

Economic Review



FEDERAL RESERVE BANK OF KANSAS CITY

September-October 1983

Government Lending:
Some Insights from Agriculture

Taxation of Corporate Income

Inflation Uncertainty and Inflation Hedging

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Government Lending: Some Insights from Agriculture

By *Marvin Duncan*

As the United States has undergone prolonged recession and vigorous competition in domestic markets from goods manufactured abroad, policymakers have begun discussing the need for an industrial policy. Discussions of industrial policy often include proposals for a government-owned redevelopment bank. The purpose of such a bank would be to provide credit for modernizing selected industries and developing markets important to the overall economy.

Although there is still no general agreement on either the scope or the dimensions of an appropriate industrial policy—if one is even called for—the issue is expected to be vigorously debated in coming months. Hence, it is appropriate that lawmakers become familiar with what has worked in the past and what has not.

Agriculture provides some interesting lessons for the rest of the economy on the use of in-

dustrial policy initiatives. The article discusses three agricultural lending programs initiated by the government, identifies the benefits of the programs to agriculture, and notes problems—actual and potential—associated with the program. Also, the article suggests criteria that could be used in judging the likely usefulness of credit programs that might be proposed.

The three credit programs are the Farm Credit System, the Commodity Credit Corporation, and the Farmers Home Administration. Although these are not the only government-initiated programs available to agriculture, they represent somewhat different government approaches to the problems of agriculture.

Farm Credit System

The Farm Credit System (FCS) was created by the federal government over the period from 1916 to 1933 to overcome financial market imperfections of that time. During the years when this system was being formed, farm credit needs were increasing as access to free government land ended, farms were being mechanized, and farm income stress was limiting farmers' access to traditional credit sources.

Long-term mortgage financing on terms suited to farm businesses was not commonly

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available then. For production financing, farmers had to rely on notes of 90 days or less with repayment provisions that were not typically adapted to farm marketing practices. Financing for farmers was usually available only from small banks that were isolated from the nation's financial markets. Consequently, as credit needs increased, shortages of dependable credit were commonplace.

Units of the system—Federal Land banks, Federal Intermediate Credit banks, Banks for Cooperatives, Federal Land Bank Associations, and Production Credit Associations—were organized as farmer-owned cooperatives. Unlike many programs the government has started, the Farm Credit System is now totally owned by its member borrowers. The last government funds used to capitalize the system were repaid in 1968.

The FCS has provided a means for intermediating loan funds from national financial markets to farmers and their cooperatives. It also has been a trendsetter in lending to agriculture. It has introduced several credit innovations, including long-term, fully amortized farm real estate loans, a well-trained cadre of professionals to service farm credit needs, loan packages designed to fit the needs of borrowers, and reasonably priced credit linked to the cost of funds in financial markets.

By performing its mission effectively, the FCS has grown remarkably. It holds about a third of all credit outstanding to farmers. In raising funds in national and international markets, it has built a solid reputation for sound credit management and financial strength.

The system has been criticized in recent years. Commercial banks have been critical of advantages they believe the system may have as a result of a regulatory framework different from that of banks. A few observers have suggested that its practices of average-cost pric-

ing—as opposed to pricing at the marginal cost of loanable funds—may have contributed to excessive borrowing by farmers. Some have said that the FCS method of valuing farmland may have contributed to the escalation in farm real estate prices. On balance, however, the FCS has been remarkably successful in fulfilling the purposes for which it was created.

Commodity Credit Corporation

The Commodity Credit Corporation (CCC) was formed during the depths of the Great Depression as an independent agency of the government. Financed originally from funds of the Reconstruction Finance Corporation, it was later wrapped into the Department of Agriculture. Currently, the CCC funds its lending activities through a \$25 billion line of credit from the Treasury.

The CCC was formed to help improve the prices farmers receive for their commodities. That is still the objective, which the CCC pursues by providing nonrecourse loans to farmers that use their commodities as collateral, by financing construction of farmer-owned storage, and by financing export sales.

The CCC program has benefitted agriculture a number of ways. The commodity loan program and its farm storage facility programs have been effective in giving farmers flexibility in product marketing. Export credit and credit guarantee programs also have been effective in expanding sales of U.S. agricultural exports.

While the marketing aspects of CCC programs have worked quite well, the setting of commodity loan rates—the value of commodities at which the government loans to farmers—has always been difficult. The commodity loan rates have been determined in the political process, have often been established well above market clearing levels. As a result, the government has sometimes acquired large, costly

stocks of farm commodities when farmers defaulted on the loans or, as in the case of dairy products, when the CCC purchased dairy products. The currently burdensome stocks of wheat, corn, and dairy products are cases in point.

Farmers Home Administration

The Farmers Home Administration (FmHA) was formed in 1946 as the successor to the Farm Security Administration of the late 1930s. Like its predecessor, the FmHA was formed to ease part of the distress of farmers by extending credit to producers that were no longer credit-worthy by commercial lending standards. The agency currently is a part of the Department of Agriculture.

The FmHA still functions as lender of last resort to farmers unable to obtain credit from other sources. As such, it concentrates most of its lending on new entrants into agriculture, small farmers, and farmers that have lost creditworthiness because of natural disasters and unusual adversities. Lending to farmers facing economic emergencies increased rapidly in the 1970s.

The FmHA provides supervised credit to individuals, often at below-market rates, and participates in credit guarantee programs with commercial lenders. Farm ownership loans and farm operating loans outstanding at the beginning of 1983 totaled nearly \$8.4 billion. Emergency loans—which began to increase rapidly about 1974—totaled about \$10 billion, compared with only \$82 million at the beginning of 1974.

The effect of FmHA lending has been mixed. Many farmers have entered agriculture through the use of FmHA loans, and many farmers have been able to revive failing businesses with the help of supervised credit from the FmHA. The FmHA is sometimes criticized, however,

for extending credit in situations that offer little hope for repayment and, therefore, for delaying changes in occupation that might have been to the borrower's advantage. The emergency credit programs—with heavily subsidized interest rates and lax eligibility requirements—have been widely criticized for being available to farmers that already have access to credit from commercial lenders.

Government credit programs in perspective

Attention can now be turned to some criteria that might help in judging the potential usefulness of government credit programs. Such programs have often been proposed as a solution to a range of problems and will probably continue to be proposed as solutions in the future.

The results of credit programs in agriculture range from outstandingly successful to unsuccessful. On balance, the programs appear to have been most successful where they were devised to resolve imperfections in the market and to improve the economic efficiency of farmers and the farm sector. The Farm Credit System has been a successful program. It has improved the efficiency of farm credit markets and given farmers access to credit supplies from national financial markets. It has also developed credit lines adapted to the needs of farmers and built a lending staff that understands both the credit needs of agriculture and the business of agriculture. The Commodity Credit Corporation loan programs also have been successful. Farmers using commodity and farm storage loan programs have been able to market their crops more profitably. Export loans and loan guarantees have been useful in building farm export markets.

Programs that tend to circumvent the working of the marketplace, however, have not

worked out as well. Emergency lending programs of the FmHA have not been effective in resolving borrowers' difficult financial situations. Efforts to use the CCC commodity loan program as an income subsidy mechanism instead of a marketing program have typically sent farmers incorrect price signals, often resulting in large inventories of government-owned commodities.

The argument has been made that a national industrial development bank is needed to provide capital investment for renewing American industry. However, the very large and efficient financial markets in this country can allocate capital to projects that are judged to be sound investments. Moreover, the private sector can make those decisions more quickly and with fewer mistakes than a government agency.

In summary, only when government credit programs have substantially improved economic efficiency or unambiguously improved equity in the sector without substantially distorting efficiency have these programs been of major long-run benefit to agriculture. There is little, if any, evidence from agriculture that government-administered generalized credit allocation has improved the sector's performance. This seems to be the lesson from agriculture that might be generalized to other sectors of the economy.

Taxation of Corporate Income

By Karlyn Mitchell

The current corporate income tax has drawn sharp criticism recently from policymakers seeking to implement supply-side economic policies. They believe the tax impedes the success of these policies. Many economists also criticize the tax, arguing that, like all profit taxes, the corporate income tax tends to discourage investment and growth in the capital stock. They hold that the corporate income tax is particularly detrimental because profits are taxed once at the corporate level and again at the personal level when dividends are received and capital gains are realized on the sale of stock. Instead of repealing the corporate income tax or sharply lowering corporate tax rates, policymakers have tried to reduce the burden of the tax by introducing tax breaks and tax credits. Critics argue, however, that instead of mitigating the undesirable effects of the tax, these measures promote an unsound pattern of investment and reduce total output.

In view of the recent interest in the corporate income tax, this article analyzes the economic effects of the tax and considers possible alternatives to it. The article is divided into five sec-

tions. The first section provides a brief history of the corporate income tax. The second section describes the corporate income tax and compares the way profits of corporate and noncorporate businesses are taxed. The third section discusses the effect of profit taxes on business investment decisions and analyzes the effect of the corporate income tax on aggregate investment. The fourth section describes how the tax affects corporate financing, pricing, and wage decisions. The fifth section then presents alternatives to the current corporate income tax and compares their merits with the current system.

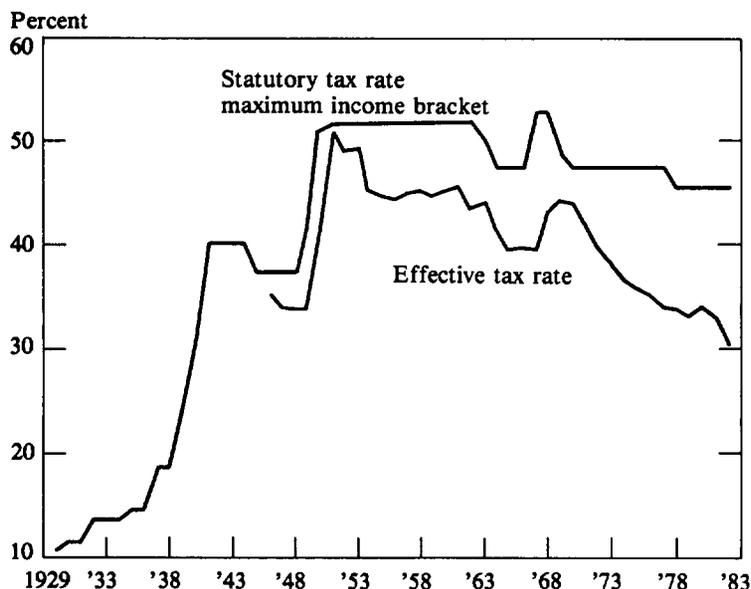
History of the corporate income tax

The federal corporate income tax was introduced in 1909, four years before the individual income tax.¹ Congress justified the taxation of corporate incomes on the grounds that businesses organized as corporations benefit substantially from such special privileges as limited liability, marketability of

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¹ The first state corporate income tax was passed in 1926 and, today they exist in nearly all states. Unlike the federal tax, state taxes are related to state government-supplied services the corporations use. Corporations paid \$11 billion in state income taxes in 1982, compared with \$48 billion in federal income taxes.

CHART 1
Statutory and effective corporate tax rates



corporate stock, and growth through earnings retention. Since these privileges exist because of federal legislation, the corporate income tax was seen as a means for the government to share in the gains resulting from a government sanctioned form of business organization.

Corporate income was taxed initially at a rate of 1 percent. As federal expenditures increased, however, the tax came to be regarded more as a source of revenue than as a tax on the benefits of incorporation. During World War I, the tax rate on corporate incomes was increased to 12 percent. In 1936, the proportional tax was replaced with a graduated tax with rates from 8 percent to 15 percent. By World War II, the maximum tax rate had risen to 40 percent. In the Korean War, it reached 52 percent. Tax rates have declined since 1969, however. The upper line in Chart 1 plots the statutory tax rate on the maximum corporate income bracket since 1929.

