

BUSINESS

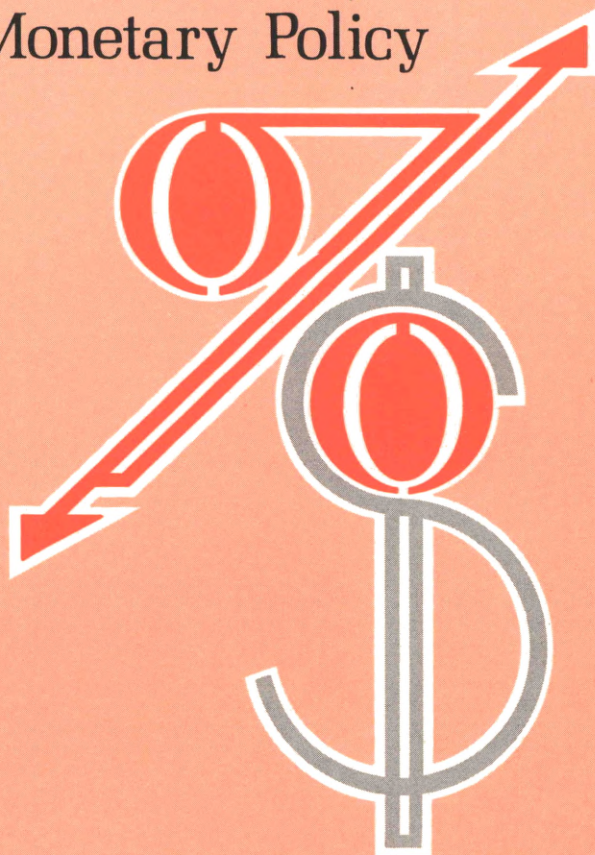
REVIEW

Federal Reserve Bank of Philadelphia

ISSN 0007-7011

MAY·JUNE 1981

Efficient Markets,
Interest Rates, and
Monetary Policy



Supply-Side Economics:
What Chance for Success?

MAY/JUNE 1981

**EFFICIENT MARKETS,
INTEREST RATES,
AND MONETARY POLICY**

Donald J. Mullineaux

. . . Efficient markets theory argues for a stable and predictable monetary policy.

**BUSINESS
REVIEW**

Federal Reserve Bank of Philadelphia
100 North Sixth Street
(on Independence Mall)
Philadelphia, Pennsylvania 19106

**SUPPLY-SIDE ECONOMICS:
WHAT CHANCE FOR SUCCESS?**

Aris Protopapadakis

. . . Inflation probably cannot be reduced significantly through supply-side policies alone.

The BUSINESS REVIEW is published by the Department of Research every other month. It is edited by John J. Mulhern, and artwork is directed by Ronald B. Williams. The REVIEW is available without charge.

Please send subscription orders, changes of address, and requests for additional copies to the Department of Public Services at the above address or telephone (215) 574-6115. Editorial communications should be sent to the Department of Research at the same address, or telephone (215) 574-6426.

• • • • •

The Federal Reserve Bank of Philadelphia is part of the Federal Reserve System—a

System which includes twelve regional banks located around the nation as well as the Board of Governors in Washington. The Federal Reserve System was established by Congress in 1913 primarily to manage the nation's monetary affairs. Supporting functions include clearing checks, providing coin and currency to the banking system, acting as banker for the Federal government, supervising commercial banks, and enforcing consumer credit protection laws. In keeping with the Federal Reserve Act, the System is an agency of the Congress, independent administratively of the Executive Branch, and insulated from partisan political pressures. The Federal Reserve is self supporting and regularly makes payments to the United States Treasury from its operating surpluses.

Efficient Markets, Interest Rates, and Monetary Policy

By Donald J. Mullineaux*

“It is evident, then, that the rate of interest is a highly psychological phenomenon . . . the long-term rate of interest will depend, not only on the current policy of the monetary authority, but also on market expectations concerning its future policy . . . a monetary policy which strikes public opinion as being experimental in character or easily liable to change may fail in its objective of greatly reducing the long-term rate of interest.”

A well-read student of current trends in economic thinking no doubt would judge these the musings of one of today’s growing number of rational-expectations theorists. Actually, though, the words were penned in 1936 by John Maynard Keynes in his classic *General Theory of Employment, Interest and Money*. This may come as a small surprise to those who credit Keynes with the proposition (or fault him with it, depending on the reader’s perspective) that an increase in the supply of money will lower both short-term and long-term interest rates. To be sure Keynes said just that; but economist par

excellence that he was, qualifications clearly crept into his argument.

The link between money and interest rates is, like sex, both an old issue and a hot topic. The President’s economic program, which includes an assumption that the Federal Reserve will pursue gradual reductions in monetary growth over the next six years, has generated a flurry of commentary. Administration spokesmen claim that monetary deceleration will mean rapid and substantial declines in interest rates. But many economists, and practically all the large-scale econometric models, contend that slower money growth brings on higher interest rates in the short term. Rates will fall in this traditional view only after a long period of adjustment. Since higher interest rates could have damaging effects on a recovering economy, the issue is more than academic.

*Donald J. Mullineaux, who received his Ph.D. from Boston College, is Vice President and Director of Research at the Federal Reserve Bank of Philadelphia. He writes on financial institutions and markets as well as on monetary theory and policy.

One fairly novel approach to explaining how financial markets work—the efficient-markets view—suggests that either the Administration or its critics could prove correct. A monetary slowdown can result in higher, lower, or even unchanged interest rates in this theory. The outcome hinges on *what's happening to expectations in financial markets*. Unlike the traditional view, the efficient-markets approach *allows for a very quick reduction* in interest rates in the face of slower money growth, though other outcomes are also possible.

The efficient-markets logic illustrates the complexities of the link between money and interest rates—an issue that policymakers can hardly ignore. The message that emerges is to avoid a monetary policy that, in Keynes's words, "strikes public opinion as being experimental in character or easily liable to change." A stable policy will be a predictable one, and where efficiency reigns, a predictable policy should lend stability to financial markets and to the economy as a whole.

**THE CONVENTIONAL WISDOM:
SLOWER MONEY GROWTH
MEANS HIGHER RATES
AND LESS ECONOMIC ACTIVITY**

One of the oldest topics in monetary theory concerns the so-called transmission mechanism of monetary policy—in plain English, the way monetary policy works. Most economists agree that interest rates, especially long-term interest rates, play a center-stage role in this story. As the tale begins, in the traditional view, a deceleration in money growth induced by the Federal Reserve leads to a prompt increase in short-term interest rates. Short rates rise because people must be persuaded to slow the pace at which they build up their money holdings. Since the short-term rate (the 90-day Treasury bill rate, say) measures the interest people forgo by holding noninterest-bearing money, a sufficiently large increase in this rate should

make people want to add to their money balances at a more gradual pace.

But this curtain-raiser represents only the beginning of a complicated story. Having seen that interest rates have increased, financial market participants are said to revise their outlook about the *future course* of short-term interest rates. In particular, the conventional wisdom claims that people will think that, because interest rates are higher today, they are likely to be at least somewhat higher in the near-term future. Once this happens, long-term interest rates also will increase. Why? Because long-term rates depend to some extent on what people expect to happen to future short-term rates.

Consider the following two alternatives facing Miss Marple, who has funds available to lend for a one-year period:

Strategy 1

Buy a one-year (long-term) Treasury bill yielding 12 percent.

