The Costs of Inflation: An Analytical Overview

By Dean W. Hughes

Production of goods and services in the United States has fallen progressively below the economy's potential output for the past three years. The subpar economic performance has been associated with increased unemployment and rising business failures. The causes of this poor performance are varied and complex. Undoubtedly both the rapid oil price increases in 1979-80 and the prospect of increasing budget deficits have contributed to the poor economic performance. Nevertheless, it is generally believed that policy actions intended to reduce inflation have been a contributing factor. Even when the economy recovers from the current recession, growth in output is expected to be moderate for the next year. Thus, the country has paid and will continue to pay a high price for reducing inflation.

The question thus arises as to whether the costs of achieving greater price stability are justified. A first step toward answering this question is to identify the costs of inflation itself. Many of the adverse consequences of inflation, such as increased social friction, cannot be easily measured. Even the economic costs of inflation—which are defined in this article as reductions in current or future economic welfare resulting from distortions caused by inflation—are not easily quantified. Moreover, the magnitudes of these costs are constantly changing as the economy adapts to inflation. As a result, a definitive answer to the question of whether the costs of reducing inflation are outweighed by the costs of allowing inflation to continue is not feasible. However, the major costs of inflation and the ways these costs are changing can be identified.

This article reviews the economic costs of inflation on a theoretical level. The extent to which means have been devised to reduce the costs by adapting laws, regulations, and contractual procedures of the economy to an inflationary environment is also considered. The first section of the article defines inflation, evaluates measures of inflation, and presents a brief history of the debate over the costs of inflation. The next two sections distinguish between the costs resulting from anticipated and unanticipated inflation. And finally, recent economic adaptations to inflation are discussed, along with their limitations in eliminating the costs of inflation.

INFLATION AND THE ECONOMY

Before examining specific costs of inflation, it is useful to specify the general framework in which the costs of inflation are analyzed. This section lays the groundwork for subsequent analysis by discussing how inflation is defined and measured, documenting the increased level and variability of inflation, and tracing changes in attitudes regarding the costs of inflation.

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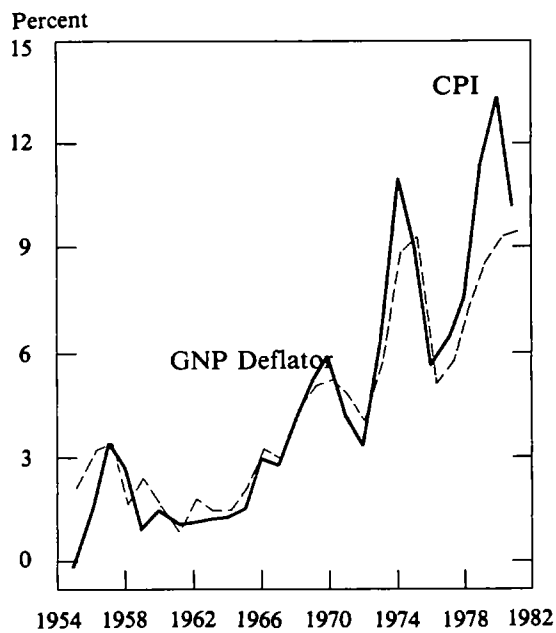
Measuring Inflation

Inflation can be defined as a sustained rise in the average dollar prices of goods and services. Stated another way, it is a continued decline in the amount of goods and services a dollar will buy and, therefore, a decline in the purchasing power of the dollar. As simple as the definition of inflation seems, constructing an empirical measure of prices that corresponds precisely to the price level used in defining inflation entails several complicated problems.

The Consumer Price Index (CPI) and the implicit GNP deflator are the two most commonly used measures of the price level. Correspondingly, annualized percentage changes in these two indexes are the most frequently cited measures of the inflation rate. There are several conceptual differences between the CPI and GNP deflator, including the comprehensiveness of the goods and services that they cover and the method of assigning weights to prices. Both have strengths and weaknesses, but most economists consider the GNP deflator preferable in most respects.[1]

Despite conceptual differences, both the CPI and the GNP deflator show that inflation has been on an upward trend in the United States since 1955, as is shown in Chart 1. For example, inflation in the 1960s averaged only 2.5 percent as measured by the GNP deflator or 2.6 percent as measured by the CPI, but accelerated to an average rate of 6.5 percent in the 1970s according to the GNP deflator or 7.5 percent according to the CPI. Chart 1 also shows that the variability of inflation tends to increase as the level of inflation rises.[2] The range of inflation rates and other statistical measures of variability increased substantially from the 1960s to the 1970s. As will be shown, increases in the level and variability of inflation lead to increases in the costs of anticipated and unanticipated inflation.