The corporate income tax came under attack after sharp increases in statutory corporate tax rates in the 1940s and early 1950s. Rather than reduce statutory tax rates, however, policy-makers modified the rules for computing taxable income and tax liabilities to reduce the burden of the tax. The lower line in Chart 1 plots the trend in the effective corporate tax rate, measured as income taxes paid relative to reported before-tax profits. The effective tax rate declined almost continuously after 1970. Because statutory tax rates were fairly stable, most of the decline in the effective rate was due to other changes in the corporate income tax. The decline in the effective rate helps explain the decline in corporate income tax receipts relative to total federal tax receipts.²

² The corporate income tax averaged 15 percent of total federal tax revenues in the 1950s, 12.5 percent in the 1960s, and 8 percent in the 1970s. Since 1980, revenues from the

Computation of the tax on corporate income

The macroeconomic effects of the current corporate income tax result from the structure of the current income tax system. This section describes key features of the system that apply to corporations and discusses the effects of these features on corporate tax liabilities and after-tax profits. The section also compares the way income from corporate and noncorporate businesses is taxed.

An overview of corporate income taxation

Table 1 shows how corporate income is taxed at the corporate and personal levels. The corporate tax liability is computed by applying the statutory tax rates to the appropriate increments of taxable income and deducting any tax credits. Subtracting the tax liability from taxable income leaves after-tax profits available for distribution to shareholders. Corporate income is taxed again at the personal level when received as dividend or capital gains income.

Table 1 also shows the difference in the taxation of corporate and noncorporate businesses. The taxable profits of proprietorships and partnerships are computed on separate schedules of the individual income tax return in much the same way that taxable corporate profits are computed. Instead of being taxed separately, however, the taxable profits of noncorporate businesses are reported on the owners' individual returns as adjusted gross income and taxed only once at the owners' personal tax rates. Tax credits due noncorporate businesses are claimed by the owners and used to offset personal taxes.

corporate income tax have averaged slightly more than 8 percent of federal tax revenues.

TABLE 1
Computation of corporate and personal income taxes

Corporate Income Tax	
<u>Item</u>	<u>Description</u>
Gross Income	Gross receipts less cost of goods sold from inventories; interest and dividend income; other income.
- Deductions	Business expenses including salaries and wages, interest paid, depreciation, and net operating losses.

Taxable Income	Taxable profits.
- Tax	Taxable income x tax rate.
+ Tax Credit	Investment tax credit, other credits.

After-Tax Profits	Profits available for distribution to shareholders.
Personal Income Tax	
Adjusted Gross Income	Wages and salaries; interest and dividend income; capital gains; taxable profits from sole proprietorships and partnerships.
- Deductions	Medical expenses; interest paid; charitable contributions.

Taxable Income	Taxable income.
- Tax	Taxable income x tax rate.
+ Tax Credits	Investment tax credit; other credits.

After-Tax Income	

Source: U.S. Corporation Income Tax Return, Form 1120, and U.S. Individual Income Tax Return, Form 1040, Internal Revenue Service.

Rate and nonrate features of the corporate income tax

Statutory corporate tax rates are important influences on the effective rate at which corporate income is taxed. Like the personal income tax schedule, the corporate tax rate schedule is progressive, meaning that the tax on an additional dollar of income increases as total income increases. Because corporate income is taxed at both the corporate and personal level, the effective rate at which a corporation's income is taxed depends on the taxable profits of the corporation and the taxable income of its shareholders. Under current tax schedules, the rate applied to corporate profits at the corporate level is usually lower than the personal tax rate applied to noncorporate business profits of the same amount. Since most corporate businesses are substantially larger than the typical noncorporate business, however, most corporate profits are taxed at higher rates than are noncorporate profits.³ Moreover, ownership of corporate shares is highly concentrated in the hands of high-income, high-tax bracket individuals. As a result, corporate income tends to be taxed at fairly high rates at the personal level.⁴ Progressive tax schedules, the relative sizes of corporate and noncorporate businesses, and the pattern of business ownership, therefore, contribute to a disparity in the effective rates at which corporate and noncorporate

³ The average corporation reported \$91,000 in taxable income in 1980, compared to \$6,150 for the average nonfarm sole proprietorship. Hence, the last dollar of income earned by the average corporation was taxed at a rate of 40 percent. In contrast, the average sole proprietor with no other income who filed a joint return would have the last dollar of income taxed at a rate of 14 percent.

⁴ In 1980, for example, taxpayers with adjusted gross incomes of \$50,000 or more received approximately 57 percent of all corporate dividends but only about 32 percent of all net profits from sole proprietorships.

profits are taxed. Recent changes in tax laws have reduced this disparity, however, by reducing statutory tax rates for corporations and individuals.⁵

Nonrate features of income tax regulations also influence the taxation of corporate and noncorporate business income. Most of the recent legislation affecting business taxes is concerned with nonrate features of the income tax. Nonrate tax regulations that apply to corporations generally apply to noncorporate businesses. Because of differences in the tax rates faced by corporate and noncorporate businesses, however, these regulations have different effects on decisionmakers in the two types of businesses.

The most important nonrate income tax regulations pertain to accounting definitions and tax credits. Like individuals, businesses can deduct interest expenses from gross income—the rationale being that income paid to creditors is taxed when interest is received as income. This deduction lowers taxable profits and the tax liability, raising after-tax profits.

The expense reported for depreciation of capital stock is a closely regulated tax deduction. Like interest expenses, depreciation expenses affect after-tax profits by affecting taxable profits and, therefore, the tax to be paid.

⁵ The current corporate tax rate schedule is given below.

Taxable Income	Tax Rate
\$0-\$25,000	16%
\$25,001-\$50,000	19%
\$50,001-\$75,000	30%
\$75,001-\$100,000	40%
Over \$100,000	46%

Except for minor revisions, the current rate schedule has been in force since the Revenue Act of 1978. The current personal tax rate schedule is the result of the Economic Recovery Tax Act of 1981 (ERTA). Provisions of the act reduced the maximum personal tax rate from 70 percent to 50 percent and reduced individual tax rates across the board over several years.

Depreciation expenses are determined by the write-off periods of depreciable assets and the method used to depreciate assets. Both are stipulated by law. Several revisions of the law have increased depreciation expenses for newly purchased depreciable assets by shortening write-off periods and favoring accelerated depreciation methods. The effect of the revisions has been to reduce taxable profits and to encourage the frequent replacement of depreciable assets.⁶

Deductions for depreciation and cost of goods sold are affected by tax regulations that require the use of historical costs to value assets. Under historical cost accounting, deduc-

tions for capital depreciation and inventory depletion are based on the assets' original costs. The assets for which deductions are made were usually purchased in earlier tax years. When the general price level is rising, the deductions understate the value of the capital and inventories used in production. By understating depreciation and inventory expenses, inflation and historical cost accounting combine to increase taxable profits and income taxes and to lower after-tax business profits.⁷

Like accounting definitions, tax credits affect business income taxation substantially. The investment tax credit has been the most important tax credit in recent years. This credit allows corporations and owners of noncorporate businesses to reduce their taxes by a proportion of their expenditures on certain categories of assets.⁸

Nonrate features of corporate tax laws have been subjected to considerable legislation because their revision represents a compromise between the goal of promoting economic growth and the goal of maintaining tax revenues. Liberalization of write-off periods, depreciation methods, and tax credits spurs investment spending by lowering the effective tax rate on new investments. Since the liberalized

⁶ Under current law, write-off periods and depreciation methods are stipulated by the Accelerated Cost Recovery System (ACRS), established by ERTA and revised by the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA). Under ACRS, depreciable assets are written off in three years (cars and light trucks), five years (equipment), or 15 years (buildings). Assets are depreciated using the 150 percent declining balance method with a switch to the straight-line method part way through the write-off period.

The ACRS continues a trend begun in 1954 toward shorter write-off periods. To see the effect of shorter write-off periods, compare the timing of depreciation expenses reported for a \$1,000 asset with two and five-year write-off periods using the straight-line depreciation method. With a five-year write-off period, \$200 ($\$1,000/5$) is deducted from gross income each year for five years. With a two-year write-off period, \$500 ($\$1,000/2$) is deducted from gross income each year for two years. If an asset with a two-year write-off period is kept in operation a third year, no depreciation expense is recorded. If the asset is replaced with an identical new asset, however, \$500 is deducted from gross income each year for another two years. Hence, shorter write-off periods increase businesses' depreciation expenses, reduce taxable profits and taxes, and encourage frequent investment in depreciable assets.

The ACRS also continues a trend toward more rapid depreciation of assets. Accelerated depreciation methods cause larger depreciation expenses to be reported in the early years of an asset's write-off period and smaller expenses to be reported in later years. As a result, taxable profits and income taxes are smaller in the early years of the write-off period and larger in later years. Thus, accelerated depreciation methods encourage the replacement of older assets having small depreciation expenses with new assets having large depreciation expenses.

⁷ In the Senate's report on the Economic Recovery Tax Act, the reduction of after-tax business profits caused by the combination of inflation and historical cost accounting was cited as a primary justification for the Accelerated Cost Recovery System. See Senate Report No. 97-144, pp. 12-13. Another way to raise after-tax business profits would be to reduce the inflation rate.

⁸ Under current law, taxpayers can claim a tax credit equal to 10 percent of their expenditures on qualifying assets, basically business machines with write-off periods of three years or more. A taxpayer may be limited in the amount of credit taken in a single year, since the credit cannot exceed a taxpayer's income tax. Also, if the credit exceeds \$25,000, the taxpayer can claim a credit in that tax year of only \$25,000 plus 85 percent of the difference between his income tax and \$25,000. Unused credits can be carried backward three years or forward 15 years.

rules do not apply to previous investments, tax revenues collected on previous investments are not affected by the revisions.

The strategy of reducing corporate tax burdens by frequent revisions in existing tax laws has several disadvantages. For liberalization of nonrate features of the income tax to reduce tax burdens, corporations must first have taxable income against which tax deductions and credits can be applied. Nonrate tax relief does not benefit smaller, rapidly growing corporations that accrue deductions and credits but do not have the taxable income to make use of these tax breaks.⁹ Another disadvantage of this strategy is that because the revised rules apply only to new investments, frequent revisions of tax laws may encourage corporate managements to delay investment until a new set of revisions is passed. Tax policy, therefore, may contribute to uneven economic growth.¹⁰ The most serious disadvantage of piecemeal revisions in the tax laws may be that the revised laws have unintended, undesirable effects. This appears to be true of revisions in recent years.¹¹

⁹ A solution to the problem of unusable deductions and credits has developed in recent years. Corporations with large tax deductions and credits but small incomes and tax liabilities enter into leaseback arrangements with corporations having small tax deductions and credits but large incomes and tax liabilities. Under a leaseback arrangement, a corporation with a large tax liability purchases an asset, leases it to a corporation with a small tax liability, and takes the tax credit and depreciation deductions. Until the passage of ERTA, the IRS strictly prohibited corporations from claiming deductions and credits on assets owned and leased solely for tax purposes. To spur investment spending, provisions of ERTA created a safe harbor for leaseback arrangements. These provisions were modified by TEFRA, reducing substantially the tax advantages of leaseback arrangements.

¹⁰ This argument is made in *The Annual Report of the Council of Economic Advisers*, 1983, p. 94.

¹¹ As a result of recent revisions in tax laws, certain industries have experienced low and, in some cases, negative

The effect of corporate income taxation of investment

This section describes the effect of the corporate income tax on the composition and amount of business investment.¹² The tax affects investment by influencing the investment decisions of corporate managements and the supply of funds to finance investment. The effects of the tax can be broken down into the effects on the composition of investment between corporate and noncorporate businesses, on the composition of factor inputs, on the composition of capital, and on total investment. Before discussing the investment effects of the tax, however, a brief description is provided on how business investment decisions are made.

Income taxes and investment decisions

In deciding whether to invest in a project, most managers begin by calculating the project's expected rate of return. This value is then compared with the minimum rate of return management requires of its investment projects. If the expected rate of return exceeds the required rate, the project is undertaken. Structural features of the corporate and personal income taxes directly affect business investment by influencing the expected rates of return on projects.¹³

effective tax rates in recent quarters. Other industries have been little affected, however. See, for example, "Corporate Taxes: Why Some Firms Pay Less," *Dun's Business Month*, May 1983, pp. 36-42. As discussed in the next section, disparities in effective corporate tax rates reduce total output by causing a misallocation of resources.

¹² In the following discussion, investment is defined as spending on productive assets such as equipment, plant, and structures.