Strategy 2

Buy a six-month (short-term) Treasury bill currently yielding 10 percent, then reinvest at maturity in another six-month bill which she *expects* to be yielding 14 percent at the time.

If we ignore the element of risk (which arises in part because future rates are imperfectly predictable), she will be indifferent between the two strategies since each yields an average return of 12 percent over the year. But if the short-term rate expected six months from now suddenly were to increase to, say, 20 percent, Miss Marple—and people with expectations similar to hers—would then prefer the six-month (short-term) bill; purchasing two short-term bills successively would yield an average return of 15 percent. As everyone attempted to sell off one-year

bills, however, the rate on these securities would rise. In fact, it would increase until the long rate was once again approximately equal to the average of the current short rate and the expected future short rate (15 percent). Long-term rates in effect embody a forecast of future short rates.¹

According to the standard view, then, long rates increase on the heels of decelerated money growth once people recognize that current short-term yields have risen and they consequently boost their forecasts of future rates. But rates don't change all at once; rather it takes time for people to adjust their expectations. So long-term rates will be increasing over what might be a substantial time period following a slowdown in money growth.

The denouement to this standard transmission-mechanism story is that several kinds of spending—especially housing expenditures and business expenditures on plant and equipment—are sensitive to movements in long-term rates. Here again, people and businesses are viewed as reducing these expenditures only gradually in response to higher long-term rates, so that still another time lag is introduced into the monetary policy process. Thus slower money growth exercises a constraint on spending over a lengthy period of time, lasting at least several years.

The story has an epilogue, and economists such as Milton Friedman have strongly emphasized it.² As reduced spending slows economic activity, the increase in rates

eventually will be reversed because of weaker demands for credit. And if the policy restraint imparts less momentum to inflation, interest rates will fall still further as lenders recognize that more slowly rising prices in the future mean each dollar they're repaid will buy more goods and services. To reflect this anticipated increase in purchasing power, they'll be satisfied with a lower rate of interest. Thus to the extent that slower money growth means a lower rate of output or less inflation, it will bring on lower interest rates eventually. But according to many monetary analysts, this shift takes quite a long period of time. And many econometric models indicate that it will be a number of years before slower money growth leads to lower long-term rates of interest.

THE EFFICIENT-MARKETS CHALLENGE

The conventional view of the way monetary policy works pays only limited attention to the role that *information* about a policy change might play in the whole process. In particular, financial-market participants are viewed as reacting mainly to information about what's happening to short-term interest rates while paying little heed to the behavior of other policy related phenomena, such as the rate of money growth. This apparent disregard for potentially useful information lies at the root of the criticism of the traditional view levied by those who believe financial markets are efficient.

Market efficiency has to do with the relation of prices to information. The market for financial assets such as long-term bonds is said to be efficient, for example, if the price of each bond fully reflects all the available information that might have an impact on its price. Information about the Federal government's plans for future borrowing, for instance, will be reflected in current bond prices in an efficient market. And if a bond's price reflects such information, so will its yield.

The argument for believing that a market

¹This averaging formula holds as an approximation for longer term securities of any maturity (again, in the absence of risk). The longer the maturity, the greater the number of future short-term rates that get averaged into long rates, however.

²For a nontechnical discussion, see Milton Friedman, "Factors Affecting the Level of Interest Rates," Proceedings of the 1968 Conference on Savings and Residential Financing, sponsored by the U.S. Savings and Loan League (Chicago: The League, 1969), pp. 11-27.

is efficient flows from this fact: an inefficient market offers opportunities for above-average profits. An old economic adage says that people will move quickly to take advantage of unusual profit opportunities until they disappear. To take an example from the stock market: suppose only one person knows about tomorrow's announcement of a firm's sharply higher earnings. He can do quite well by buying that firm's stock today. But if everyone knows the announcement is coming, the stock price will have been bid up already and there won't be any unusual profit opportunity. An efficient market allows above-average profits only when relevant information isn't publicly available.³

A basic message of the efficient-markets approach is that only unexpected events will cause changes in interest rates, so that only *new information* will have an impact on financial-market yields. Past developments and even anticipated events—such as an expected large cut in government spending—already will be reflected in today's yields in financial markets.

The efficient-markets approach calls into question the traditional view of the monetary policy process, particularly its failure to distinguish anticipated from unanticipated policy shifts. Since only new information can affect yields in an efficient market, a change in the current stance of monetary policy (as reflected by the growth rate of the money supply) will affect interest rates only if the shift was not expected. An expected policy change would be factored into financial market yields *before* the shift takes place.

Interest Rates and Shifts in Money Growth: The Key Role of Expectations. Many

³Trading on inside information (such as was alleged in recent reports of stock purchases by individuals involved in arranging corporate mergers) could yield very large profits, even in an efficient market. Trading based on this kind of information, however, generally is prohibited by law.

economists argue that the interest rate on a financial asset of given maturity roughly equals the so-called real rate (the interest rate in the absence of any inflation) plus the expected rate of inflation over the asset's time horizon (the inflation premium). So if people expect that inflation rates will fall in the future, they also should expect lower future short-term interest rates because the inflation premium will fall. This anticipated reduction in future short rates should be reflected in long rates now because long rates reflect forecasts of future short rates.

But why should people expect future inflation to be lower than today's inflation? One reason might be that they expect money growth rates to fall since slower money growth historically has been accompanied by lower inflation rates. If people anticipate that money growth will be reduced permanently next year by five percentage points, for example, then *today's* long-term rate should be lower than if people expect no reduction in money growth. If and when money growth does so decelerate, there will be no reason for long-term rates to change because there will be no new information in the fact that people's expectations are borne out.

But suppose people receive a piece of news that leads them to revise their expectations of future money growth. Suppose everyone has been expecting a steady eight-percent rate of money growth over the next ten years. If for some reason people revise their forecasts to a permanently lower three-percent growth rate, then long-term rates should fall quite promptly. Why? Because people now should anticipate lower inflation than before.

The notion that people can be convinced to lower their expectations about future money growth and consequently become more optimistic about the prospects for lower inflation is a major reason why Administration economists believe interest rates will show a steady decline over the next four to

five years. But many are skeptical of this view, especially those who subscribe to the traditional view. These traditionalists argue that monetary decelerations are almost always accompanied by at least some period of *increasing* interest rates. In fact, the efficient-markets logic itself suggests that slowdowns in money growth can be accompanied by rising rates, but only if the slower money growth *comes as a surprise* to market participants.

Money growth different from what people expected does represent new information and therefore should influence interest rates. In particular, an unexpected decline in money growth should mean higher rates for the very reasons stressed by the traditional view—people have to be discouraged from adding to their money holdings as rapidly as before.

One way to interpret the traditional view, then, is that it treats all shifts in money growth as unexpected, at least for a while. And, indeed, most large-scale econometric models of the economy do not attempt to differentiate between anticipated and unanticipated shifts in money growth. These models simply do not allow for revisions in anticipated money growth to have quick and direct effects on interest rates. Rather, a reduction in money growth lowers interest rates only after actual inflation begins to fall—which, the traditionalists claim, takes quite a long time.