Chart 1
MEASURES OF INFLATION



Changing Attitudes About the Costs of Inflation

It was traditionally thought that the economic costs of inflation were negligible.

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[1] For further discussion, see Henry J. Levinson, "Some Problems of Price Indexes and Gains and Losses from Inflation," Staff Report on *Employment Growth and Price Levels*, Joint Economic Committee, 86th Cong., 1st sess., 1959.

[2] For a more rigorous treatment of this relationship, see John Taylor, "On the Relation Between the Variability of Inflation and the Average Inflation Rate," Carnegie-Rochester Conference Series on Public Policy, *The Costs and Consequences of Inflation*, Karl Brunner and Allan Meltzer, eds., North-Holland Publishers, Vol. 15, 1981, pp. 57-85.

Although admitting the possibility that inflation has adverse social consequences, such as arbitrary redistribution of income and wealth, traditional economic analysis did not imply that inflation reduces aggregate economic welfare.[3] For example, microeconomic theory as developed by neoclassical economists in the 19th century suggests that economic welfare depends on the optimal allocation of resources, which in turn depends only on relative prices of commodities and productive resources.[4] Since there is nothing inherent in the theory to suggest that relative prices are affected by the average level of prices, these economists inferred that neither the price level nor its rate of change would adversely affect economic welfare, as measured by the total output of goods and services.[5]

As recently as the 1960s, most economists still thought the economic costs of inflation were small. Economic costs were thought to be limited to the use of resources required to economize on cash balances and were described as consisting of only a few extra trips to the bank.[6] Moreover, the social consequences of inflation were considered manageable.[7] Indeed, many economists argued that the meager economic costs and limited social consequences of inflation were more than offset by the reduction in unemployment and increases in output that could be achieved by accepting inflation.[8] Some economists went so far as to suggest that a small amount of inflation might actually improve economic performance by facilitating relative price adjustments.

As inflation accelerated and economic performance deteriorated in the 1970s, however, economists began to reexamine earlier views regarding the costs of inflation.[9] Two primary conclusions emerged as the result of this reexamination.

The first conclusion is that previous estimates overstated the benefits of inflation. The current view is that the benefits of inflation are tem-

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[3] See Henry C. Wallich, "Honest Money," *Federal Reserve Readings on Inflation,* Federal Reserve Bank of New York, February 1979, pp. 1-12, for a discussion of some of the social consequences of inflation.

[4] See R. B. Ekelund, Jr., and R. F. Hebert, *A History of Economic Theory and Method,* McGraw-Hill, 1975, pp. 387-408, for a discussion of different economists' points of view on this subject.

[5] There does not have to be a reduction in gross national product for inflation to have costs. Even if resources were fully employed during an inflation, some of the resources might be "wasted" in the production of goods and services that would not be required in a noninflationary economy. If inflation were controlled, wasted resources could be used to increase economic welfare. This article, however, is not a restatement of the work done by John A. Tatom, "The Welfare Cost of Inflation," *Review,* Federal Reserve Bank of St. Louis, November 1976, pp. 9-21. Tatom focuses on measuring the welfare loss on real money balances and disregards the other rigidities of the economy that form the basis of this analysis. He estimated the annual costs at $5 to $7 billion in 1975. So, while the problems of measuring all the costs of inflation make it almost impossible to assign a specific number, the costs are not trivial. Martin S. Feldstein, "The Welfare Cost of Permanent Inflation and Optimal Short-Run Economic Policy," *Journal of the Political Economy,* Vol. 87, 1979, pp. 749-68, suggests that the discounted present value of these costs might be infinite.

[6] See William H. Branson, *Macroeconomic Theory and Policy,* Harper and Row, 1972, p. 247.

[7] See Paul A. Samuelson, *Economics,* McGraw-Hill, 1967, p. 20.

[8] See A. W. Phillips, "The Relationship Between Unemployment and the Rate of Change in Money Wage Rates in the United Kingdom 1862-1957," *Economica,* November 1958, for the original reasoning behind the Phillips curve. See Saul Hymans, "The Trade-Off Between Unemployment and Inflation: Theory and Measurements," *Readings in Money, National Income and Stabilization Policy,* Warren L. Smith and Ronald L. Teigen, eds., 1970, pp. 152-60, for support of the Phillips curve in the late 1960s.