¹³ The investment criterion described in this section is the internal rate of return criterion. A project's internal rate of

Three factors determine the expected rate of return. The most important is after-tax profits expected over the life of the project. The greater the after-tax profits, the greater the expected rate of return from a project and the more likely a project is to be accepted. Another factor determining the expected rate of return is the value of the depreciation deductions taken over the life of the project. Like other business expenses, depreciation is deducted from gross income in computing taxable income. Unlike other expenses, however, these funds are not paid to anybody outside the business but are accumulated for the eventual purchase of new capital. The greater the value of the depreciation deductions, the greater the project's expected rate of return. The third factor affecting projects' expected rates of return is initial cost. The lower the initial cost, the higher a project's expected rate of return.

return (IRR) is the rate of return at which the expected benefits from undertaking the project exactly equal the costs. A project is undertaken if its IRR exceeds the business's cost of capital, defined as the average rate a corporation pays for the use of funds.

A project's internal rate of return is calculated by solving the following equation for the unknown IRR.

$$(1) \quad 0 = \sum_{t=1}^T \frac{ATCF_t^e}{(1 + IRR)^t} - C^e$$

In equation 1, $ATCF_t^e$ is after-tax cash flow expected in year t , C^e is the expected initial cost of the investment, and T is the number of years in the life of the investment project. The first term after the equality sign is the sum of the discounted expected after-tax cash flows from the investment project. Future after-tax cash flows are discounted because one dollar of after-tax cash flow generated next year is worth less than one dollar of after-tax cash flow generated this year. By discounting the after-tax cash flows, the flows can be compared with the present cost of the investment. After-tax cash flow is essentially after-tax profits plus depreciation expenses. Financial expenses, such as interest and dividends, are not included in this calculation because financial decisions are made independently of investment decisions.

Both rate and nonrate features of the income tax code affect the expected rates of return on investment projects. Higher tax rates reduce projects' expected rates of return by reducing after-tax profits. Shorter write-off periods and accelerated depreciation methods increase expected rates of return by increasing the value of depreciation deductions. Inflation combined with historical cost accounting, however, reduces expected rates of return by reducing the value of these deductions. Liberalization of tax credits increases expected rates of return by reducing the initial costs of projects. By affecting projects' expected rates of return relative to the required rate of return, income taxes influence the projects businesses undertake and the total amount of business investment.

Composition of investment between corporate and noncorporate businesses

The most familiar effect of the corporate income tax on investment is its discouragement of investment by corporations. This effect arises from the double taxation of corporate income, which makes the expected rate of return from an investment project smaller if undertaken by a corporation than by a noncorporate business. By keeping current and potential shareholders less well remunerated for supplying funds to corporations than to other types of businesses, the corporate income tax curtails the flow of financing for corporate investment.¹⁴

¹⁴ The effect of the corporate income tax on investment by the corporate and noncorporate sectors has been discussed extensively by Arnold Harberger, "The Incidence of the Corporate Income Tax," *Journal of Political Economy*, June 1962, pp. 215-40. The effect can be illustrated by showing how an increase in the tax rate affects IRR in equation 1, since the double taxation of corporate income raises the tax rate applied to corporate income above the rate applied to noncorporate business income. An increase in tax rates reduces after-tax cash flows and, therefore, the numerator of the first term after the equality sign. For the

Composition of factor inputs

The corporate income tax encourages investment in projects that use relatively more depreciable capital and relatively less labor and nondepreciable capital. The effect arises because the asymmetric treatment of expenses on the factors of production in the investment criterion interacts with rate and nonrate features of the tax system.¹⁵ To illustrate, suppose a corporation is choosing between two projects of equal cost. Both are expected to earn similar gross incomes but one uses less labor and more depreciable capital than the other. In choosing between the projects, management accepts the project with the higher expected rate of return. The expected rate of return of the more capital-intensive project is higher and, hence, is accepted.¹⁶ Projects using large amounts of depreciable capital have higher expected rates of return because depreciation expenses, unlike labor expenses, both reduce taxable income and provide a cash flow. The bias toward projects using

right-hand side of equation 1 to equal zero, IRR must also decline. Projects with low IRR's are less likely to be accepted, however. Hence, the corporate income tax tends to discourage investment by corporate businesses.

¹⁵ This effect has been emphasized by Steven Sheffrin, "What Have We Done to the Corporate Tax System?" *Challenge*, May/June 1982, pp. 46-52. Nondepreciable assets include inventories, land, and financial assets. The personal income tax has a similar effect on investment by noncorporate businesses, since the factors of production are also treated asymmetrically in the noncorporate business investment criterion. The effect is stronger in the corporate sector, however, because corporate income is usually taxed at higher rates.

¹⁶ The more capital-intensive project has a higher expected rate of return because wage expenses are lower, making after-tax profits higher, and because the value of depreciation deductions is higher. Referring to equation 1, lower wage expenses and higher depreciation expenses increase $ATCF_t^c$ and, thus, the numerator of the first term after the equality sign. For the right side of equation 1 to be zero, IRR must increase.

depreciable capital is increased by higher tax rates, accelerated depreciation schedules, and shorter write-off periods.

Composition of capital

The corporate income tax also encourages investment in short-term depreciable assets, particularly equipment, and discourages investment in long-term depreciable assets, particularly structures. This effect is due to the combined influence of historical cost accounting, inflation, and the investment tax credit.¹⁷

Under historical cost accounting, depreciation deductions are based on the original cost of the assets. As depreciation expenses do not rise with inflation to reflect the higher current cost of replacing the assets, historical cost accounting reduces the rates of return expected on all investment projects during times of inflation. The reduction is greatest for projects with long-term depreciable assets, since the purchasing power of their deductions declines the most. Hence, fewer of these projects meet the investment criterion.¹⁸

¹⁷ This effect has been emphasized by Partick Corcoran, "Inflation, Taxes, and the Composition of Business Investment," in *Public Policy and Capital Formation*, Washington: Board of Governors, 1981; and by Robert Tannenwald, "Federal Tax Policy and the Declining Share of Structures in Business Fixed Investment," *New England Economic Review*, July/August 1982, pp. 27-39. The personal income tax has a similar effect on investment by noncorporate businesses, but the effect is stronger in the corporate sector because of the higher tax rates.

¹⁸ In terms of equation 1, the expectation of future inflation increases expected after-tax profits but historical cost accounting keeps the value of depreciation deductions from rising. Hence, inflation and historical cost accounting decrease $ATCF_t^c$ and the numerator of the first term after the equality sign. For the right-hand side of equation 1 to equal zero, the denominator of the first term after the equality sign must decline. This occurs if IRR declines. It also occurs if projects with shorter write-off periods are picked, since reducing t also reduces the value of the denominator.

The bias against long-term projects is reinforced by the investment tax credit, which favors investment in assets with short write-off periods. The bias toward short-lived assets has two sources. First, new structures, which have long write-off periods, are not generally eligible for the credit, while equipment, which has shorter write-off periods, is usually eligible. Second, the short write-off periods on equipment, which encourage equipment to be replaced frequently, also allow the credit to be taken more often, providing a maximum reduction in income taxes. To reduce the bias in favor of short-lived assets, the law allows less credit for equipment with write-off periods of less than seven years, but this is probably not enough to prevent misuse.¹⁹

Total investment

The corporate income tax probably reduces the amount of investment undertaken by all businesses, corporate and noncorporate. The reduction probably occurs because the double taxation of corporate income leads to a reallocation of capital and labor that reduces the after-tax profitability of all capital and, therefore, reduces the flow of funds from households to businesses.²⁰

To understand why the corporate income tax may reduce total business investment, consider the effects of an increase in corporate tax rates. Suppose that before the increase the demand

for funds to finance investment projects and the supply of investable funds are equal, and that the after-tax expected rates of return of the last projects accepted in the corporate and noncorporate sectors are also equal.²¹ The rates of return expected from projects under consideration in the noncorporate sector are not affected by the increase in corporate tax rates. In contrast, the rates of return expected from projects under consideration in the corporate sector are reduced, leaving fewer projects with expected rates of return that exceed the required rate of return. The smaller demand for funds to finance investment relative to the supply available at the old required rate causes the required rate to decline until supply and demand are again equal. The decline in the required rate causes noncorporate investment to expand more than corporate investment, because the expected rates of return of projects under consideration by the noncorporate sector are not affected by the tax rate increase. Eventually, however, the decline in the required rate of return probably reduces the flow of funds to finance investment projects. An increase in corporate tax rates, therefore, tends to reduce total investment. By this reasoning, the corporate income tax probably keeps total investment lower than it would be without the tax.

Not all economists agree that the corporate income tax reduces total investment. The corporate income tax could have little effect on total investment if personal saving rates are

¹⁹ See Emil Sunley, "Tax Neutrality Between Capital Services Provided by Long-Lived and Short-Lived Assets," Office of Tax Analysis Paper 10, Department of the Treasury, 1976.

²⁰ Taxation of noncorporate business income also probably reduces total investment. The investment-inhibiting effect on the tax on noncorporate income is probably smaller, however, because noncorporate income is taxed at substantially lower rates.

²¹ For noncorporate businesses, a project's after-tax expected return is computed by using the formula given as equation 1. For corporate businesses, whose income is taxed at both the corporate and personal levels, the after-tax expected return is the expected return computed from equation 1 multiplied by one minus the marginal personal tax rate. Equilibrium is attained when after-tax expected returns to equalize, because individuals can then earn the same return regardless of the type of business in which they invest.

largely insensitive to after-tax rates of return. The interest sensitivity of the personal saving rate remains an unresolved issue.²² If personal saving rates are insensitive to after-tax rates of return, then the investment effects of the corporate income tax are limited to the effects on the composition of total investment.

Cost of investment effects of corporate income taxation

The main social cost of a tax that discriminates among different types of businesses and productive factors is a reduction in the total output of goods and services. The effect of the corporate income tax on the composition of investment reduces output by causing a misallocation of resources. Misallocation occurs because employment and production decisions are based partly on tax incentives instead of solely on factor costs and goods prices. As a result, some businesses produce more than they would in the absence of the tax while others produce less. When output gains are netted against output losses, however, the result is a net loss.²³ The effect of the corporate income

tax on total investment also may reduce output. If personal saving rates are sensitive to after-tax rates of return, lower total investment results in a smaller capital stock. With less capital per worker, a given labor force is less productive and, consequently, produces a lower output.

The output loss caused by the investment effects of the nonneutral corporate income tax is extremely difficult to quantify. It seems likely, though, that the trend has been toward smaller losses as revisions in the tax laws have lowered the effective corporate tax rate.

Effect of corporate income taxation on financing and pricing decisions

In addition to influencing the pattern and amount of investment, the current corporate income tax influences the financing, pricing, and wage decisions of corporations. This section describes features of the tax system that affect corporations and discusses how taxes affect corporate policy.

Corporate income taxation and financial policy

The current system for taxing corporate income influences corporate financial policies two ways. The system encourages the use of debt instead of equity and promotes the reten-

²² Michael Boskin finds an elasticity of saving with respect to the real, after-tax rate of return of 0.4. See "Taxation, Saving, and the Rate of Interest," *Journal of Political Economy*, April 1978 (part 2), pp. 53-57. In contrast, Paul David and John Scadding find that the ratio of gross private saving to gross national product was trendless from 1898 to 1969, implying an interest elasticity of saving of zero. See "Private Savings: Ultrarationality, Aggregation, and 'Dension's Law,'" *Journal of Political Economy*, March/April 1974, pp. 225-49. Even if personal saving is insensitive to after-tax rates of return, the tax is likely to decrease total investment if the government has a lower propensity to save than individuals. See Martin Feldstein, "Incidence of a Capital Income Tax in a Growing Economy with Variable Savings Rates," *Review of Economics and Statistics*, October 1974, pp. 505-14.

²³ This method of assessing the loss due to the tax-induced misallocation of resources was made popular by Arnold C. Harberger, "The Corporation Income Tax: An Empirical Appraisal," in *Tax Revision Compendium*, Vol. 1,

Washington: House Committee on Ways and Means, Government Printing Office, 1959. The most recent estimate of this loss has been made by John Shoven, "The Incidence and Efficiency Effects of Taxes on Income from Capital," *Journal of Political Economy*, December 1976, pp. 1261-84. Using a 12-sector general equilibrium model, Shoven estimates an annual output loss for the 1953-59 U.S. economy of \$1.5 billion, or about \$5.1 billion for the 1982 economy. This estimate understates the true loss, however, since the model cannot measure the output loss due to the distortionary effect of the corporate income tax on the composition of factor inputs or the composition of capital.