Which view of the world is correct? If the Administration's budget plan is implemented and if the Fed gradually reduces monetary growth over each of the next six years, will rates drop quickly, or will they increase, perhaps dramatically, before they begin to fall? An honest answer is: no one can say with any strong degree of confidence. We simply do not know enough about how people form expectations about monetary policy or how changes in those expectations affect interest rates. But, while the Administration's interest-rate forecast may be opti-

mistic, it is not, as some have claimed, implausible. Those who judge the rapid-rate-decline scenario totally unlikely must see no merit to the efficient-markets approach. This is an extreme position. While we lack good estimates of precisely how a particular policy package works out over time, there is a large body of evidence that says, on balance, financial markets tend to be highly efficient.

WHAT DOES THE EVIDENCE SAY ABOUT EFFICIENT MARKETS?

In a 1976 paper, William Poole had this to say about tests of the efficient-markets theory: "Numerous investigators have analyzed an enormous amount of data using many different statistical techniques, and no serious departures from the predictions of the hypothesis have been found. Thus, there is very strong evidence in favor of the hypothesis."⁴ Since Poole's analysis, even more supporting evidence has accumulated, especially concerning the long-term bond market and the link between long-term rates and monetary policy actions.

Tests of financial market efficiency usually revolve around the statement that, if a market is efficient, it shouldn't be possible to explain changes in yields on the basis of any information that was publicly available *prior* to the price change; only *new* information causes prices to change. In a large number of cases, certain segments of the financial markets have been found to satisfy this condition.⁵ More importantly from the perspective of students of monetary policy, several recent investigations have found that the long-term bond markets in both the United States and Canada appear to be

⁴See William Poole, "Rational Expectations in the Macro Model," *Brookings Papers on Economic Activity* 1976: 2, p. 467.

⁵For an extensive survey of the evidence, see Eugene F. Fama, "Efficient Capital Markets: A Review of Theory and Empirical Work," *Journal of Finance* 25 (May 1970), pp. 383-417.

efficient.⁶ Phillips and Pippenger show, for example, that long-term rates efficiently reflect information about past inflation rates and past short-term interest rates.⁷ Using a somewhat different approach, Mishkin confirms this result. And Pesando reports that changes in long-term bond rates in Canada cannot be predicted by prior changes in either interest rates or in key economic variables such as the money supply or the unemployment rate. These studies suggest that the long-term bond market is no less efficient than the short-term debt market, the stock market, or the foreign-exchange market.⁸

⁶See Llad Phillips and John Pippenger, "The Term Structure of Interest Rates in the MIT-PENN-SSRC Model: Reality or Illusion?" *Journal of Money, Credit, and Banking* 11 (May 1979), pp. 151-163; James E. Pesando, "On the Efficiency of the Bond Market: Some Canadian Evidence," *Journal of Political Economy* 86 (1978), pp. 1057-1076; and Frederic Mishkin, "Efficient-Markets Theory: Implications for Monetary Policy," *Brookings Papers on Economic Activity* 1978, pp. 708-752.

⁷More exactly, past interest rates don't explain long-term Treasury rates. Corporate bond rates are found to be related to past short-term rates (on commercial paper). The authors suggest the latter result may be colored by statistical problems, however.

⁸Not all the tests of market efficiency tend to be supporting, however. Some recent work suggests that prices in certain financial markets are more volatile than we should expect if markets were, in fact, efficient. Robert Shiller, for example, has recently argued that stock prices and long-term interest rates move around too much to be explained simply by the receipt of new information. See his papers: "The Volatility of Long-Term Interest Rates and Expectations Models of the Term Structure," *Journal of Political Economy* 87 (October 1979), pp. 1190-1219; and "Do Stock Prices Move Too Much To Be Justified by Subsequent Movements in Dividends?" National Bureau of Economic Research Paper No. 456. These so-called "variance bounds" tests represent a new approach to testing market efficiency, and the results suggest that something more than new information may be affecting behavior in financial markets. While this doesn't necessarily mean the efficient-markets view is wrong, it does imply the theory may be incomplete.

This evidence calls into question econometric models in the traditional view which often violate the efficiency criterion by linking interest rate changes to old information. But the market-efficiency studies don't offer direct support to the view that interest rates will drop rapidly if the Administration's economic package, including gradual deceleration in money growth, is implemented. The reason is that none of this work examines the relationship of interest rates to *revisions in anticipated monetary policies*. Efficient-markets logic contends that a newly expected permanent deceleration in money growth should be accompanied promptly by lower interest rates. Unfortunately, no tests of this proposition have been reported in the literature to date.

But while it doesn't help predict the timing of the interest-rate outcome of this particular policy strategy, the overall evidence does embody some broad lessons for the exercise of monetary policy.

EFFICIENT MARKETS AND MONETARY POLICY

A number of important implications for the conduct of monetary policy flow from the theory of efficient markets. Perhaps the most crucial is the key role that expectations play in the process, a point that Keynes clearly recognized. To be precise, three different outcomes for long-term interest rates are possible when the Fed slows the growth of the money supply. If the shift was expected before the Fed acted, nothing should happen to financial-market yields. People already would have taken account of the monetary slowdown in their decisionmaking. But if the policy is accompanied by revised expectations of permanently lower money growth, then rates should fall because expectations of future inflation also should be reduced. Finally, if the deceleration in money growth is unexpected, interest rates should rise for the reasons emphasized in the traditional view.

To predict the interest-rate outcome of its policies, then, the Fed must have a good estimate of what people are anticipating. Unfortunately, this is not an easy piece of information to acquire. Yet without it, there is a serious risk that a policy will have unintended effects. Suppose policymakers reduce money growth one percentage point hoping to slow economic activity, for example. If the market had been expecting a two-percentage-point drop, money growth would be unexpectedly higher rather than lower. Interest rates would fall, for a while at least, and the economy would be unintentionally stimulated. One lesson of the efficient-markets approach, then, is that without a good gauge of people's expectations concerning the monetary policy outlook, the interest-rate outcome of a policy shift can't be estimated.

Policy anticipations presumably would be easier to appraise in a relatively stable environment (see **WHAT IS A STABLE MONETARY POLICY?**). To borrow again the language of Keynes, if monetary policy "strikes public opinion as . . . easily liable to change," then assessing the market's policy expectation may be next to impossible. Yet another advantage of a stable monetary policy is the

prospect that policymakers would acquire more credibility concerning their intentions. Reductions in expectations of future money growth should be accompanied in efficient markets by interest-rate declines, and vice versa; but it is doubtful that public pronouncements from policymakers can have much impact on what people expect if money growth has been highly unstable.

Finally, even though the efficient-markets view suggests that interest rates might decline in the face of an unanticipated acceleration in money growth, there are reasons to doubt the wisdom of trying to exploit this link in an attempt to stimulate the economy. First, there is the practical problem of gauging the market's policy-related anticipations (so that the Fed could do the unexpected). Second, some recent evidence fails to support the proposed link between unexpected money growth and long-term rates.⁹ And third, it may not be possible for the Fed to generate unexpected shifts in money growth systematically. One school of thought, the rational-

⁹See Frederic Mishkin, "Monetary Policy and Long-Term Interest Rates: An Efficient-Markets Approach," *Journal of Monetary Economics* 7 (January 1981), pp. 29-55.

WHAT IS A STABLE MONETARY POLICY?

Stability, like motherhood and the home team, is something most people are inclined to support; the term, in other words, is a loaded one. Just what do people mean, operationally speaking, when they cite a need for a stable monetary policy?

In most instances, the phrase is used to characterize a monetary policy involving relatively infrequent changes in the longer term growth rate of the money supply. Note that the stance of policy is reflected in money growth, not some other factor such as the level of interest rates. While this is somewhat controversial, the Fed itself views the rate of money growth as the primary gauge of the thrust of policy over periods of, say, six months or more.