[9] Clearly not all of the economic problems of the 1970s can be blamed on inflation. There were supply shocks to the economy in agriculture and energy, and the war in Vietnam ended. These changes, and more, make it difficult to identify the effects of any one factor.

porary and small rather than permanent and large as had been thought in the 1960s. Increases in output above the economy's full employment or "potential" output can be caused by inflation only to the extent that it is unanticipated.[10] Once the economy adjusts to a higher level of inflation, economic output returns to the more natural level, thereby offsetting to some extent the benefits of inflation. In addition, temporary increases in output that might be gained through unanticipated inflation are offset by losses in output if inflation is returned to its original level. These losses, the costs of fighting inflation, offset the original benefits of inflation.

The second conclusion of the current view is that the costs of inflation were understated in the 1960s. In large part, this understatement resulted from failure to recognize many of the adverse effects of inflation on potential output. Whereas fluctuations around the potential level of output caused by unexpected changes in inflation affect only the time path of production and income, reduction in the economy's potential to produce goods and services imposes lasting economic costs. To the extent that inflation results in a misallocation of resources that reduces potential output, economic welfare is impaired. These reductions in potential output are identified in the remainder of this article as the costs of inflation. Reductions in potential output can be caused either by anticipated or unanticipated inflation.

COSTS OF ANTICIPATED INFLATION

Businesses and individuals can adjust their actions to take account of inflation to the extent that they can predict the rate of inflation in advance. It might be concluded, therefore, that anticipated inflation does not lead to misallocation of resources and therefore does not impose economic costs. However, several institutional, legal, and regulatory rigidities make it difficult to adjust entirely to anticipated inflation.[11] As a result, even inflation that is generally anticipated can lead to distortions that reduce potential output. While some of the costs of anticipated inflation are primarily short run, others have more persistent effects on economic welfare.

Short-Run Costs

Short-run costs of anticipated inflation are those that could be quickly eliminated if price stability were restored. For example, the reductions in output resulting from the diversion of labor would be reversed soon after firms and individuals became convinced that lasting progress was being made in reducing inflation.[12] Because current decisions regarding the supply of labor by individuals and the demand for labor by firms primarily affect the current level of potential output, distortions in the labor

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10 A typical definition of potential output is the level of output where resources are used to the extent that there are no pressures for inflation to increase or decrease. Some additional resources can be made available to production but only at the expense of accelerating inflation. Potential output is used here in a broader sense than is typical. The term is used in this article to refer to maximum welfare developed subject to the preferences of consumers, production technology, and the current rules and regulations of society. A measure of this concept would have to include the value of leisure and work done outside of the market system as well as the value of goods and services incorporated in the GNP. See Paul A. Samuelson, *Economics*, McGraw-Hill, 1967, pp. 183-85, for a discussion of measuring economic welfare.

11 These costs are a joint product of both inflation and regulation. Without inflation, the cost of regulation would be less. Without regulation, the cost of inflation would be less. In this article, the rules and regulations of society are taken as given. Thus, the queston is what are the costs of inflation given the current set of laws governing the economy.

12 For a more detailed description of these costs, see Stanley Fischer and Franco Modigliani, "Towards an Understanding of the Real Effects and Costs of Inflation," NBER Working Paper No. 303, November 1978, pp. 8-10.

market caused by inflation have only a limited impact on future levels of potential output. It is in this sense that these costs can be described as short-run costs of anticipated inflation.

A reduction in output resulting from the diversion of resources to change published prices is one of the most obvious costs of anticipated inflation. For example, labor and other variable inputs used to reprint catalogs and restaurant menus to reflect increases in pricing resulting solely from inflation could better be used to increase production of goods and services that increase economic welfare. Of course, not all resources devoted to changing posted prices can be attributed to inflation. Changes in the relative prices of goods and services necessary for the efficient functioning of the economic system require that some resources be devoted to changing published prices even in the absence of inflation. However, to the extent that such changes must be made more frequently in an inflationary environment, some of the resources used are wasted and thus reduce economic welfare.

Additional labor used to economize on cash balances because of inflation also results in economic costs. As inflation is by definition a decline in the purchasing power of money, households and businesses have an incentive to devote resources to hold cash balances at a minimum. This distortion could be alleviated by paying a market interest rate on monetary assets. However, paying interest on currency would be difficult or impossible, and interest on demand deposits is prohibited by law.[13] As a result, individuals and businesses must devote time and other resources to maintaining the purchasing power of their assets by minimizing cash balances. For example, individuals make more frequent trips to the bank to transfer funds between money balances and interest-earning assets, and businesses expend time and energy developing sophisticated cash management programs, such as lockboxes and remote disbursement. These resources could be used in production of other goods and services were it not for the artificial costs of holding down cash balances created by inflation.