TABLE 2
Effect of debt and equity finance
on current shareholders

	(1)	(2) ^a	(3) ^b
Gross Income	\$300	\$320	\$320
- Labor Expense	100	100	100
- Interest Expense	0	0	10
<hr/>			
Taxable Income	200	220	210
- Tax ^c	100	110	105
<hr/>			
After-Tax Profits	100	110	105
<hr/>			
Equity			
Current Shareholders	1,000	1,000	1,000
New Shareholders	0	100	0
<hr/>			
Net Rate of Return to Current Shareholders ^d	10%	10%	10.5%

a. \$100 of new shares are sold to finance a project earning \$20 in income each period.
b. \$100 of 10 percent bonds are sold to finance the same project as in a.
c. The corporate tax rate is 50 percent.
d. Net rate of return to current shareholders equals the proportion of equity owned by current shareholders multiplied by after-tax profits and divided by total equity.

tion of earnings instead of the payment of dividends.

Because interest expenses can be deducted from pretax corporate income, corporations raising funds in capital markets are led to use more debt than equity. Debt is substituted for equity because corporate shareholders receive the tax saving that results from interest ex-

penses lowering taxable income and corporate income taxes.²⁴

Table 2 shows the benefits of tax deductible interest expenses to shareholders. Column 1 shows after-tax profits and the net rate of return to shareholders before investing in a new project. Column 2 shows the effect on corporate income of a \$100 investment financed by a sale of new equity. The project increases gross corporate income by \$20. Although the corporation earns a larger after-tax profit with the project, current stockholders receive the same 10 percent rate of return as before. This is because they must share the larger profit with new stockholders. Current stockholders, therefore, are not affected by the investment.

Current shareholders are benefited, however, when the investment is financed by debt. Column 3 shows that by increasing the interest expense, the debt-financed investment lowers taxable income to \$210. Although total after-tax profits are lower with debt finance, there are no new stockholders to share in the profits. With the new investment financed with debt, the net rate of return on current shareholders' investment in the corporation rises from 10 percent to 10.5 percent.²⁵

²⁴ Noncorporate businesses also have a tax incentive to use debt because of the tax deductibility of interest expenses combined with the personal income tax. The incentive is less strong for noncorporate businesses for two reasons. First, personal income is generally taxed at lower rates than corporate income so that the incentive to shield income from taxes is less. Second, owner-managers of noncorporate businesses lack limited liability in the event of bankruptcy.

²⁵ Exploiting the beneficial effects of debt also affects corporate investment. Financing investment by use of more debt and less equity affects the cost of capital against which projects' expected rates of return are compared. Since bond yields are generally lower than equity yields, a shift toward debt reduces the cost of capital and increases the number of projects that meet the acceptance criterion. Several researchers have used this fact to argue that the corporate income tax has little effect on total investment. See, for ex-

The primary disadvantage of tax deductible interest expenses is that this feature of the corporate income tax makes the financial system more fragile by encouraging excessive use of debt. When corporations are heavily indebted, the probability is increased that a prolonged recession could lead to widespread loan defaults and corporate bankruptcies. The cost of this feature of the corporate income tax is difficult to quantify, although the potential for high debt levels to result in corporate bankruptcies was seen in the recent recession.

The current tax system also leads corporations to retain more after-tax income and pay out less as dividends. The incentive to retain earnings results from the double tax on corporate earnings being lower when earnings are retained and reinvested in the corporation.²⁶

Unlike the tax at the corporate level, the tax on corporate income at the personal level varies according to the proportions of corporate income retained and distributed. Except for a small deduction, income distributed as dividends is taxed as ordinary income at shareholders' personal tax rates. In contrast, income retained by the corporation is not immediately taxable to shareholders. Retained earnings are reinvested in the corporation, raising the book value of shareholders' equity and usually the market value of their stock. When stock held for more than a year is sold, any capital gains are taxed at 40 percent of the shareholder's personal tax rate. Because the total tax on corporate income is lower when

ample, Joseph Stiglitz, "Taxation, Corporate Financial Policy, and the Cost of Capital," *Journal of Public Economics*, February 1973, pp. 1-34; and Martin Feldstein and Joel Slemrod, "Personal Taxation, Portfolio Choice, and the Effect of the Corporation Income Tax," *Journal of Political Economy*, October 1980, pp. 854-66.

²⁶ Unlike many of the effects discussed earlier, this effect is unique to corporate businesses, since only corporations can legally defer the payment of profits to its owners.

earnings are retained, tax laws promote the retention of earnings by corporations.

The disadvantage of a tax system that promotes earnings retention by corporations is that it inhibits the efficient allocation of resources. Allocation of resources is most efficient when the limited supply of investable funds is used to finance projects with the highest expected rates of return. When corporations pay a high percentage of their after-tax profits to shareholders, efficient resource allocation is promoted because shareholders are free to reinvest funds in corporations having projects yielding high rates of return. When corporations distribute less of their profits, efficient resource allocation occurs only if the retaining corporations also have high yielding projects. Since rapidly growing, cash-short companies often offer the most profitable investment opportunities, the current tax structure inhibits the efficient allocation of resources.²⁷

Corporate income taxation and prices

When the corporate income tax was enacted, lawmakers intended the tax to be paid out of the profits of corporate stockholders, who reap the benefits of ownership of incorporated businesses. It is often argued, however, that corporate managements shift some of the burden of the tax from stockholders to consumers by raising prices and using the extra revenue to pay part of the tax. This argument implies that the corporate income tax raises the price of goods corporations produce relative to goods produced by noncorporate businesses.

Economic theory provides conflicting answers to the question of how corporate in-

²⁷ See, for example, Charles McLure, Jr., *Must Corporate Income Be Taxed Twice?* Washington, D.C.: Brookings Institution, 1979, and the sources he cites.

come taxation affects corporate pricing decisions. If managements behave as profit maximizers, theory predicts that income taxation has no effect on their pricing decisions.²⁸ If managements follow a cost-plus pricing rule, however, theory predicts that prices are set to cover the tax and, hence, the tax is passed on to consumers.²⁹ Empirical studies have reached opposite conclusions about the effect of the corporate income tax on pricing decisions. A few researchers have found that manufacturing firms shift more than 100 percent of an increase in corporate tax rates to consumers. Others have found that almost no shifting occurs.³⁰

Ultimately, however, double taxation of corporate income probably raises the prices of corporate goods and depresses the prices of noncorporate goods. The price effect comes from

28 Profit maximizing managements produce at the level where the revenue from producing one additional unit of output exactly equals the cost of producing the additional unit. The corporate income tax has no effect on the cost of producing an additional unit of output because it is a tax applied to profits earned from the sale of all units, not profits from the last unit. For a further discussion of this analysis, see J. Gregory Ballentine, *Equity, Efficiency, and the U.S. Corporation Income Tax*, Washington, D.C.: American Enterprise Institute, 1980.

29 See Ballentine.

30 Studies that have found evidence of short-run shifting include Marian Krzyzaniak and Richard Musgrave, *The Shifting of the Corporation Income Tax*, Baltimore, Maryland: The Johns Hopkins Press, 1963; and Richard Dusansky, "The Short-Run Shifting of the Corporation Income Tax in the United States," *Oxford Economic Papers*, November 1972, pp. 357-71. The findings of both studies have been heavily criticized on methodological grounds, however. Studies that have found an insignificant amount of short-run tax shifting include Robert Gordon, "The Incidence of the Corporation Income Tax," *American Economic Review*, September 1967, pp. 731-58; John Cragg, Arnold Harberger, and Peter Mieszkowski, "Empirical Evidence on the Incidence of the Corporation Income Tax," *Journal of Political Economy*, December 1967, pp. 811-21; and William Oakland, "Corporate Earnings and Tax Shifting in U.S. Manufacturing, 1930-1968," *Review of Economics and Statistics*, August 1972, pp. 235-44.

the influence of corporate income taxation on the composition of investment between corporate and noncorporate businesses. By discouraging corporate investment relative to noncorporate investment, the double taxation of corporate income reduces the capital stock of the corporate sector and increases the capital stock of the noncorporate sector. The price of corporate output tends to rise, because the tax reduces the output of corporate businesses, making it more scarce and more valuable. Similarly, the price of noncorporate output tends to fall, because the tax increases the output of noncorporate businesses, making it more plentiful and less valuable. Hence, consumers that spend a large part of their incomes on noncorporate goods are benefited by the price effects of the current corporate income tax, while consumers that spend a relatively large part of their incomes on corporate goods are hurt.

Corporate income taxation and wage decisions

The corporate income tax probably tends to reduce wages. This effect occurs because taxation of corporate income probably reduces total investment and the total stock of capital.³¹

According to economic theory, wages are determined primarily by workers' productivity. Productivity, in turn, is heavily influenced by the amount of capital combined with labor during production. The productivity of a given labor force is usually greater the larger the

31 For a mathematical demonstration of the wage-reducing effect of the corporate income tax, see Martin Feldstein, "Incidence of a Capital Income Tax in a Growing Economy with Variable Savings Rates," *Review of Economic Studies*, October 1974, pp. 505-14. Like taxation of corporate income, taxation of noncorporate business income also probably reduces wages. The wage-reducing effect is smaller, however, because of the lower rates at which noncorporate income is taxed.

capital stock. Since one probable effect of the corporate income tax is to discourage investment and diminish the capital stock, the tax likely depresses wages.

Reforming the corporate income tax

Proposals to reform the federal income tax have been given more attention in recent years. Dissatisfaction with the current system is due to a growing belief that the system has been a factor accounting for the disappointing growth of the economy over the past decade. A complete reform of federal tax laws would require a reform of the laws governing the taxation of capital income—and, hence, the corporate income tax. This section examines ways of reforming the corporate income tax to reduce the economic distortions and costs associated with the current system.

Identifying the elements of a good tax system is a prerequisite to successful tax reform. Two attributes are particularly important.³² First, a good tax system raises a given amount of revenue with as little effect on economic activity as possible. Second, a good tax system is equitable, meaning that the tax falls least on those least able to pay and most on those most able to pay. A revision of the way corporate profits are taxed would be an improvement over the current system if it raised the same revenues with fewer economic distortions or if it improved the equity of the system. Ideally, a revision would do both.

Some of the disadvantages of the current corporate income tax could be overcome by maintaining the separate tax at the corporate level

but changing certain nonrate features of the tax. One such change might be to revise the investment tax credit to eliminate the current bias against structures and in favor of shorter term assets. A change of this type would improve the composition of business investment. Another possible change might replace historical cost accounting with market value accounting. Market value accounting would probably increase investment, especially in structures and long-term assets, by protecting depreciation deductions from changes in the price level. Still another change might be the replacement of accelerated depreciation methods with methods based on actual wear of assets. This change would promote the use of labor and nondepreciable capital in production. All three of these changes would very likely increase production by reducing the misallocation of resources. Because they would also affect tax revenues and the timing of tax receipts, the effect of these changes on the equity of the tax system would depend on the type of tax increase used to make up the lost revenues.

Another modification of the current corporate income tax might be a substantial reduction in corporate tax rates. Lower tax rates would tend to increase total investment by increasing the number of projects with expected rates of return that exceed the hurdle rate and by raising shareholders' after-tax return.³³ A reduction in corporate tax rates would also improve the composition of investment by reducing both the tax penalty corporations face relative to noncorporate businesses and the tax incentive to invest in particular types of capital. Since a reduction in tax rates would lower tax receipts, the effect of a rate reduction on the

³² For a discussion of the characteristics of a good tax system, see Richard Musgrave and Peggy Musgrave, *Public Finance in Theory and Practice*, New York: McGraw-Hill, 1973.

³³ Although lower rates tend to increase investment demand, they would not increase total investment if the personal saving rate is insensitive to the after-tax rate of return on investment.

equity of the tax system would again depend on the kind of tax increase used to make up for the loss in revenues.

Revisions in the tax laws to eliminate the double taxation of corporate dividends have also been proposed.³⁴ Under one proposal, dividends would be deducted from pretax corporate income, just as interest expenses are now deducted. Dividend relief would probably reduce the misallocation of resources between corporate and noncorporate businesses and possibly increase total investment by increasing after-tax rates of return to corporate shareholders. Dividend relief would also probably improve the financial condition of corporations by reducing the incentive to use debt financing. Such a measure might also improve the equity of the tax system by taxing dividends only at shareholders' personal rates. Since excluding dividends from taxable corporate income would lower tax receipts, the ultimate effect of dividend relief on the equity of the tax system would depend on the tax measures taken to replace the loss in revenue.