Also, the argument is usually made that money growth rates can fluctuate over short periods (week to week and month to month) without violating the notion of a stable policy, provided that money growth behaves smoothly over longer time periods. This means the Fed must avoid *cumulations* of short-run deviations in money growth from its longer term target in one direction or another. The case for the view that short-term changes in money growth don't reflect policy instability rests mainly on evidence suggesting these fluctuations have very little impact on economic activity.

expectations view, argues that if the Fed continuously adjusts money-growth rates in attempting to smooth out fluctuations in economic activity, people will recognize this policy propensity and factor it into their forecasts of policy actions.¹⁰ Policy-related changes in money growth therefore would be anticipated by financial-market participants. The sum of these factors again argues

¹⁰For a general discussion, see Donald J. Mullineaux, "On Active and Passive Monetary Policies: What Have We Learned from the Rational Expectations Debate?" *Business Review*, Federal Reserve Bank of Philadelphia, November/December 1979, pp. 11-19.

for a monetary policy characterized by few, if any, changes in money growth once inflation has settled at a socially tolerable level.

In short, Keynes recognized well over 40 years ago that there are several reasons to be skeptical of what we know about the link between money and interest rates. Efficient-markets theory, rather than resolving some of that skepticism, serves mainly to offer still more outlets for Murphy's Law ("If something can go wrong, it will") to work its way. In the face of all this, the best monetary policy appears to be the most predictable one, and a stable policy seems more likely to be predictable than an unstable one.

Supply-Side Economics: What Chance for Success?

*By Aris Protopapadakis**

The economic success of the 1960s gave way to unfulfilled expectations in the 1970s. The U.S. economy failed to deliver the price stability and the generally high growth of real income that had come to be expected. Perceiving this as the failure of Keynesian economic policies, some economists have advocated tax cuts and reductions in government regulations as the solution to the economic malaise that threatens to dominate the 1980s. These supply-side prescriptions represent a resurfacing of economic thinking dominant before the Great Depression.

The likely impact and success of supply-

side economics were an important feature of the tax reform debate in the 1980 Presidential campaign. The emphasis on tax cuts in the campaign as well as the tax proposals of the new Administration reflect inroads of supply-side economics on the policymaking process. Whether this approach will work, however, is not clear.

THE 1970s: INFLATION AND SLOW GROWTH

During the 1970s, the U.S. economy experienced a high rate of inflation and a low growth rate of output. The growth rate of productivity (output per hour worked) came to a halt in the later 1970s, in contrast to the 1950s and 1960s. Furthermore, the share of income that the Federal, state, and local

*Aris Protopapadakis is Research Officer and Economist at the Philadelphia Fed. He received his Ph.D. from the University of Chicago.

governments took through various taxes was higher in this decade than at any other time (Figure 1), resulting in a decline in the per capita real income that goes to the private sector in the latter part of the decade. The average rate of inflation as measured by the CPI also was higher in this decade, and it increased alarmingly in 1977-79.

Inflation has been viewed both as a direct source of the economic malaise and as the reason for the poor output performance of the economy. Most economists and businessmen believe that at least in the short run the performance of the economy is not independent of the rate of inflation. Inflation is viewed as causing increased uncertainty in the business environment, higher and more volatile interest rates, automatic increases in taxes, and depreciation of the dollar vis-à-vis other currencies.

Though most people agree that stagnating productivity and high inflation are undesirable, there is much less agreement about their causes and cures. Some argue that the low and falling investment rate causes productivity to stagnate, which worsens inflation. Others contend that the high inflation rates reduce incentives to save while the accompanying uncertainty reduces incentives to invest, sapping productivity growth. Causes and consequences are hard to sort out.

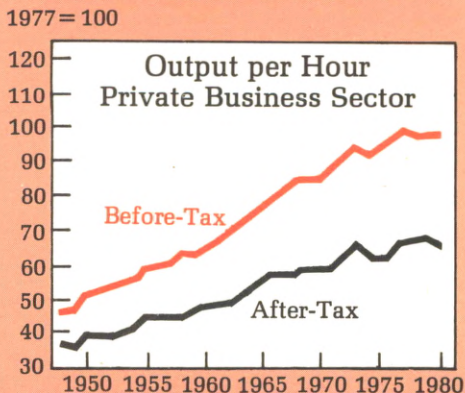
One school of thought, generally referred to as supply-side economics, recently has gained attention with tax and expenditure cut proposals. The basic claim is that the economic stagnation of the 1970s is a result of increasing taxes on all forms of income that have reduced incentives to produce and invest, and that reducing these taxes will restore productivity growth.

DEMAND MANAGEMENT VS SUPPLY-SIDE ECONOMICS

Supply-side economics is firmly rooted in classical economic theory. Until the Great Depression, economists believed that gov-

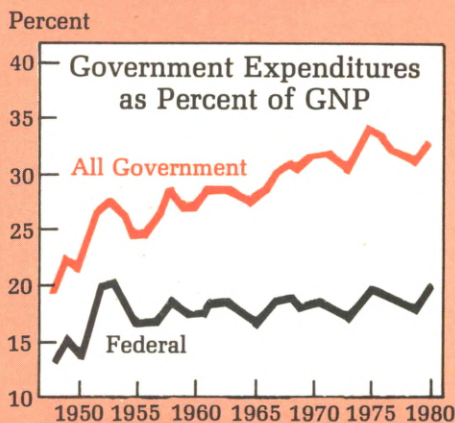
FIGURE 1

PRODUCTIVITY GROWTH FLATTENS OUT . . .



SOURCE: Survey of Current Business.

. . . AS GOVERNMENT TAKES MORE IN TAXES



SOURCE: Calculated at the Federal Reserve Bank of Philadelphia.

ernment could increase the level of output only by implementing policies that increase financial incentives to produce. But economists were unable to reconcile the high and persistent unemployment of the Great Depression with the teachings of classical economic theory. They eventually came to conclude that a slowdown of the growth of output was evidence that labor and capital were not being fully utilized because they were *involuntarily* idle, so that increasing financial rewards to production would not increase output or reduce unemployment. The policy prescriptions of classical economics were viewed as bankrupt and demand management was born.

Demand Management. Economic policy since World War II has been dominated by demand management policies. Demand management (often referred to as Keynesian economics) is the attempt to increase output by increasing demand for it, through government policies. There are two fundamental premises of demand management. One is that the level of economic activity can be affected in predictable and persistent ways by fiscal and monetary policies. The other is that the economy often experiences underutilization of labor (unemployment) and capital as a result of the failure of markets to work satisfactorily. Since these underutilized resources could be put to work if more demand were forthcoming, Keynesians argue that it is up to the government to design policies aimed at increasing aggregate demand.

The two traditional tools of demand management are monetary and fiscal policy. To expand aggregate demand through monetary policy, the Federal Reserve increases the growth rate of the money supply above its longer term trend. This temporarily decreases the cost of borrowing to firms, which spurs investment and increases consumption demand as consumers try to spend the excess money. To expand aggregate demand through fiscal policy, the govern-

ment can increase expenditures or reduce taxes. Demand increases directly, as government buys more goods and services or leaves more disposable income with consumers, part of which they choose to spend.