The time businesses devote to developing nontaxable benefits for employees because of higher marginal tax rates resulting from inflation must also be included as a cost of inflation. Income tax schedules are specified in nominal terms. Because of the progressive nature of the tax system, higher nominal incomes resulting from inflation cause an increase in the proportion of income paid in taxes.[14] The decline in the after-tax wage rate resulting from "bracket creep" may reduce the amount of labor supplied, thereby reducing potential output. To attract workers at the lowest costs, employers have developed nontaxable employee benefits. Additional resources devoted by businesses to development of these nontaxable benefits, as

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[13] Efforts have been made to provide some compensation to individuals and businesses holding demand deposits and other monetary assets. Charges on checking accounts that are lower than the costs of processing checks are one example of what could be called implicit interest. Another example would be lower interest rates on loans to businesses that leave compensating balances on deposit. See Bryon Higgins, "Interest Payments on Demand Deposits: Historical Evaluation and the Currency Controversy," *Monthly Review*, Federal Reserve Bank of Kansas City, July-August 1977, pp. 3-11, for a more complete analysis of this topic.

[14] Some economists would argue that the level of real taxes is independent of the inflation rate over long periods of time. They suggest tax cuts are made by the government to offset increases in real tax rates caused by inflation. See "The Inflation Tax: The Case for Indexing Federal and State Income Taxes," *An Information Report*, Washington, D.C.: Advisory Commission on Intergovernmental Relations, January 1980, for more information on the subject. Clearly, though, there are long delays in government actions to realign real tax rates after inflation has occurred. Thus, personal planning must be made on the basis of current laws, which imply real tax rate increases for any positive expected inflation rate.

well as the inefficiencies in the labor market created by the need to compare the effective compensation of jobs with different benefits packages, can be included as a cost of inflation.

Long-Run Costs

Long-run costs of anticipated inflation would persist even if inflation were to abate. Most of these costs result from reductions in the level of business investment in plant and equipment. By reducing current incentives to save and invest, the interaction of inflation and the tax system reduce future potential output. The resulting slowdown in the rate of economic growth has a persistent negative effect on economic welfare. These long-run costs are more serious that the short-run costs because of their continuing impact on the economy's productive capacity.

The reduction in personal saving caused by declines in real returns is one aspect of the long-run cost of anticipated inflation.[15] Savers must pay taxes on the nominal interest income received on financial assets that serve as stores of value. With inflation, this interest income includes an inflation premium required to compensate for the decline in the purchasing power of savings. Nevertheless, tax laws do not distinguish between the real interest rate component of interest income and the inflation premium component of interest income. As a result, the component of the return to saving that corresponds to the maintenance of purchasing power of assets in an inflationary environment is taxed even though it represents compensation for loss in the value of principal rather than a true return to principal. Empirical evidence suggests that nominal interest rates rise somewhat more than inflation but less than would be required to keep the real after-tax rate of return on savings as high as it would be without inflation.[16] As a result, inflation reduces incentives to save, and the consequent decline in funds available to finance capital investment reduces economic growth.

Capital investment is also adversely affected by tax laws relating to the depreciation of capital goods in an inflationary environment.[17] In principle, profit taxes apply only to business income above that necessary to replace existing capital goods. But the tax laws base depreciation allowances on original purchase price. In an inflationary environment, the cost of replacing capital goods exceeds the initial purchase price. As a result, tax laws provide an inadequate shield for this cost of doing business, and profits as defined for purposes of calculating business taxes exceed true profits. Calculation of depreciation allowances on the basis of historical costs rather than the economically sounder basis of replacement costs encourages businesses to use more inputs that are fully deductible in calculating profits and discourages investment in capital goods. Since future productive capacity depends on previous investment in capital goods, this bias tends to slow economic growth.

Tax treatment of inventories and other business assets may also create economic costs when inflation causes an artificial rise in the

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15 See Gregory V. Jump, "Interest Rates, Inflationary Expectations, and Spurious Elements in Measuring Real Income and Savings," *American Economic Review*, Vol. 70, 1980, pp. 990-1004, for a more in-depth analysis.