While the costs of the corporate income tax could be reduced by changing the current tax, elimination of these costs would require more drastic reform. Consumption-based tax plans have recently begun to receive serious attention from policymakers. Under a consumption tax, corporate and personal income taxes would be abolished and individuals would be taxed on their expenditures for goods and services. Most of the distorting effects on economic activity found under the current income tax system would be absent under a consumption tax system. Personal saving would not be discouraged by a tax on noncorporate business

income or a double tax on corporate income. The undesirable investment, financial, price, and wage effects of profit taxes would also be absent. Without the distorting effects of income taxes—especially the corporate income tax—production would probably increase, possibly by substantial amounts.³⁵ The equity of a consumption tax system would depend on the tax rate schedule selected and certain other technicalities.

While many criticisms have been raised against consumption-based tax plans, three merit particular consideration. Critics point out that, unless supplemented by a wealth tax, a consumption tax would worsen the distribution of wealth by favoring the rich, who have low propensities to consume. Passing the enacting legislation against such a powerful self-interest would be difficult, critics note. Second, tax rates would have to be higher under a consumption tax system than under an income tax system in order to raise an equivalent amount of tax revenues. This is because individuals usually consume less than their total incomes. Critics point out that higher tax rates would seriously distort taxpayers' work-leisure decisions and encourage tax evasion. Finally, the practical problems in making the transition from one tax system to another substantially reduce the probability that a consumption tax

³⁴ Similar revisions have been adopted in other countries. In France, Canada, and the United Kingdom, a portion of dividends is shielded from double taxation, while in West Germany, all dividends are shielded from double taxation.

³⁵ See Alan Auerbach, Laurence Kotlikoff, and Jonathan Skinner, "The Efficiency Gains from Dynamic Tax Reform," *International Economic Review*, February 1983, pp. 81-100; and Don Fullerton, John Shoven, and John Whalley, "Replacing the U.S. Income Tax with a Progressive Consumption Tax: A Sequenced General Equilibrium Approach," *Journal of Public Economics*, February 1983, pp. 3-24. Both studies use dynamic numerical general equilibrium models to estimate the output gained by moving from the present income tax system to a consumption-based tax system. Fullerton, Shoven, and Whalley estimate an increase in output of between 2 and 3 percent. Auerbach, Kotlikoff, and Skinner estimate a gain of nearly 5 percent.

would be adopted.³⁶

Another proposal, favored by many economists, would do away with the double taxation of corporate income by integrating the corporate and personal income taxes. Under a fully integrated income tax system, there would be no tax at the corporate level and corporations would be treated as partnerships. In terms of Table 1, integration would eliminate the upper panel and require corporate stockholders to complete a schedule similar to the schedules used in reporting proprietorship and partnership income. Corporations would furnish stockholders the information needed to complete these schedules, such as each stockholder's share of taxable corporate income and tax credits. With integration, stockholders would be taxed on their share of corporate income whether it was distributed as dividends or retained for reinvestment in the corporation.³⁷ Hence, integration would result in single taxation of corporate income at a single rate for every shareholder.

Economic distortions would be fewer under a fully integrated tax system. By taxing the profits of corporate and noncorporate businesses the same way, integration would eliminate the resource misallocation that results because projects yield higher after-tax rates of return when undertaken by noncorporate businesses. Integration would reduce the misallocation that results when high corporate tax rates affect the

composition of capital and factor inputs. Provided personal saving rates are interest sensitive, tax integration would tend to increase total investment by eliminating double taxation of corporate profits and increasing stockholders' after-tax rates of return from investment. Because fewer economic distortions would occur under a fully integrated tax system, the total output of goods and services would probably be greater.³⁸

The equity of the tax system would also be improved by tax integration. With corporations treated as partnerships, taxpayers would have their share of profits taxed at their own marginal tax rates instead of having part of profits taxed at an unrelated corporate tax rate. Integration would probably increase the profit tax paid by high-income taxpayers and lower the profit tax paid by low-income taxpayers.³⁹

Despite the efficiency and equity gains from tax integration, opponents of integration cite two major weaknesses in the plan. Administering the integrated tax system would be difficult. Corporations would have to compute and report to stockholders not only each stockholder's share of taxable corporate profits but also their share of nontaxable corporate profits and corporate credits. Moreover, because ownership of some stock changes between tax dates, income and credits would have to be allocated between old and new stockholders. Critics point out that the costs of

³⁶ For a further discussion of the disadvantages of the consumption tax, see, for example, Richard Goode, "The Superiority of the Income Tax," in Joseph Peckman (ed.), *What Should Be Taxed: Income or Expenditure?* Washington, D.C.: Brookings Institution, 1980.

³⁷ Under most fully integrated tax plans, corporate stockholders would adjust the basis of their stock upward every tax period by an amount equal to their share of retained earnings. The capital gains tax would remain in existence, but the basis adjustment would reduce or eliminate the capital gains realized when the stock was sold.

³⁸ See Don Fullerton, Thomas King, John Shoven, and John Whalley, "Corporate Tax Integration in the United States: A General Equilibrium Approach," *American Economic Review*, September 1981, pp. 677-91. Using a dynamic numerical general equilibrium model, the authors estimated that complete integration of the corporate and personal income taxes would increase total output between 0.5 and 1.5 percent.

³⁹ See Martin Feldstein and Daniel Frisch, "Corporate Tax Integration: The Estimated Effects on Capital Accumulation and Tax Distribution of Two Integration Proposals," *National Tax Journal*, March 1977, pp. 37-52.

obtaining the information needed for accurate taxing could be substantial.⁴⁰ A second major weakness is that tax integration would require the adoption of some unpopular measures. To make sure that taxes were paid, corporations would be required to withhold part of shareholders' profits, just as corporations now withhold part of employees' wages and salaries. This could be unpopular with lower income shareholders, critics argue, because the highest personal tax rate would probably be used in computing the amount of profit income to be withheld. Moreover, personal tax rates would have to be increased to make up for the tax revenues lost from the abolition of the tax at the corporate level. Critics note that these disadvantages must loom large relative to the benefits of integration because no country has adopted such a plan, and nowhere is a serious move being made to adopt an integrated tax scheme.⁴¹

Summary and conclusion

The current system of taxing corporate income has long been recognized as contributing to an inefficient allocation of resources. It is hardly surprising, therefore, that the system has recently come under attack from proponents of supply-side economics, who assert that changes in government policy, especially tax policy, could increase production, productivity, and the standard of living given available resources.

The article has examined the economic effects of the current corporate income tax and has looked at alternatives to the tax. Both rate and nonrate features of the tax, together with differences in the tax treatment of corporate and noncorporate profits, were shown to affect

economic activity. These effects were divided into the effects on aggregate investment and the effects on other macroeconomic variables. It was argued that the corporate income tax adversely affects the pattern of corporate investment by determining the collection of projects with expected rates of return that exceed the hurdle rate. It was also argued that the tax may lower total investment by lowering the after-tax rate of return on investment. Because of the effects of the tax on investment and, thus, production, the prices of corporate goods are probably higher and the wages of all workers are probably lower than under a neutral corporate income tax. Other features of the current tax were shown to increase the use of debt finance and the retention of earnings by corporations.

Proposals to reform the corporate income tax range from simple revisions in the current tax rules to abolition of the tax. Some of the output that is now foregone as a result of the tax could probably be regained by adopting modifications to the tax that reduce the difference between investment projects' before-tax and after-tax expected rates of return. More of the output loss might be recouped by combining these modifications with either a plan to integrate the corporate and personal income taxes or a plan to tax consumption. While the prospect of these institutional changes would no doubt evoke some opposition, the long-run benefits in terms of increased national output would very likely outweigh the short-run costs of implementing such reforms.

⁴⁰ See McLure.

⁴¹ See McLure.

Inflation Uncertainty And Inflation Hedging

By Laurence G. Kantor

Increased inflation in the United States over the past ten years has been accompanied by increased volatility in inflation that has probably made inflation harder to predict. Many analysts have identified uncertainty about inflation as a major cost of inflation.¹

Inflation uncertainty is said to affect the economy several ways. One is by increasing the

¹ See, for example, Milton Friedman, "Nobel Lecture: Inflation and Unemployment," *Journal of Political Economy*, June 1977, pp. 451-72; Dean Hughes, "The Costs of Inflation: An Analytical Overview," *Economic Review*, Federal Reserve Bank of Kansas City, November 1982, pp. 3-14; Burton Malkiel, "The Capital Formation Problem in the United States," *Journal of Finance*, May 1979, pp. 291-306; Donald Mullineaux, "Unemployment, Industrial Production, and Inflation Uncertainty in the United States," *Review of Economics and Statistics*, May 1980, pp. 163-69; Maurice Levi and John Makin, "Inflation Uncertainty and the Phillips Curve: Some Empirical Evidence," *American Economic Review*, December 1980, pp. 1022-27; and John Makin, "Anticipated Money, Inflation Uncertainty, and Real Economic Activity," *Review of Economics and Statistics*, February 1982, pp. 126-34.

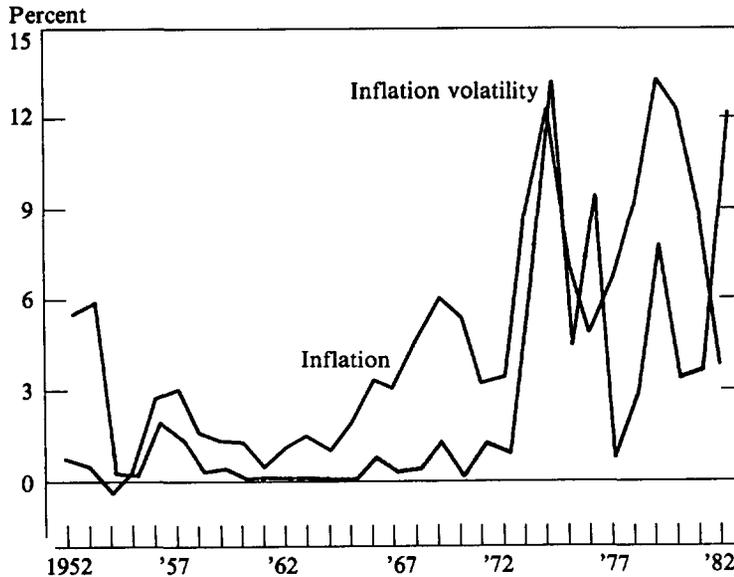
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riskiness of the real rate of return on savings. Since consumers are generally risk averse, this riskiness imposes costs on households and should, therefore, encourage households to rearrange their portfolios in an effort to protect the real rate of return on their savings from unexpected changes in inflation. The resulting increase in the demand for savings instruments with a real return better protected from unexpected changes in inflation should increase the supply of such assets. To the extent that these efforts to hedge against inflation succeed, they offset the costs that inflation uncertainty inflicts on households.

Previous research on the effects of inflation uncertainty on households and other economic agents has ignored the potentially neutralizing effect of inflation hedging. This article re-examines the effect of inflation uncertainty on households by explicitly considering the role of inflation hedging.

The first section documents trends in inflation, inflation volatility, and inflation uncertainty and examines the theoretical relationships between them. The second section explains how inflation uncertainty can impose costs on households and examines how inflation hedging can offset these costs. The third section discusses the ways households might hedge inflation and provides evidence of the

CHART 1
Inflation and inflation volatility



Note: Inflation is the yearly (December to December) percentage change in the Consumer Price Index. Inflation volatility is the variance of inflation, plotted as a three-year moving average.

nature of this hedging and the extent to which it has been successful. The results are then used to draw inferences about how inflation uncertainty has affected households and the extent to which inflation hedging has neutralized these effects. Particular attention is given to changes since 1973, when inflation became significantly greater and more volatile and uncertain. The final section presents conclusions that can be drawn from this analysis, including implications for the effect of inflation uncertainty on other economic variables.

Recent experience with inflation volatility and uncertainty

Several economists have noted positive associations between inflation, inflation volatility, and inflation uncertainty. This section examines the empirical and theoretical relationships between these variables.