These traditional economic policies appeared to work reasonably well until the late 1960s. Since that time, it has become increasingly clear that the economy does not consistently respond in the way Keynesian economists predict; indeed, sometimes the response seems opposite to what they expect, as during periods when inflation and unemployment have risen simultaneously. This suggests that low productivity growth and high inflation might persist in spite of—some say because of—demand management policies.

The Supply-Side View. The main claim of supply-side economics is that aggregate economic behavior will respond measurably to changes in financial incentives, and in particular to those incentives that are affected by the economic policies of the government. Why? Because all the goods and services in the economy are produced by people. People are hired by firms or are self-employed; in either case they use tools, machines, computers, and communication systems to produce those goods and services. In a decentralized economic system the number and kinds of tools, machines, computers built, and how much each person works are a result of individual decisions in response to financial incentives in the markets. The cost of borrowing to finance investment, wages earned from employment, and the tax rates on income are three examples of financial incentives. As any of these incentives is changed, individuals may change their decisions about what kinds of jobs they want and how hard they want to work, while firms may change their investment and employment plans.

Recent economic research has shown some reasons why the level of output is not likely to respond to demand management

policies in predictable ways.¹ It argues that increased production requires the perception of higher rewards for working and investing—that output does not respond automatically to higher demand. If no additional incentives to produce are generated, increased demand is more likely to lead to higher prices than to more output. Proponents of supply-side policies therefore argue that the obvious remedy to stagnating growth is to concentrate economic policies on restoring the incentives to work and save, since it would be the only reliable way to increase aggregate output and productivity.

The principal supply-side policies that are currently advocated are reductions in tax rates on labor and capital income. Supply-siders claim that lower tax rates on wages, interest, dividends, and corporate income will increase output by increasing the incentives to work, increasing the supply of labor, and by increasing the incentives to save and invest. They also argue that the rapid increase in tax rates since the 1964 tax cut is largely responsible for the fall in the growth rate of productivity because it has diminished incentives to work and save. Thus, decreasing taxes will restore these incentives and cause an expansion of output.

Many economists are skeptical about these supply-side prescriptions. They believe that cutting taxes will significantly increase neither the supply of labor nor the supply of saving. What is the evidence? What, for example, have economists found out about the effect of taxes on labor?

REDUCING TAXES ON LABOR INCOME

There are many economic studies of how the work force in the U.S. has behaved as

wages have changed.² Since a tax cut results in an after-tax increase in wages, these studies may offer a guide to how the labor force will respond to a tax cut.

Studies to date generally agree that prime-age males do not measurably alter the number of hours they work in response to changes in their wages over time. But other groups, which comprise an increasing share of the work force, appear more responsive to wage changes.³ One recent study, for instance, shows evidence that married women vary their work habits in response to changing wages: a 10-percent increase in the wage rate increases the number of hours they work by more than 10 percent. The number of workers also appears to respond differentially to tax rate changes. One estimate suggests that a percentage-point reduction in personal income taxes will increase the primary labor force by only 0.05 percent, but the secondary labor force rises 0.37 percent.⁴ The net increase in employment hours (stemming from more workers and some people working more) from the same tax reduction is estimated at 0.5 percent.

There are other points to consider. The decision about when to retire appears to depend on after-tax income. If the tax rates are high, take-home pay is low relative to retirement pay and people choose to retire early. Thus a decline in the tax rates may

²Harvey Rosen, "What is Labor Supply and Do Taxes Affect It?" *American Economic Review* 70, 2 (May 1980), pp. 171-176, and Jerry Hausman, "Income and Payroll Tax Policy and Labor Supply," paper presented at a conference on "The Supply Side Effects of Economic Policy," Washington University and the Federal Reserve Bank of St. Louis, October 24-25, 1980.

³Prime-age males made up almost 70 percent of the work force in 1964 but only 56 percent of the work force in 1977.

⁴Michael Evans, "An Econometric Model Incorporating the Supply Side Effects of Economic Policy," paper presented at a conference on "The Supply Side Effects of Economic Policy," Washington University and the Federal Reserve Bank of St. Louis, October 24-25, 1980.

¹See Donald J. Mullineaux, "On Active and Passive Monetary Policies: What Have We Learned from the Rational Expectations Debate?" *Business Review*, Federal Reserve Bank of Philadelphia, November/December 1979.

expand the supply of labor by postponing retirement plans. Also, evidence from a study done on self-employed individuals shows that both their hours worked and their intensity of work are highly sensitive to after-tax income and therefore to tax rate cuts.⁵

To put things in rough perspective, a tax cut that would induce a 10-percent increase in the supply of labor would result in a 7-percent to 10-percent increase in output, spread over the time period necessary for the adjustment to be completed (which could take several years).⁶ In current dollars, this represents only a \$190-billion to \$270-billion increase in the full-employment GNP. Under optimistic assumptions, such an increase could be obtained through a decrease of roughly 14 percentage points (roughly a 40-percent reduction in the marginal tax rates on labor income).⁷ These estimates are subject to a large margin of error. It is also the case, however, that if the percentage of the secondary labor force in the total labor force continues to increase, the responsiveness of the total labor supply to tax cuts may well rise beyond the level assumed in this calculation.

⁵Terrance Wales, "Estimation of a Labor Supply Curve for Self-Employed Business Proprietors," *International Economic Review* 14 (February 1973), pp. 69-80.

⁶The 7-percent increase in output will be a result of the increase in the supply of labor. The additional 3 percent will be because as additional savings get converted into physical capital the capital-to-labor ratio will return to its original value (K/L will initially fall as the labor force increases).

⁷This calculation relies on a simple Cobb-Douglas production function ($Y = K^{0.3}L^{0.7}$), where Y is real income, K is capital, and L is labor. The increase in output would be 7 percent if capital remains fixed but 10 percent if the capital-to-labor ratio remains fixed. The primary labor force (55 percent of the total) is assumed to increase its work hours by .5 percent in response to a 10-percent increase in wages, while the secondary labor force responds with a 10-percent increase. The average marginal tax rate is taken to be 33 percent.

What Kind of a Tax Cut? Taxes on labor income can be cut either by reducing the average taxes collected on income (the average tax rate), or by reducing the marginal tax rate on income—the tax a person pays on a dollar of *additional* income. Will these different ways of cutting taxes have different effects? To answer this question it is necessary to find out how changes in the wage rate affect the supply of labor.

A measure of the incentive that most affects people's willingness to work is the hourly take-home pay. Increasing the hourly pay has two separate and opposite effects on individuals. First, it results in more income for the same work, and this induces people to work fewer hours. But since the wage rate is higher, the income in additional wages people give up by not working more is higher. This induces them to work more hours. These two forces (the income effect and the substitution effect) work against one another.⁸ Whether an increase in the hourly take-home pay will induce people to work more or less depends on which effect dominates.

Both the marginal and average tax rates on labor income affect how much people decide to work. (Progressive income tax schedules assure that the marginal tax rate is always higher than the average tax rate.) People will respond differently to changes in their

⁸Since work is the opposite of leisure, working reduces an individual's utility, everything else remaining equal. More income from increased wages for the same amount of leisure, therefore, will cause an individual to increase his leisure and utility. This is the income effect. The increase in wage rate, however, makes the opportunity cost of leisure (income forgone to obtain leisure) higher. If his income is kept the same, an individual will prefer to work more. This is the substitution effect. Whether an increase in the average wage rate results in an increase in the supply of labor depends on people's preferences and incomes. It is obvious that with sufficiently high incomes the utility of additional income will be sufficiently small so that an increase in the wage rate will decrease the supply of labor.

marginal tax rates than in their average tax rates, because of the way in which the income and substitution effects operate. To see how this works, take a fictitious example of an individual who earns \$25,000 a year, and whose total deductions come to \$5,000. Also suppose that the tax rate for income between \$15,000 and \$25,000 is 30 percent, while for below \$15,000 the rate is 20 percent. This taxpayer computes her taxes to be \$4,500.⁹ Her marginal tax rate is 30 percent while her average tax rate is only 18 percent.

