differently. However, this procedure raises the possibility that the equations estimated over the shorter time periods may be contaminated by the business cycle problem mentioned earlier.

Findings

The results of this research suggest that countries with lower inflation rates do tend to exhibit higher rates of long-run growth. The cross-country comparisons indicate that a 5 percentage point decrease in the average rate of inflation

is associated with an increase in annual growth per capita of about 0.2 percentage point. Since inflation in the U.S. between 1982 and 1992 was about 5 percentage points lower than during the previous ten years, this result suggests that the lowering of inflation will add about 0.2 percentage point to long-run growth. This is sufficient to increase the discounted lifetime income of a typical worker by an amount equal to about one year's income, assuming a 40-year working life and a 3 percent real discount rate. This estimated benefit exceeds the costs of lowering inflation which typically are estimated as amounting to at most one-fourth of one year's GDP for a 5 percentage point reduction in inflation (Ball 1993, Mankiw 1992, p. 309). It must be recognized, however, that although the benefits exceed the costs in present value terms, much of the benefit will accrue in the relatively distant future, whereas the costs must be borne today.

As I have emphasized, there are a number of statistical problems that always will make it difficult to demonstrate conclusively that lower inflation will lead to faster growth. However, the evidence in this study, while not conclusive, not only is consistent with such a relationship but also suggests that the quantitative magnitude of this effect is sufficiently large that policymakers should lean toward low inflation.

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