16 See Richard Startz, "Unemployment and Real Interest Rates: Econometric Testing of Inflation Neutrality," *American Economic Review*, Vol. 71, December 1981, pp. 969-77, and Eugene F. Fama, "Short-Term Interest Rates as Predictors of Inflation," *American Economic Review*, Vol. 65, June 1975, pp. 269-82, for discussions of the size of the rise of interest rates with inflation. This interaction between inflation and interest rates is called the Fisher effect.

17 See Martin Feldstein and Lawrence H. Summers, "Inflation and Taxation of Capital Income in the Corporate Sector," *National Tax Journal*, Vol. 32, December 1979, pp. 445-70.

value of the assets.[18] Businesses must pay taxes on capital gains resulting from increases in the nominal value of inventories or from the sale of other assets at a price higher than the original purchase price. To the extent that these nominal capital gains result from a general rise in the price level rather than an increase in the relative prices of goods held in inventories or of other business assets, the resulting tax liability reduces the real net worth of firms and creates cash flow problems for them. Both effects may impair businesses' willingness and ability to invest in capital goods.[19]

COSTS OF UNANTICIPATED INFLATION

Although the costs of anticipated inflation are significant, most could be reduced appreciably by adjusting tax laws, regulations, and other institutional arrangements. This is not true for the costs of unanticipated inflation.

Unanticipated inflation is defined as the portion of inflation that firms and households cannot predict. For the most part, unanticipated inflation results from changes in inflation from the rate that has come to be expected and incorporated in economic decisions. Because these changes are unpredictable, the costs of unanticipated inflation cannot be easily eliminated by institutional changes that reduce market imperfections.

The costs of unanticipated inflation are more fundamental in that they occur as a result of long-term contracts and other long-run economic decisions based on a future expected price level. To the extent that the actual price level differs from the expected price level, previous economic decisions prove to be suboptimal. As a result, resource allocation is distorted in a variety of ways, and potential output is reduced. The costs of unanticipated inflation, like the costs of anticipated inflation, can be divided into two classes—short run and long run.

Short-Run Costs

Short-run costs of unanticipated inflation result from temporary distortions in relative prices caused by unexpected changes in inflation. Because businesses and individuals base economic decisions on their predictions of the future rate of inflation, any deviation in the rate of inflation from expectations can cause relative prices to diverge in the future from what was assumed when the original commitments were made. Moreover, the timing of the impact of inflation on the prices of various commodities depends on numerous factors,

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18 See Phillip Cagen and Robert E. Lipsey, *The Financial Effects of Inflation*, Ballinger Book Co., 1978, and D. Pearce, "The Impact of Inflation on Stock Prices," *Economic Review*, Federal Reserve Bank of Kansas City, March 1982, pp. 3-18, for more details. Nominal accounting at historical cost also misstates the government's financial condition leading to an overstatement of the deficit. See Stanley Fischer and Franco Modigliani, "Towards an Understanding of the Real Effects and Costs of Inflation," NBER Working Paper No. 303, December 1978, pp. 14-15, for further discussion of this topic.

19 The adverse consequences for investment spending of the interaction between inflation and the tax system are offset to some extent by the deductibility of interest expenses in computing income for tax purposes. The same inflationary premium in nominal interest rates that serves to reduce the after-tax return to lenders also reduces the after-tax cost of borrowing. Because both the inflation premium and real interest rate components of nominal interest rates can be deducted from income in computing tax liabilities, anticipated inflation reduces the real after-tax cost of borrowed funds. This reduction in the cost of borrowing has two primary effects. First, it encourages use of debt financing relative to equity financing. By adding to businesses' fixed costs, this increased use of debt increases risk and reduces the ability of firms to adapt to changing business conditions, thereby slowing the response to changes in relative prices and impairing efficiency in the allocation of resources. Second, the reduced cost of borrowing lowers the average cost of capital, which is a weighted average of the cost of debt and the cost of equity. By so doing, the deductibility of nominal interest expenses taken by itself tends to encourage business investment.

such as the market structure of the industry producing the commodities. Thus, unanticipated inflation affects the prices of some commodities sooner than others. As a result, even a one-time increase in inflation that was not anticipated leads to a temporary misallocation of resources. However, businesses and households can adjust to the higher level of inflation if it persists long enough to become considered "normal." Thus, the initial reduction in potential output caused by misallocation of resources resulting from an unexpected change in the inflation rate can be reversed as long as the surprise in the inflation rate does not recur.