Reducing her average tax rate but not her marginal tax rate can be accomplished by increasing her allowable personal deductions. If she were allowed to deduct \$4,000 more, her total taxes would be only \$3,300, her average tax rate would drop to 13.2 percent, but her marginal tax rate would remain at 30 percent. How would she respond to this tax cut? Since she has a higher income for the same hours worked, she will be likely to work less (income effect). Since her marginal tax rate hasn't changed, the substitution effect will not operate to counteract the income effect.

By contrast, a widening of the tax brackets will decrease her marginal tax rate but not her average tax rate—for instance income up to \$25,000 may now be taxed at 18 percent. In this case, her average tax rate will remain at 18 percent but her marginal tax rate will drop to 18 percent. How would she respond? Since she will earn the same income as before by working the same number of hours, she has no incentive to reduce her hours worked. In other words, the income effect does not operate. But since her marginal tax rate has fallen, it is more lucrative to work more hours than it used to be (substitution effect), and she would be likely

to work more.

The response of labor supply to a tax reform package is not easy to predict. If both marginal and average tax rates are reduced, then the overall effect on the supply of labor will come from the interaction of the income and substitution effects which is difficult to gauge. But if, as a result of the revenue loss, government services are reduced along with the tax cut, the aggregate labor supply will respond much as it would to a cut in marginal tax rates alone. The reason is that individuals will have to pay directly for services they are receiving through their tax dollars, so that the combination of the tax cuts and the reduction in government services will leave them with roughly the same income as before. Since the income effect is severely limited, the response of labor will reflect mainly the substitution effect, which should mean an increase in hours worked.

Most labor studies have not measured the income and substitution effects separately. Thus, we know very little about the magnitude of each effect alone. It is clear, however, that a tax cut that primarily reduces marginal tax rates rather than average rates will have the most impact, and almost certainly increase the supply of labor.

REDUCING TAXES ON CAPITAL INCOME

An additional way in which incentives to produce can be increased is to reduce taxes levied on the return to capital, or capital income. These are taxes collected directly from corporations via the corporate income tax and from consumers via taxes on dividends, interest income, and capital gains. The claim of supply-siders is that a reduction in taxes on capital income will increase the incentives to save by increasing the after-tax return to capital.

Taxes on the returns to capital have been growing steadily for two separate reasons. One is that income tax rates have been rising. The other is the way the tax code

⁹She pays $0.2 \times \$15,000 = \$3,000$ on the first \$15,000 reported income and $0.3 \times \$5,000 = \$1,500$ on the remaining \$5,000. Her average tax rate is $4,500/25,000 = 18$ percent.

interacts with inflation. The existing tax code does not distinguish real capital gains (which occur only when the value of an asset changes *relative* to that of goods and services) from the rise in the dollar value of an asset caused by inflation. If the price of a share goes up by 6 percent while inflation is 10 percent, the real value of the asset has *declined* by 4 percent, but the tax system treats the 6-percent increase as a capital gain. The tax code affects interest receipts in roughly the same way. Interest receipts usually are treated as taxable income (interest on state and local securities is tax exempt), even though most if not all of them simply offset the rate of inflation. In an economic environment where the inflation rate is rising, as it was in the 1970s, the current tax code ensures that the tax rates on capital income will rise and the after-tax return to its owners will fall, for the same quantity of installed capital—plant and machinery (see Appendix).

Taxes on capital income reduce the return to the owners of the claims to this capital (stocks, bonds, and business loans). And this is equally true whether these taxes are collected from individuals in the form of income and capital gain taxes or from businesses in the form of profits taxes. Increasing the returns to capital may induce people to save more or less; the outcome again depends on a balancing of the income and substitution effects. A higher return to capital will make the future rewards from saving higher, which will encourage saving. This is the substitution effect once again. But higher returns mean that the future income from accumulated savings will be higher, so that people don't have to save as much or as long to get the same future consumption. This is the income effect, and it works to discourage saving.

While economists disagree about the impact of higher rates of return on savings, there is a consensus that the economy needs to generate more saving. Since gross saving represents the difference between what is

produced and what is consumed in the economy, saving a higher proportion of income will make more resources available for the production of capital goods, increasing the amount of physical capital and research and development, both of which lead to higher per capita output in the future.

Economists have tried to find out how saving is likely to respond to higher rates of return by analyzing historical evidence. Early studies of consumption and saving found saving behavior to be insensitive to rates of return. A recent study by Boskin, however, has documented a substantial impact of after-tax returns on gross saving.¹⁰ He found that a 10-percent increase in the real (actual returns adjusted for inflation) after-tax rate of return will result in an increase of approximately 2 percent to 4 percent in available savings each year, which would result in an overall increase in the full-employment GNP of 1 to 2 percent.¹¹ This means that halving of the tax levied on the returns to capital could result in a permanent increase in saving of 31 percent and an eventual increase in GNP of 10 to 17 percent (250 to 420 billion current dollars).¹² Evans also finds a significant correlation between saving and the after-tax real rate of return. He calculates that a one-percentage-

¹⁰This study has come under some criticism and has been discussed extensively. For a good summary of the issues and criticisms, see Charles McClure, Jr., "Taxes, Saving and Welfare: Theory and Evidence," *National Tax Journal* 33, 3 (September 1980), pp. 311-320.

¹¹This value is calculated from the same production function as before, but assuming that labor supply does not respond to the higher wages that will result from the increased productivity.

¹²This calculation is meant to be illustrative, because it is very difficult to take into account all the complexities of the tax laws. It is assumed that all returns to capital are taxed at a 35-percent average tax rate, that the inflation rate is 10 percent, and that the average return is 17 percent before tax. This implies an after-tax real return of 1.05 percent at 35-percent tax and 4.025 percent at 17.5-percent tax.

point increase in this return would raise saving by \$12 billion or by 2 to 3 percent.

Economists are far from agreeing on the magnitude of the impact of a tax cut aimed at stimulating saving. The estimates discussed here must be viewed as preliminary and probably optimistic. Changes in marginal tax rates again have a different effect on saving than changes in average tax rates. A decrease in the marginal tax rate will trigger the substitution effect response and will increase the supply of saving, while a decrease in the average tax rate only will operate through the income effect and will reduce the supply of saving. A tax reform designed primarily to reduce the *marginal* tax rates on capital income seems likely to result in moderate increases in the saving rate and in

the full-employment GNP.

Can tax cuts increase the growth rate of productivity? How quickly will tax cuts work? How will they affect inflation? What will be the impact on the Federal deficit (see CAN TAX CUTS PAY FOR THEMSELVES?)? These are the questions most often asked about supply-side economics. The answers are neither simple nor precise.

CAN SUPPLY-SIDE ECONOMICS WORK?

The supply-side logic and a small body of evidence suggest that reducing marginal tax rates on labor income will increase the supply of labor somewhat, while the same kind of reduction in taxes on capital income will increase the supply of saving and allow investment to rise. As a result of either type

CAN TAX CUTS PAY FOR THEMSELVES?