Inflation and inflation volatility

Common measures of inflation and inflation volatility are employed here. To measure inflation, percentage changes in the Consumer Price Index (CPI) are used. To measure inflation volatility, the variance of inflation is used, which is the average squared deviation of values from the mean.²

Chart 1 shows the rate of inflation and the volatility of inflation from 1952 through 1982.

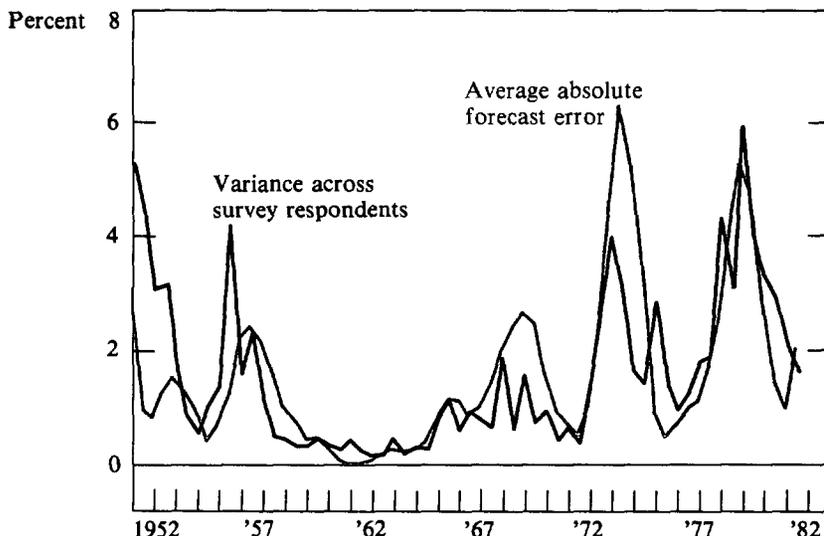
² The variance of the inflation rate over n periods would be equal to:

$$\text{Var}(P) = \frac{1}{n} \sum_{i=1}^n (P_i - \bar{P})^2,$$

where P_i = the rate of inflation in period i , and

$$\bar{P} = \text{the average rate of inflation} = \frac{1}{n} \sum_{i=1}^n P_i.$$

CHART 2
Inflation uncertainty proxies



Note: Variance is the variance of 12-month inflation forecasts across respondents to the Livingston survey at each of the June and December survey dates. Average forecast error is the three-period moving average of the absolute value of 12-month inflation forecast errors, measured as the actual rate of inflation minus the mean expected rate of inflation across respondents to the Livingston survey.

The chart shows that when inflation increased dramatically beginning in 1973, so did inflation volatility. Several researchers have found further evidence of a positive association between inflation and inflation volatility, for both the United States and other countries.³

³ The strongest evidence of a positive relationship between inflation and inflation volatility consists of a significantly positive relationship between average inflation and the variance of inflation across countries. Such evidence has been presented by John Taylor, "On the Relation Between the Variability of Inflation and the Average Rate of Inflation," *Carnegie-Rochester Series on Public Policy*, Autumn 1981, pp. 57-86; Stanley Fischer, "Towards an Understanding of the Costs of Inflation: II," *Carnegie-Rochester Series on Public Policy*, Autumn 1981, pp. 5-42; Arthur Okun, "The Mirage of Steady Inflation," *Brookings Papers on Economic Activity*, 1971:2, pp. 435-498; and Denis Logue and Thomas Willett, "A Note on the Relationship Between the Rate and Variability of Inflation," *Economica*, May 1976, pp. 151-158. Taylor, "On the Relation . . .," also presents evidence of a positive association between inflation and inflation volatility over time for various countries.

Inflation volatility and inflation uncertainty

Inflation volatility and inflation uncertainty have much the same elements, but they are not identical.⁴ If inflation could be predicted, increased inflation volatility would not necessarily be associated with increased inflation uncertainty. This, however, has not been the case in the past ten years. Increased inflation volatility has coincided with a reduction in inflation predictability. The major cause of the increased inflation and inflation volatility in the 1970s, sharp increases in the price of crude oil, was generally unexpected.

⁴ See I. Ibrahim and Raburn Williams, "Price Unpredictability and Monetary Standards: A Comment on Klein's Measure of Price Uncertainty," *Economic Inquiry*, July 1978, pp. 431-437, for a more formal analysis of the differences between inflation volatility and uncertainty than presented here.

Researchers have also shown a positive association between inflation volatility and various proxies for inflation uncertainty.⁵ Chart 2 traces two proxies for inflation uncertainty. One is the variance of inflation forecasts across respondents to the Livingston expected-inflation survey.⁶ The other is the three-period moving average of the absolute value of inflation-forecast errors—that is, the actual rate of inflation less the expected rate of inflation—based on inflation forecasts from the Livingston data. The evidence suggests that inflation uncertainty, like inflation volatility, has increased since the early 1970s, particularly during and after the two main energy-induced inflation shocks in 1973-74 and 1979.

Inflation uncertainty and hedging: theoretical considerations

This section examines the theoretical basis for the effect of inflation uncertainty on house-

holds and shows how inflation hedging can offset this effect. Inflation uncertainty affects households by making the real rate of return on household savings more risky. The real rate of return on savings is defined approximately as the nominal (stated) rate of return minus the actual rate of inflation:

$$r_t = R_t - P_t, \quad (1)$$

where r_t is the actual (ex post) real rate of return over holding period t , R_t is the nominal rate of return over period t , and P_t is the rate of inflation over the same period.⁷ Since households save for future consumption, they are concerned with the goods and services their savings will buy in the future. It is assumed, therefore, that they are concerned with real rates of return on their savings rather than nominal rates because real returns account for changes in purchasing power.⁸

Inflation uncertainty increases risk

Equation 1 can be modified to show that greater uncertainty about inflation implies greater uncertainty about the real return on savings.⁹ Whether the nominal rate of return is

⁵ Alex Cukierman and Paul Wachtel, "Inflationary Expectations: Reply and Further Thoughts on Inflation Uncertainty," *American Economic Review*, June 1982, pp. 508-12, show that the variance of inflation-forecast errors, a common proxy for inflation uncertainty, and the variance of inflation are both increasing functions of the variance of the rate of change in nominal income. In that paper and their paper, "Differential Inflationary Expectations and the Variability of the Rate of Inflation," *American Economic Review*, September 1979, pp. 595-609, they also show that the variance of inflation is significantly and positively correlated with the variance of inflation forecasts across survey respondents, another proxy for inflation uncertainty. Taylor, "On the Relation Between . . .," demonstrates that the variance of inflation-forecast errors from an inflation-forecasting equation is positively related to both the variance and mean of inflation across seven countries. Inflation volatility has often been used as a proxy for inflation uncertainty. See, for example, Mullineaux, "Unemployment, Industrial Production . . .," and Benjamin Klein, "Our New Monetary Standard: The Measurement and Effects of Price Uncertainty, 1880-1973," *Economic Inquiry*, December 1975, pp. 461-484.

⁶ The Livingston data refer to a survey of economists and leading financial market participants compiled every June

and December by Joseph Livingston, a financial columnist for the *Philadelphia Inquirer*. The data used here were revised by John Carlson, "A Study of Price Forecasts," *Annals of Economic and Social Measurement*, Winter 1977, pp. 27-56.

⁷ A more precise definition would include an interaction term representing the depreciation of real interest. However, this term is very small and usually ignored.

⁸ Households are also concerned with after-tax rather than before-tax rates of return. That issue is ignored in this article, however, to focus on the effect of changes in inflation.

⁹ No distinction is made in this article between risk and uncertainty. These terms are used interchangeably. See Frank Knight, *Risk, Uncertainty and Profit*, London School of Economics and Political Science, 1948, for an explanation of the distinction.

known in advance or not, the real rate is always uncertain. This is because future inflation is always uncertain and fully inflation-indexed savings instruments are not available.¹⁰ With the assumption that the nominal rate of return is known at the beginning of the holding period, the expected real rate of return is defined approximately as:

$$r_t^e = R_t - P_t^e, \quad (2)$$

where r_t^e is the expected real rate of return for period t and P_t^e is the expected rate of inflation for period t . By subtracting equation 2 from equation 1, equation 3 is obtained:

$$r_t - r_t^e = P_t^e - P_t. \quad (3)$$

This equation shows that when inflation is different from expected, that is, when $P_t^e - P_t$ is not zero, the real rate of return is also different from what was expected, that is, $r_t - r_t^e$ is not zero. This means that more uncertainty about inflation implies more uncertainty about the real rate of return on savings.

Inflation hedging reduces risk

Equation 1 can be further modified to show that inflation hedging, which results in a more positive association between the nominal rate of return on savings and the rate of inflation, may reduce uncertainty about the real rate of return on savings caused by inflation uncertain-

ty. Equation 2 assumes that a fixed nominal rate of return is known at the beginning of the holding period. If the nominal rate is uncertain, as it usually is, equation 2 becomes:¹¹

$$r_t^e = R_t^e - P_t^e. \quad (4)$$

Subtracting equation 4 from equation 1, the following is obtained:

$$r_t - r_t^e = (R_t - R_t^e) + (P_t^e - P_t). \quad (5)$$

Inflation hedging, as indicated above, causes R_t and P_t to move together. In the case of complete inflation hedging, any change in R_t is accompanied by an equal change in P_t . Thus, any difference between expected and actual inflation, that is, any nonzero value for $P_t^e - P_t$, is offset exactly by a divergence between the actual and expected nominal rate of return, that is, by a nonzero value for $R_t - R_t^e$. This offsetting effect eliminates any divergence between the actual real rate of return and the expected real rate—that is, it means $r_t - r_t^e = 0$. In general, then, a more positive association between R_t and P_t implies that unexpected inflation has less effect on the difference between the actual real rate of return on savings and the expected real rate. Hence, the effect of inflation uncertainty on the uncertainty about the real rate of return on savings is reduced.

The incentive to hedge inflation

The analysis so far has established that, other factors held constant, an increase in inflation

¹⁰ If a household's savings consisted only of Treasury bills held until maturity, the nominal return on its savings would be known in advance but not the real return. Alternatively, neither the nominal nor the real return on common stock is known in advance. The unavailability of fully inflation-indexed savings instruments is discussed in Stuart Weiner, "Why Are So Few Financial Assets Indexed to Inflation?" *Economic Review*, Federal Reserve Bank of Kansas City, May 1983, pp. 3-18.

¹¹ In practice, the only assets with nominal rates of return known and fixed at the beginning of the holding period are assets that are default-risk free, have a fixed maturity, no coupon, and are held until maturity. Many assets used by households as savings instruments do not satisfy all of these conditions, as for example, real estate, common stock, and bonds sold before maturity.

uncertainty increases the riskiness of the real rate of return on savings, which makes consumers worse off.¹² This being the case, an increase in inflation uncertainty creates an incentive for households to rearrange their portfolios toward assets that are better inflation hedges and to demand assets that better hedge inflation.¹³ To the extent that households succeed in changing their portfolios so that the real rate of return on their savings is better protected from changes in inflation—or so that the nominal rate is more positively associated with the rate of inflation—they can offset the increase in risk and, hence, offset the cost associated with increased inflation uncertainty.¹⁴

¹² It is generally assumed that economic agents, including consumers, are risk averse. With regard to savings, risk aversion implies that, given two investments offering the same rate of return but different degrees of risk, consumers will prefer the investment with less risk.

¹³ Increased uncertainty regarding the real rate of return on savings might also affect households' income allocation between spending and saving, but the direction of the effect is theoretically ambiguous. One response to increased uncertainty about the real rate of return on savings would be to save more to make sure of a minimum purchasing power in the future. There is also a motive to substitute spending for saving, however, because the real return to saving has become more risky relative to consumption. The net effect depends on the precise nature of savers' attitudes toward risk. For a more formal theoretical analysis of the effect of uncertainty (not specifically inflation uncertainty) on total saving, see J. Stiglitz, "A Consumption-Oriented Theory of the Demand for Financial Assets and the Term Structure of Interest Rates," *Review of Economic Studies*, April 1970, pp. 345-351, and A. Sandmo, "The Effect of Uncertainty on Saving Decisions," *Review of Economic Studies*, April 1970, pp. 353-360. Not surprisingly, empirical tests of the effect of inflation uncertainty on saving yield ambiguous results and are sensitive to the definition of saving used and to the specification of the test. For examples, see Paul Wachtel, "Inflation Uncertainty and Saving Behavior Since the Mid-1950's," *Explorations in Economic Research*, Fall 1977, pp. 558-578, and Philip Howrey and Saul Hymans, "The Measurement and Determination of Loanable Funds Savings," *Brookings Papers on Economic Activity*, 1978:3, pp. 655-685.