Unanticipated inflation can create economic costs by changing the relative prices of alternative factors of production. An unexpected decline in inflation can increase the cost of factors of production purchased under long-term contracts relative to factors of production purchased in the spot market. For example, union labor may become more expensive relative to other factors of production. Long-term contracts are common for labor unions. Such contracts can benefit both employers and employees by reducing costs of negotiating wage rates and other terms of employment. A certain level of anticipated inflation is typically incorporated into wage increases over the term of the contract. A decline in the rate of inflation below that built into union wages tends to raise the real wage rate for employees covered by the contract. As a result, employers have an incentive to substitute other resources for union labor even though doing so reduces productivity somewhat. For instance, businesses may hire additional management personnel rather than union members merely because the relative wage rates have been distorted by unanticipated inflation. If so, economic efficiency, which requires an optimal combination of the various factors of production, would be impaired, thereby reducing economic welfare.

Unanticipated inflation may also lead to misallocation of resources by distorting relative prices of products because of different speeds of adjustment to the aggregate inflation rate. The prices of commodities produced in a competitive industry may respond more rapidly to unexpected changes in the inflation rate than do prices of goods produced in oligopolistic industries. A competitive environment forces producers to react more quickly to changing conditions of supply and demand. In addition, speeds of adjustment to the aggregate inflation rate may differ between industries because of differences in the extent to which long-term contracts for materials are used.[20] Regardless of the nature of the frictions that prevent businesses from fully adjusting to unanticipated inflation, however, resulting distortions in the choice of inputs cause economic inefficiency.

Long-Run Costs

Long-run costs of unanticipated inflation result primarily from the uncertainty caused by recurring surprises in the rate of inflation.[21] Occasional divergences from the expected rate of inflation on which economic decisions are based may be insufficient to cause fundamental changes in the basis for ordering economic relationships. However, recurrent bouts of unan-

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20 See Michael Mussa, "Sticky Individual Prices and the Dynamics of the General Price Level," *The Costs and Consequences of Inflation,* Carnegie-Rochester Conference Series on Public Policy, Karl Brunner and Alan Meltzer, eds., North-Holland Publishers, 1981, pp. 261-96, and Dennis Carlton, "The Disruptive Effect of Inflation on the Organization of Markets," paper presented at an NBER conference on inflation, Washington, D.C., February 1981.

21 See Hayne E. Lehland, "The Theory of the Firm Facing Random Demand," *American Economic Review,* Vol. 62, 1972, pp. 278-91, and Stephen L. Able, "Inflation Uncertainty, Investment Spending, and Fiscal Policy," *Economic Review,* Federal Reserve Bank of Kansas City, February 1980, pp. 3-13.

ticipated inflation can increase uncertainty to the extent that fundamental changes are made in the conduct of economic affairs. Moreover, these changes will persist, even after unanticipated inflation is eliminated. Economic agents adjust their expectation slowly. Thus, risks resulting from continuously unanticipated inflation can be eliminated only after a prolonged period in which there have been no surprises about inflation.

One major long-run cost of unanticipated inflation results from the reluctance of savers to buy long-term assets. As savers have been repeatedly surprised by the acceleration of inflation, they have increased the liquidity premium required to invest in long-term financial assets. By investing in short-term assets, savers are protected from the large capital losses that result from declines in the purchasing power of long-term financial assets when inflation accelerates unexpectedly. However, reluctance of savers to commit funds on a long-term basis impairs the ability of businesses to finance long-term investment projects. Borrowing short-term funds to finance long-term real investment creates a risk that the real cost of the project will increase if unexpected inflation causes an unanticipated increase in the short-term interest rates required to refinance debt. Therefore, savers' reluctance to invest in long-term assets increases the riskiness of business fixed investment and thereby reduces the growth of potential output.

Costs are also incurred because of reluctance to enter into long-term nonfinancial contracts. Long-term contracts between workers and firms, suppliers and producers, and other economic units reduce transactions costs and risks for both parties. However, the usefulness of long-term contracts is premised on the predictability of prices over the term of the contract. Thus, by destroying confidence in the ability to predict future prices, recurrent bouts of unanticipated inflation undercut the economic rationale for long-term commitments. The resulting loss of efficiency in the conduct of economic affairs persists until confidence in the predictability of prices is restored and is therefore a long-run cost of unanticipated inflation.