Some supply-siders maintain that tax cuts will generate enough additional economic activity so that total tax receipts will not decline. A reduction in tax rates obviously will result in lower receipts to the Treasury at a given level of national income. But more tax revenue will be forthcoming if national income increases. If tax incentives increase income by enough, the new receipts will offset the losses from the tax cut, and the government budget will not show any additional deficits. This idea dates back to eighteenth-century economists, and has recently been revived by Professor Laffer as the "Laffer Curve."

There is no doubt that at sufficiently high tax levels this scenario can take place. But most economists are very skeptical that, at current tax rates, supplies of labor and saving will respond strongly enough to tax cuts to prevent an increase in the deficit. Fullerton, for example, calculates that even with optimistic assumptions about the response of labor, the average tax rate on wages would have to be well above 40 percent before tax cuts would pay for themselves.* And even if the deficit created by the tax cuts turned out to be small following all adjustments of labor and capital decisions, the deficits would be much larger in the beginning while the adjustment process gets under way, creating an interim need for large deficit financing.

There are some offsetting considerations, however. Some economists estimate the underground economy—that area of activity where transactions go unrecorded—to be as large as 33 percent of reported GNP.† If the reduction in the tax rates causes a significant portion of this economy to become legitimate, a tax cut might well pay for itself. In addition, individuals and corporations should find it less worthwhile to employ tax shelters at lower tax rates; if they report higher taxable income, Treasury revenues will increase. On balance, it doesn't seem likely that tax cuts will pay for themselves, though the resulting deficits are unlikely to be as disastrous as some opponents of supply-siders predict.

* Don Fullerton, "On the Possibility of an Inverse Relationship Between Tax Rates and Government Revenues," *National Bureau of Economic Research*, Working Paper No. 467, April 1980.

† Edgar Feige, "How Big Is the Irregular Economy?" *Challenge*, November-December 1979.

of tax cut, output will be higher in the future than it would be without the tax cuts. During the transition, as workers adjust their work habits and increased investment builds up the physical capital stock, the growth rate of output will be higher than it otherwise would be. For instance, it was noted above that a 14-percentage-point decrease in the marginal tax rates on labor income might result in as much as \$270-billion total increase in output. In this scenario, output would grow by 3.5 percentage points more a year if the adjustment took as little as 3 years but by 1.5 additional percentage points if the adjustment took as long as 7 years. Once the adjustment was complete, however, the growth rates of GNP and productivity would return to their longer term trend, though their level would always be higher.

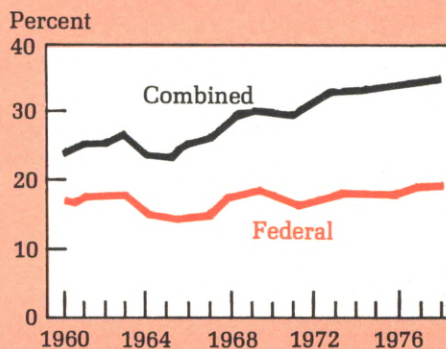
The total marginal income tax rate has been climbing since 1964, in spite of periodic tax rate cuts (see Figure 2).¹³ The principal reason is that as dollar incomes rise, individuals are pushed into higher tax brackets. This phenomenon, called bracket creep, will cause tax rates to continue rising automatically as long as inflation persists. Supply-siders argue that this continually growing disincentive is responsible for the low productivity growth in recent years. A tax reform that would reduce taxes, and more importantly keep them at the new rates, would allow productivity to grow permanently faster than it has in the recent past.

How quickly labor supply may respond to the tax cuts is hard to know. There are severe technical problems that make it difficult to measure accurately how quickly labor supply has responded to shifts in financial incentives in the past, as well as how quickly the U.S. economy has adjusted to the resulting

¹³Michael Evans, "Reagan Plan Hinges on Tax Brackets," *The New York Times*, December 23, 1980, calculates that a 10-percent increase in personal income results in a 15-percent increase in personal income taxes.

FIGURE 2

COMBINED MARGINAL INCOME TAX RATE CONTINUES TO RISE*



*The combined average marginal rate shown includes Federal and state income taxes and social security taxes. Most of the combined increase is made up of increases in state income tax and social security tax rates.

changes in the supply of labor. The last question is important, because output will rise not because the supply of labor has increased but because more labor is employed. The circumstances surrounding the tax cut will affect the adjustment process and will determine whether and how output will respond in the short run. For instance, if people believe that tax cuts are likely to be reversed in the future, they will not significantly change their work habits or substantially change their consumption and saving patterns. Nor are firms likely to undertake major additional investments if they perceive the tax cuts as transitory. Unless tax reductions are viewed as permanent, there will be only a small response to the tax cuts at best.

Another important element in the adjustment process is the type of policy that accompanies a tax cut. The short-term impact of tax reductions is not likely to be the same as their long-term impact. Because the

supply-side effects of tax cuts will appear slowly, the policies that accompany the tax cuts will, to a large extent, determine the economy's response in the short term. All tax cuts have demand-side implications. A cut in taxes without a similar cut in government expenditures will probably cause an increase in the demand for goods and services, with higher prices and interest rates over the short term. This will facilitate the output adjustment by increasing the demand for labor and physical capital, but it will also likely mean a higher inflation rate and lower investment during the transition. If, on the other hand, government expenditures are reduced by roughly the same amount (to keep the deficit from growing), demand in the sectors that depend on government financed programs will fall, while demand in the sectors dealing with consumers and business firms will rise. This will mean imbalances in employment throughout the economy that may take a while to work out, masking the supply-side effects of the tax cuts. But inflation during the adjustment would likely be lower than in the case where government spending is not reduced.

Can the supply-side effects of tax cuts help reduce the rate of inflation? The answer is disappointing: not by much. Over the long haul, inflation is basically the result of two economic forces. One is the demand for money (in terms of its purchasing power) and the other is the supply of money in dollars. If the real demand for money increases at 3 percent as a result of growth in output, stable prices require that the supply of money increase roughly by 3 percent. If, however, the supply of money increases by 12 percent, then prices will increase by about 9 percent. It follows that tax cuts will reduce inflation at a given rate of money supply growth only if they increase the growth in the demand for money by increasing output growth. The consensus estimate from current studies is that a 10-percent increase in output will cause about a 6-percent increase in the real

demand for money. Thus, if supply-side initiatives were to increase output by, say, 10 percent over a six-year period, money demand would increase one percentage point a year and inflation would be reduced by about one percentage point a year, but *only* during the adjustment process. Once the adjustment is complete, money demand will grow at the rate dictated by the long-run growth rate of output. Thus, supply-side policies cannot substitute for restraining growth in the money supply as a means to combat inflation.

Finally, supply-side policies should not be looked at to replace countercyclical demand-management policies. Demand management may be the appropriate policy response to recessions that periodically are brought about by special sequences of economic events. But these policies are ill suited to improving long-term growth in productivity and output, because they don't necessarily increase incentives to produce, save, and invest. Supply-side policies do precisely that, but they are likely to work slowly and therefore can't be used to combat recessions.