Households can also protect themselves from inflation by adjusting their liabilities. However, this article does not address those adjustments.

Empirical evidence of inflation hedging by households

The previous section indicates that households have a greater incentive to hedge inflation when it becomes more uncertain because hedging can offset increases in the riskiness of the real rate of return on savings that result from increases in inflation uncertainty. This section investigates the nature of inflation hedging by households and the extent to which households have succeeded in hedging inflation. Results of the investigation are then used to estimate the effects of inflation uncertainty and inflation hedging on the riskiness of the real rate of return on household savings. Particular emphasis is placed on the period since 1973, when inflation became significantly greater and more uncertain. Finally, a comment is offered on the changes in consumer welfare that accompanied changes in inflation and inflation uncertainty.

Nature of hedging by households

Households try to insulate the real rate of return on their savings from changes in infla-

¹⁴ While the focus here is on the effect of inflation uncertainty on the riskiness of the real rate of return on savings, it is also important to consider any effects on the level of the real rate of return. An increase in the riskiness of the real rate of return on savings leaves households worse off, but an increase in the level of the real rate of return on savings makes them better off. Inflation hedging has been broadly defined as including adjustments that protect the real rate of return on savings from changes in inflation. While hedging offsets the effect of inflation uncertainty on the riskiness of the real rate of return on savings, it also offsets declines in the level of the real rate of return resulting from increases in inflation. Since the level of inflation has been positively correlated with inflation uncertainty, it is not always possible to distinguish between inflation hedging designed to protect the level of the real rate of return on savings from increases in the level of inflation and inflation hedging intended to protect against increases in the riskiness of the real rate due to increases in inflation uncertainty.

tion by reallocating wealth among existing assets in their portfolios and demanding new financial assets that are better inflation hedges. This demand for inflation hedges has been one of the factors, along with financial deregulation, that has encouraged an increased supply of such assets. Some of this inflation hedging is designed to protect the level of the real rate of return on savings from falling due to higher levels of inflation. Some is also designed to protect against an increase in the riskiness of the real rate caused by increased inflation uncertainty.

Financial futures contracts are examples of financial assets that can be used to offset increases in the riskiness of the real rate of return due to increased inflation uncertainty. Their development reflects growth in the demand for such assets. New assets with more flexible nominal rates of return that adjust more easily to changes in inflation protect both the level of the real rate of return on savings from higher inflation and the riskiness of the real rate from greater inflation uncertainty. Examples of such assets that came about as a result of deregulation include Super NOW accounts, money market certificates, money market deposit accounts, and all savers certificates. Some of these assets were supplied by nondepository institutions. They include money market mutual funds, universal and variable life insurance, and floating rate notes. These new, more inflation-hedged assets began to appear in the mid-1970s, just after inflation became significantly greater and more uncertain.¹⁵

An examination of the changes in the relative proportions of the household sector's portfolio allocated to various classes of assets provides

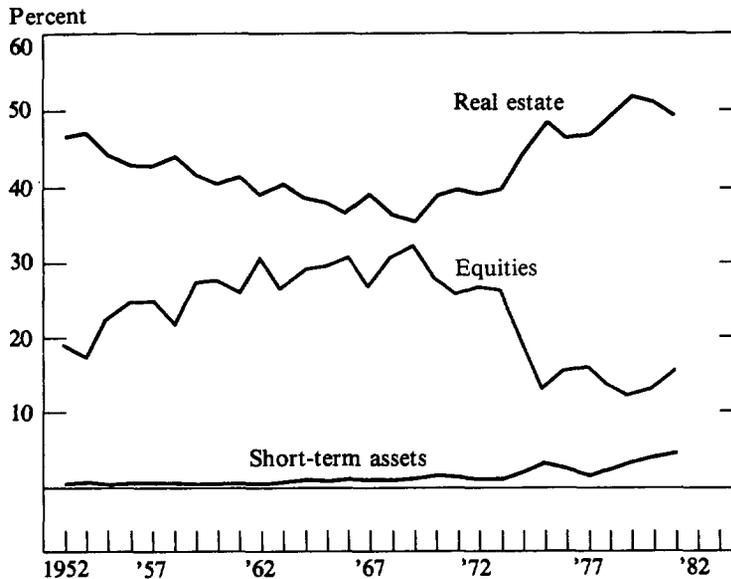
¹⁵ See Weiner for a more detailed discussion of these assets as well as the exact dates of their appearance.

some indication of how households have responded to the increase in inflation and inflation uncertainty since 1973.¹⁶ Chart 3 shows the changes in the three classes of assets with weights that have changed the most since 1973. The proportion that households have allocated to equity (including mutual funds) has declined significantly since 1973. At the same time, the allocation to real estate (including both farm and residential real estate) has increased considerably, as has the allocation to short-term securities (which includes Treasury bills, money market mutual funds, large CD's, and commercial paper). The increase in the household sector's portfolio allocation to short-term assets is underestimated, though, because the estimates do not include the new short-term assets with more flexible nominal rates of return that resulted from financial deregulation.

¹⁶ Note that the changes in weights reflect some supply and demand factors other than those resulting from changes in portfolio allocations by households. In the long run, however, households will readjust their portfolios in response to undesired changes in weights induced by changes in outstanding market values that originate from sources other than household portfolio reallocation—that is, from supply sources and portfolio reallocations by other sectors.

These weights are calculated from outstanding values held by households at the beginning of the year (or, the end of the previous year). The data are obtained from the Federal Reserve's Flow of Funds for all assets other than life insurance reserves and real estate. Values for life insurance reserves are obtained from various issues of the *Life Insurance Fact Book*. Market values for residential real estate are from John Musgrave, "Fixed Non-Residential Business and Residential Capital in the United States, 1925-79," *Survey of Current Business*, February 1981. The value of land beneath the structures was assumed to be 20 percent of the value of the structures. (See Roger Ibbotson and Laurence Siegel, "The World Market Wealth Portfolio," *Journal of Portfolio Management*, Winter 1983, pp. 5-17, for a further explanation of these real estate values.) Market values for farm real estate were from Ibbotson and Carol Fall, "The United States Market Wealth Portfolio," *Journal of Portfolio Management*, Fall 1979, pp. 82-92, and Ibbotson and Siegel, "The World . . ."

CHART 3
Portfolio allocation by households



Note: Real estate includes residential and farm real estate. Equities include common stock and mutual funds, other than money market mutual funds. Short-term assets include U.S. Treasury bills, money market mutual funds, large certificates of deposit, and commercial paper.

These trends in the allocation of household assets suggest a reallocation from less inflation-hedged assets to assets that are more inflation hedged. Several studies show that nominal stock returns have been negatively related to inflation.¹⁷ Real estate, however, has been one of the best inflation hedges available to households. Short-term financial assets are better inflation hedges than long-term financial assets. Returns on short-term assets are better at cap-

turing short-term changes in the expected rate of inflation. Furthermore, unexpected inflation results in less capital loss on short-term securities than on long-term securities.¹⁸

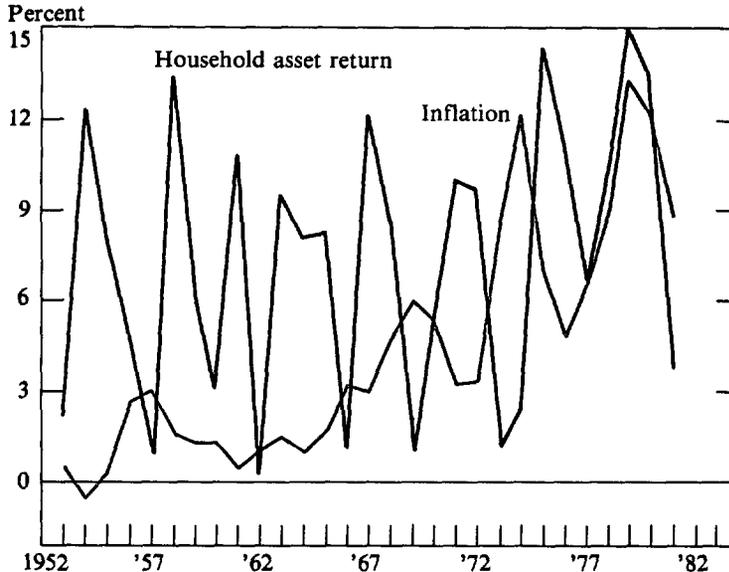
Inflation hedging performance of households

While it appears that households may have tried to hedge inflation, it is useful to examine the extent to which they succeeded. Their success should be reflected in a positive association between the nominal rate of return on their savings and the rate of inflation.

¹⁷ See, for example, Zvi Bodie, "Common Stocks as a Hedge Against Inflation," *Journal of Finance*, May 1976, pp. 459-470; Eugene Fama and G. William Schwert, "Asset Returns and Inflation," *Journal of Financial Economics*, 1977, pp. 115-146; and Charles Nelson, "Inflation and Rates of Return on Common Stocks," *Journal of Finance*, May 1976, pp. 471-482. One hypothesis that has been offered to explain why stocks have not been a good inflation hedge is that inflation increases the real tax burden of corporations because of inventory and depreciation accounting methods that are based on historic costs.

¹⁸ For the same reason, households should allocate less of their wealth to long-term assets in response to increased inflation volatility and uncertainty. The relative weight allocated by households to long-term assets (which included Treasury notes, Treasury bonds, municipal bonds, corporate and foreign bonds, and government agency

CHART 4
Nominal rate of return on household assets



Note: Return on assets is the value weighted annual nominal rate of return on assets held by the household sector, other than consumer durables. Inflation is yearly (December to December) percentage changes in the Consumer Price Index.

Chart 4 plots the nominal rates of return on the aggregate portfolio of assets held by households and the inflation rate from 1953 through 1981.¹⁹ The aggregate portfolio includes financial assets and real estate but not consumer durables. The rates of return are before taxes, since after-tax data are not available.²⁰

securities) was approximately the same in 1981 as it was in 1973. However, the weights for these long-term securities were calculated by using outstanding par values instead of market values. Since there was considerable unexpected inflation over this period and interest rates generally rose, the market values of many bonds fell below their par values. Thus, the relative weight of household portfolios allocated to long-term securities, with respect to outstanding market values, probably declined over this period.

¹⁹ This rate-of-return series consists of the weighted rate of return on the assets held by households. The beginning-of-year weights are described in footnote 16. All rates of return are calculated on a calendar-year basis. Thus, the results presented in this section implicitly assume a one-year holding period. Assets included in the portfolio are demand deposits and currency, savings and small time deposits

(under \$100,000) at all depository institutions, certificates of deposit, money market mutual funds, Treasury bills, notes, and bonds, municipal bonds, corporate and foreign bonds, commercial paper, mutual funds, equities, life insurance reserves, U.S. savings bonds, residential real estate, farm real estate, and government agency securities. Rates of return are obtained from Ibbotson and Fall, "The United States . . .," Ibbotson and Siegel, "The World Market . . .,"; *The Mutual Fund Fact Book*, 1978 and 1982 editions; Federal Reserve Flow of Funds data; the *Life Insurance Fact Book*, various issues; the U.S. Savings Bond Division of the Treasury; the *Federal Reserve Bulletin*; Chase Econometrics, Inc.; the Federal Home Loan Bank Board *Journal*; the Federal Home Loan Bank Board *Sourcebook*; and Scott Winningham and Donald Hagan, "Regulation Q: An Historical Perspective," *Economic Review*, Federal Reserve Bank of Kansas City, pp. 3-17. The precise methods used in calculating the various rates of return are available from the author.

²⁰ Thus, this examination does not consider the extent to which households were able to avoid inflation-induced increases in taxes. The reallocation of household assets toward real estate, illustrated in Chart 3, suggests that households adjusted to avoid these tax increases to some extent. The implicit rental return on residential real estate is not taxed and taxes on capital gains can be largely avoided through deferral options and exemptions.