Reductions in international trade resulting from unanticipated inflation in one country also impose long-run economic costs. It has been recognized for centuries that world economic welfare is enhanced by every country specializing in the production of goods in which it has a comparative advantage. Yet, historically, unanticipated inflation in one country has caused the prices of the goods it exports to rise unexpectedly and prices of the goods it imports to fall unexpectedly. Under the fixed exchange rate system that existed until 1973, governments bore the risks of unanticipated inflation in that variation in government's foreign exchange reserves was used to preserve the international value of its currency. Since the floating exchange rate system was introduced, however, importers and exporters have borne the risks of unanticipated changes in exchange rates resulting from unexpected inflation. To the extent that these risks have discouraged international trade, the potential output of all countries has been reduced.

RECENT ADAPTATIONS TO INFLATION

The increase in the level and variability of inflation in the 1970s led individuals, businesses, and the government to develop methods of alleviating the costs of inflation. As these costs became more evident, laws, regulations, and private contracts governing economic relationships have been altered to adapt to an inflationary environment. Although the adaptations have reduced the costs of both anticipated and unanticipated inflation, they have not eliminated the costs altogether.

A number of developments have alleviated the cost of holding money balances. Several new financial instruments yielding a market rate of interest—including money market mutual funds, corporate repurchase agreements, and money market CD's—have emerged as very close substitutes for traditional forms of transactions balances. Moreover, the Depository Institutions Deregulation and Monetary Control Act of 1980 authorized nationwide NOW accounts for individuals. Although initially subject to a 5.25 percent interest rate ceiling, interest rates on NOW accounts and all other time and savings deposits will be deregulated altogether by 1986. Thus, consumers will eventually be able to earn a market rate of return on transactions deposits, thereby reducing the incentives to economize on cash balances resulting from inflation.

Despite recent and prospective developments expanding the range of options for holding liquid assets, inflation will continue to impose costs by creating incentives to economize on cash balances for several reasons. NOW accounts cannot be offered to business firms. Moreover, there is no prospect of paying interest on currency held by the public or on reserves held by depository institutions. Finally, even for financial assets that earn competitive yields, after-tax real returns will be low or negative in an inflationary environment due to the taxation of nominal interest income. For all of these reasons, incentives will continue for businesses, financial institutions, and individuals to economize on cash balances. Economic costs associated with resources wasted on cash management will therefore continue if inflation persists.

Adaptation of tax laws will also reduce the costs of inflation. The Economic Recovery Tax Act of 1981 (ERTA) provides for indexing of personal income tax rates beginning in 1985. By eliminating bracket creep, tax indexation will reduce the misallocation of resources caused by distortions in labor markets due to the interaction of tax laws and inflation.

Indexing of income tax rates is not adequate in itself for the elimination of all the costs brought about by the failure of the tax laws to allow for the effects of inflation. For example, the ERTA does not change the tax treatment of real and financial capital. Distortions arising from taxation of nominal interest income and nominal capital gains will continue to impose economic costs if inflation persists. Although the ERTA provides incentives for investment in the form of more liberal depreciation allowances, the incentives are not directly geared to the problems inflation creates. As a result, incentives to invest in plant and equipment will continue to be distorted by high and variable inflation rates.

Indexation of private contracts, like indexation of the tax code, has alleviated some of the costs of inflation. For example, an increasing number of labor contracts contain escalator clauses involving automatic cost of living allowances (COLA's). By automatically adjusting nominal wage rates by a percentage that depends on the overall rate of inflation, COLA's reduce the misallocation of resources resulting from inflation distorting real wage rates. In addition, indexed contracts for labor and for goods and services reduce the need for incurring the economic costs of renegotiating contracts and alleviate the risk of entering into long-term contracts.

Nonetheless, indexation of some private contracts has not eliminated the entire cost of inflation associated with long-term economic agreements. Comparatively few contracts include COLA's, and many of the COLA's are constrained by maximum allowable increases in wage rates. While the real prices of commodities covered by indexed contracts are less affected by inflation, these prices still vary

relative to prices of commodities covered by nonindexed contracts.[22] Thus, inflation will continue to distort prices and cause misallocation of resources as long as some economic agreements are not fully indexed.

Adjustable rate loans represent the indexation of financial contracts. The interest rate on a variable rate loan is indexed to the cost of funds to the lender or some other measure of current interest rates that varies with inflation. As such, rates on variable rate loans are effectively indexed to current inflation rather than to the inflation expected when the loan was made. Consequently, variable rate loans reduce interest rate risk for borrowers and lenders caused by unexpected capital gains or losses. The introduction of this type of loan, therefore, alleviates some of the costs of inflation caused by reluctance to commit funds for long periods in the face of unanticipated inflation.