To sum up, the major claim of supply-side economics is that increasing incentives to produce and save by cutting taxes will increase the level of output and labor productivity and may temporarily reduce the rate of inflation. The available evidence indicates that such cuts, if properly designed, are likely to yield moderate gains in output and productivity. But once-and-for-all tax cuts should increase the growth rate of income and productivity only while the economy is adjusting to the new conditions. It is less likely that inflation can be significantly reduced through supply-side policies because the temporary increases in the growth rate of output are likely to be small and because they will have an even smaller impact on the demand for money. Money supply growth more in line with growth in real output is an unavoidable part of a viable anti-inflation policy.

APPENDIX

HOW TAXES ON RETURNS TO CAPITAL INTERACT WITH INFLATION

The economic difficulties created by the interaction of the tax code and inflation have been discussed extensively at all levels of sophistication. Different rates of inflation can result in different tax burdens without any explicit tax law changes, and the distribution of these burdens can vary, depending on the rate of inflation.

In the economist's mind, pure inflation is when all prices and wages rise simultaneously, continuously, and by the same amount. If prices rise at 10 percent a year, then all prices rise together at 10 percent, all wages, stock prices, and housing prices rise at 10 percent. Owners of bonds (Treasury bills, corporate bonds) are compensated for the inflation by a sufficiently higher interest rate, while owners of stocks are similarly compensated by a combination of dividends and capital gains. Any price shifts that would take place without inflation would still take place and would be superimposed on this rise in prices and wages. Suppose food constitutes one-quarter of the consumer budget. If food prices were to rise by 4 percent relative to other prices with no inflation, with a 10-percent overall inflation rate food would rise by 13 percent while other prices would rise by 9 percent. With pure inflation, the purchasing power of the ever increasing dollar value of a worker's income does not change. (The purchasing power of income or of an asset is the *real* value of that income or asset, while the dollar value is the *nominal* value.)

The reason the U.S. tax code interacts with the rate of inflation to increase and alter the tax burdens is because it does not explicitly recognize the difference between nominal and real values.

Income Taxes on Capital Income. Individuals pay the regular income tax rates on interest and dividend income and almost half that rate on capital gains.* Therefore, the impact of the current tax system on interest and dividend payments and on capital gains varies with the inflation rate.

Interest payments are made to bond holders. Bonds are nominal assets and their value at maturity is fixed in dollar terms. This means that the real value of such a bond will decline over time if there is inflation. Suppose the inflation rate were expected to average 10 percent over the interval, and did.

* Michael Evans, "Reagan Plan Hinges on Tax Brackets," *The New York Times*, December 23, 1980.

An investor that owns a \$1,000 10-year bond would at maturity be able to purchase goods with it that are only worth \$368 now. The interest rate on the bond compensates the bondholder for this loss of purchasing power to the extent that it is anticipated by the market. If the interest rate on such a bond would have been 5 percent with no anticipated inflation, it would be 15 percent if inflation was anticipated to be 10 percent. The reason is that since the nominal asset cannot appreciate in dollar value, the interest rate compensates the investor for the expected real loss. If there are no taxes, both the holder and the issuer of the bond remain equally well off, whether there is inflation or not. But the U.S. tax system treats the 15-percent interest payment the same way it treats the 5-percent interest payment. The part of the interest payment that compensates the bondholder for the expected loss is taxed as if it were regular income. As the inflation rate increases, the taxes bondholders pay increase, and the after-tax returns decline. The first panel of the accompanying table illustrates the effect of increased anticipated inflation on the real value of the principal and interest after one year, with an example. To see how the table is constructed, look at the fourth line of the first panel. Here the tax rate on interest income is 40 percent, the anticipated inflation is 10 percent, and the interest rate is 15 percent (5 percent + 10 percent). The investor purchases a bond with a face value of \$100 (column 4). The interest from the bond is \$15 (15-percent interest), and after taxes are subtracted he is left with \$9. There are no capital gains by assumption (column 6). When the bond is redeemed, the total dollar value of the interest and principal comes to \$109. To find the real value of this sum, it must be divided by the new price level. If prices were taken to be 1.00 when the investor purchases the bond, they are now 1.1 and his real wealth is only 99 (\$109 now buys what $109/1.1 = \$99$ bought when the bond was purchased; see column 8). In the example given, the investor realizes a loss in the purchasing power of his wealth when there is inflation, even though the interest rate was higher by the rate of inflation.

Similarly with stocks. The only difference is that since part of the return to stockholders is in the form of capital gains, the overall tax ends up being lower. This is illustrated in the second panel of the table. The example is chosen so that without taxes, the returns from the stock and bond are identical. Furthermore, it is assumed that the firm distributes all its economic profits (after economic depreciation) to its shareholders in the form of dividends, so that ignoring the business cycle and secondary impacts of inflation on profitability, the price of the shares will grow at the rate of inflation. Finally, the last panel shows that if taxes were indexed to inflation, the tax burden would not rise as inflation increases.

This example is not to suggest that the situation will persist as shown over a long time, since investors will sell assets with the lower after-tax returns in favor of those with higher after-tax returns, adjusted for risk. Also, the interest rate, dividends, and the size of the capital stock will adjust to conditions of higher inflation. It is only meant to illustrate the increase in taxes and the nature of the distortion introduced by the interaction of the tax system with inflation.

Corporate Income Taxes. Corporations pay Federal and state taxes on their reported profits. Since they do not pay taxes on the increases in the dollar value of the physical capital they own, such as land, buildings, and machinery, it would seem that the taxes they pay would not depend on the underlying inflation rate. This is not so, because depreciation allowances for plant and equipment are calculated based on historic costs. To see the effect of inflation, take a simple example of a company that has just purchased a car for \$10,000 which it plans to replace in one year. Suppose that the car loses 50 percent of its real value during the year. If there is no inflation, the company will sell the car for \$5,000 at the end of the year and deduct \$5,000 from its reported profits, saving \$2,300 in taxes.* If the inflation rate is 100 percent instead, the used car will sell for

* Assuming a three-year straight line depreciation, the firm takes the allowed $33 \frac{1}{3}$ depreciation rate and the additional $16 \frac{2}{3}$ percent as a business loss.

\$10,000, and the allowable depreciation deduction (\$5,000) will be offset by the apparent capital gain. Thus, though the new car will now cost \$20,000, the firm gets no depreciation allowance at all and pays \$2,300 more in taxes.

National Income Accounts reported in the Survey of Current Business show that the accounting methods used for inventory and depreciation together resulted, in 1970, in almost \$3 billion overstatement of total corporate profits (and almost \$1.5 billion more in taxes paid), while in 1978 they resulted in almost \$43 billion overstatement of corporate profits (and almost \$20 billion more in taxes paid).

Tax Rate	Inflation Rate	Interest Rate	Initial \$ Investment	After-tax Interest or Dividend Payments	\$ Capital Gain	Total \$ Value	Total Real Value
<u>Bonds</u>							
(A)							
0	0	5	100	5	0	105	105
0	10	15	100	15	0	115	105
40	0	5	100	3	0	103	103
40	10	15	100	9	0	109	99
<u>Stocks</u>							
(B)	Capital Gains Tax = 20 Percent						
0	0	—	100	5	5	105	105
0	10	—	100	5	10	115	105
40	0	—	100	3	0	103	103
40	10	—	100	3	8	111	101
(C)	Taxes Indexed to Inflation						
0	0	—	100	5	0	105	105
0	10	—	100	5	10	115	105
40	0	—	100	3	0	103	103
40	10	—	100	3	10	113	103

**BUSINESS
REVIEW**

Federal Reserve Bank of Philadelphia

**on Independence Mall
100 North Sixth Street
Philadelphia, PA 19106**