However, variable rate loans do not eliminate the problems unpredictable inflation poses for long-term loan agreements. For example, variable rate loans force borrowers to accept substantially higher cash flow risks than conventional fixed rate loans. Interest payments on a variable rate loan can increase sharply when interest rates rise, as would occur when expectations of future inflation rise. Moreover, even if the increase in interest rates results from an increase in current rather than expected future inflation, the borrower's income might not keep pace with inflation. If not, the disparity between the borrower's income and the timing or magnitude of the effect of inflation on interest expenses can create severe cash flow risks for the borrower. In the extreme case, the borrower's inability to make loan payments could result in default. Thus, instead of eliminating the risk of loan agreements associated with unanticipated inflation, variable rate loans transfer risk from one category to another. As a result, unanticipated changes in inflation continue to impose costs in the form of risk accompanying long-term loan agreements.

Development of financial futures markets is a recent innovation for reducing the cost of inflation. In these markets, individuals or businesses can enter agreements that effectively lock in a given interest rate regardless of what happens to market interest rates. Consequently, these agreements can be used to hedge against the adverse effects for borrowers or lenders of future interest rate movements, thereby reducing the economic costs of inflation.

As with variable rate loans, however, financial futures contracts merely redistribute the risks associated with interest rate changes caused by unanticipated inflation. To the extent that futures markets facilitate the transfer of risk to those better able or more willing to accept it, the economic costs resulting from unanticipated inflation are reduced. Nevertheless, it is unlikely that those accepting risk are totally indifferent to it. Rather, they are probably only less risk adverse than others that use futures markets to hedge. In addition, there are transactions costs of transferring risk in financial futures markets, and futures contracts are currently available on only a limited range of financial assets. Thus, financial futures markets provide a means for some individuals to limit the prospective costs of unanticipated inflation to themselves but do not allow the economy as a whole to avoid the costs.

SUMMARY AND CONCLUSION

The costs of inflation discussed in this article are defined as the losses in potential output that occur during periods of increases in the average

22 See Stanley Fischer, "Adapting to Inflation in the United States Economy," paper presented at an NBER conference on inflation, Washington, D.C., October 1980.

dollar prices of goods and services. Economic theory suggests that temporary gains and losses in the actual level of economic output occur over a business cycle as inflation first increases unexpectedly and then declines. Since these short-run changes in output substantially offset each other, this article focuses on the reductions in potential output caused by inflation.

Some of the costs are incurred even if inflation is fully anticipated, since resources can be misallocated when relative prices change due to the interaction of inflation and various rules and regulations that do not adequately account for inflation. The costs of anticipated inflation can be further categorized into short-run costs that price stability would quickly eliminate and long-run impacts on the growth in potential output that occur when investment is reduced. Short-run costs of anticipated inflation include reductions in potential output resulting from resources being wasted on repricing goods, minimizing cash balances, and developing nontaxable employee benefits. Long-run costs of anticipated inflation are caused by the interaction of inflation with tax laws that reduce the incentives for consumers to save and for businesses to invest.

Other costs of inflation are incurred when unanticipated changes in the inflation rate cause temporary changes in relative prices and increase risks. Both unexpectedly high and low rates of inflation change the relative prices of factors of production and final products. The resulting redirections of resources into production activities that would not otherwise be warranted diminish potential output. In addition, the increase in risks associated with a fluctuating rate of inflation can lead to lower domestic and international levels of output.

Increases in the level and variability of inflation during the 1970s led to many adaptations made in an effort to reduce the costs of inflation. Many of the recent innovations in financial instruments can be traced to the need to compensate holders of cash balances for the losses they suffer when inflation is rapid and interest rates are high. Income taxes are scheduled to be indexed in 1985 to keep tax rates from increasing simply because of inflation. Many long-term contracts for goods and services have been indexed to a measure of inflation to protect both buyer and seller from unanticipated inflation. Finally, financial markets are adjusting to unanticipated inflation through use of adjustable rate loans and financial futures. These adaptations have not eliminated the costs of inflation entirely, however, either because they are not in all contracts or because risks cannot be totally eliminated.

There are continuing costs of inflation, and therefore, the costs are not likely to be eliminated until inflation is eliminated. The imperfect adaptations that have evolved already resulted from more than a decade of historically high inflation. No one can be certain how long it would take for a more complete transition to an indexed economy where inflation imposes no costs. The result of continuing inflation or a return to even higher inflation would, therefore, be further reductions in current output and cumulative losses in future production. These costs are a principal reason for the Federal Reserve System's commitment to reducing inflation.