Over the 1953-72 period, before inflation became considerably greater and more uncertain, there seems to have been a negative relationship between the nominal rate of return on household savings and the rate of inflation.²¹ Beginning with the huge increase in inflation in 1973, the rate of return on household assets appears to have begun to follow inflation with a lag that made their contemporaneous association negative. Beginning in 1977, however, the nominal rate of return of household savings and the rate of inflation were closely and positively associated.

Correlation coefficients between the nominal rate of return on household assets and the rate of inflation generally support these observations.²² This standardized measure of association indicates that inflation and the nominal rate of return on the aggregate portfolio of household assets were positively but not significantly related over the entire 1953-81 period at 0.12. The results also indicate, however, that the associations between the nominal rate and the rate of inflation changed markedly over the 1953-72, 1973-76, and 1977-81 subperiods. The relationship was negative for 1953-72 (-0.24) but turned more negative over the 1973-76 period (-0.74) and significantly positive over the 1977-81 period (0.83).

The evidence presented so far indicates that the 1953-72, 1973-76, and 1977-81 periods were distinctly different in levels of inflation and inflation uncertainty and in the extent of inflation

hedging by households. The 1953-72 period was characterized by low inflation and inflation uncertainty and little apparent inflation hedging by households. During the 1973-76 period, the economy was beset by high inflation and inflation uncertainty precipitated by the unexpected large increase in energy prices and the removal of price controls. Households, however, apparently did not hedge the inflation over this period. Another major oil shock occurred in 1979, and inflation remained high and uncertain over the 1977-81 period. Unlike the 1973-76 period, however, households did hedge inflation.

The evidence suggests that when inflation became greater and more uncertain, households hedged inflation after an adjustment period. It takes time for households to adjust their portfolios, for new financial assets to be developed, and for financial deregulation to be legislated and implemented. An adjustment period of several years is not surprising, given the previous 20 years of relatively low and predictable inflation. In sum, the evidence is consistent with the hypothesis that when inflation becomes greater and more uncertain, the benefits of inflation hedging increase relative to the costs.

Contribution of inflation hedging to risk reduction

The results presented above indicate that the nominal rate of return on household savings and the rate of inflation were negatively related over the 1953-72 period and became more negatively associated over the 1973-76 period. The implication of a negative association between the nominal rate of return on household savings and the rate of inflation is that increases in inflation are associated with decreases in the nominal rate and, thus, even bigger decreases in the real rate of return on savings. Similarly, increased inflation volatility would imply even

21 Household savings is loosely defined as consisting of the financial assets held by the household sector plus residential and farm real estate.

22 A correlation coefficient is a standardized measure of association between two variables constrained to be greater than or equal to -1 and less than or equal to 1 . A correlation coefficient of 1 implies that two variables are perfectly and positively associated. A correlation coefficient of -1 implies that the two variables are perfectly and negatively associated.

greater volatility in the real rate of return on savings and increased inflation uncertainty would imply greater uncertainty about the real rate. Alternatively, as already discussed, a positive association between the nominal rate and the rate of inflation reduces—and can even eliminate—the negative effect of increased inflation on the real rate of return on savings. Such an association—which characterized the 1977-81 period—also reduces the effect of inflation uncertainty on the riskiness of the real rate.

The effect of inflation uncertainty and the counteractive effect of inflation hedging on the riskiness of the real rate of return on savings are not easy to measure because the riskiness of the real rate and inflation uncertainty cannot be observed directly. A commonly used proxy for the riskiness of financial portfolios is the variance of the real rate of return.²³ The variance of the real rate can be decomposed as follows:

$$\text{Var}(r) = \text{Var}(R) + \text{Var}(P) - 2\text{Cov}(R,P), \quad (6)$$

where $\text{Cov}(R,P)$ is equal to the covariance (a measure of the degree of association) between the nominal rate of return and the rate of inflation. This expression shows that an increase in the variance of the inflation rate—which has been closely associated with inflation uncertainty—increases the variance of the real rate of return on savings. However, an increase in the covariance between the nominal return and in-

²³ Since the variance of the real rate of return on savings is unknown at the beginning of the holding period, a more precise measure of risk would be the expected variance of the real rate of return. However, as the expected variance is not observable, the actual variance of the real rate of return is often used as a proxy. The suitability of the variance of the real rate of return on savings as a measure of its riskiness depends partly on the extent to which the length of savers' holding periods matches the length of the holding

TABLE 1
Components of variance
of real rate of return
on household savings

	$\text{Var}(r)$	=	$\text{Var}(R)$	+	$\text{Var}(P)$	-	$2\text{Cov}(R,P)$
1953-72	23.93	=	17.46	+	2.98	-	2[-1.75]
1973-76	80.02	=	41.07	+	9.60	-	2[-14.68]
1977-81	7.94	=	21.77	+	7.62	-	2[10.72]

flation—a result of successful inflation hedging—reduces the variance of the real rate of return on savings.

Table 1 shows the components of the variance of the real rate of return on household assets for three periods: 1953-72, the period before the dramatic increase in inflation and inflation uncertainty; 1973-76, the period of adjustment; and 1977-81, the period in which households were able to adjust to high and uncertain inflation. Inflation volatility, measured by the variance in the rate of inflation, began increasing in 1973 and remained high through 1981. The variance in the real rate of return on household savings increased substantially from the first period to the second, with all three components of the variance of the real return contributing to the increase.²⁴

period used in calculating the variance. For example, if savers do not plan to spend out of their savings for at least a year, the monthly volatility of the real rate of return on their savings within the year might be irrelevant. However, holding periods are uncertain. Savers do not usually know beforehand exactly when they will need to spend out of their savings. Given that holding periods are uncertain and vary across households, increased volatility of the real rate of return on total household savings calculated by using any reasonable holding period can be assumed to increase risk.

²⁴ The increase in the variance of the nominal rate of return on savings, $\text{Var}(R)$, cannot, by itself, be interpreted as increasing risk. This is because changes in the nominal rate of return at least partly reflect changes in expected inflation. However, the substantially more negative covariance between the nominal rate of return and the rate of inflation suggests that the variance of the nominal rate of

TABLE 2
Means and variances of real rates
of return on household assets
before, during, and after adjustment
to high and variable inflation

	Mean	Variance
1953-72	4.52	23.93
1973-76	-0.93	80.02
1977-81	-0.16	7.94

Although the variance in inflation remained high in the 1977-81 period, the variance in the real rate of return on household assets fell dramatically, below what it had been before 1973. This drop was due primarily to a large increase, to a positive value, in the covariance between the nominal return on household savings and inflation. When this covariance is positive, it subtracts from, rather than adds to, the variance of the nominal rate and the variance of inflation in the calculation of the variance of the real rate of return. While other factors could have also contributed to this increased covariance, the evidence is consistent with the premise that, after an adjustment period when the riskiness of the real rate increased substantially, inflation hedging by households offset the effect of increased inflation uncertainty on the riskiness of the real rate of return on their savings.

*A look at changes
in the welfare of households*

The riskiness of the real rate of return on household savings appears to have risen from the 1953-72 period to the 1973-76 period and then, because of inflation hedging, to have

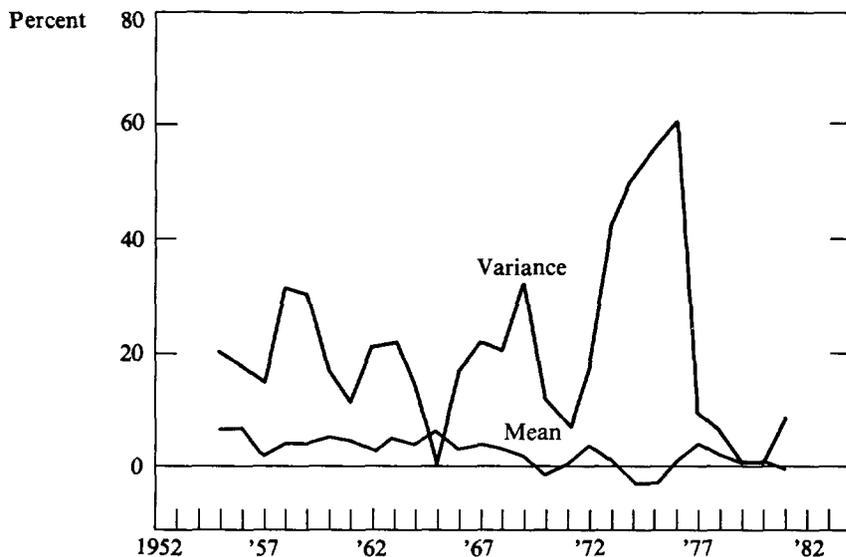
return contributed to the increase in the riskiness of the real rate of return on savings over this period.

fallen from the latter period to the 1977-81 period. Given these changes in risk, it is useful to assess the changes in consumer welfare that occurred. To do that, changes in the level of the real rate of return on household savings also have to be examined. It is assumed that consumers' welfare is a positive function of the real rate of return on their savings and a negative function of the variance of the real rate of return.

Chart 5 shows the three-year mean and variance of the real rate of return on household savings for 1955-81. Table 2 reports the average real rate of return and the variance of the real rate of return for 1953-72, 1973-76, and 1977-81. The high and unpredictable rates of inflation that began in 1973 were accompanied by a decline in the average real rate of return on household savings and an increase in the variance of the real rate of return for the 1973-76 period. Households were clearly worse off during this adjustment period in terms of the real return and the riskiness of their savings. Beginning in 1977, however, the average real rate of return rose—although not generally as high as before 1966—and the variance of the real rate of return fell to levels generally below those before 1973. Thus, in terms of the real return and riskiness of their investment assets, it appears that the welfare of households improved once they could adjust to inflation.

It is difficult, however, to compare their welfare in the 1953-72 and 1977-81 periods. Both the average real return and the variance of the real return seem to have fallen. Households appear to have recently been earning a negative real rate of return on their savings, but a more certain rate. It is also difficult to assess the extent to which inflation and inflation uncertainty have contributed to these changes in welfare. Other factors also affect risk and return. Higher oil prices, for example—the major source of increased inflation and inflation

CHART 5
Mean and variance
of real return on household assets



Note: Variance is the variance of the real rate of return on household assets, shown as a three-year moving average. Mean is the mean of the real rate of return on household assets, shown as a three-year moving average.

uncertainty—may have contributed significantly to the reduction in consumer welfare by lowering the real rate of return on capital.²⁵ The evidence strongly suggests, however, that after a period of adjustment, at least some of the adverse effects of increased inflation uncertainty have been offset by inflation hedging.

Summary and implications

This article reexamines the effect of inflation uncertainty on households by considering the potential for neutralizing this effect by hedging. In theory, inflation uncertainty affects households by making the real rate of return on their savings more risky. This effect depends on a less than perfect positive association between

the nominal rate of return on household savings and the rate of inflation.

By increasing the association between the nominal return on household savings and inflation through hedging, the effect of inflation uncertainty on the riskiness of the real return on household savings is reduced. The implication, since consumers are risk averse, is that an increase in inflation uncertainty creates an incentive for inflation hedging by increasing the benefits of hedging relative to the costs.

Inflation hedging—its nature and extent—was examined to see if hedging increases with inflation and inflation uncertainty. It was found that households were largely unhedged before inflation became significantly higher and more uncertain in 1973 and that they remained unhedged for several years after. Evidence indicates that households suffered welfare losses during the period immediately

²⁵ See James Wilcox, "Why Real Interest Rates Were So Low in the 1970's," *American Economic Review*, March 1983, pp. 44-53.

following the first episode of high and volatile inflation, 1973-76.

It appears, however, that the nominal rate of return on household savings and the rate of inflation became highly correlated after 1976. This apparent success in hedging was accompanied by a reallocation of household savings away from equity and long-term assets and toward real estate and short-term assets and toward the new financial assets that allowed households to better hedge against inflation. Moreover, this inflation hedging appears to have substantially improved consumer welfare. In brief, the evidence is consistent with the hypothesis that increased inflation and inflation uncertainty encourage inflation hedging which reduces the associated costs to households.

The arguments presented here can be applied to the analysis of the effects of inflation uncertainty on other economic variables. Empirical and theoretical research indicates that inflation uncertainty lowers investment spending, real output, and employment. This literature, however, has ignored the potentially offsetting effects of inflation hedging. For example, if inflation uncertainty makes profits more uncertain, thus lowering investment spending, businesses would presumably try to insulate their profits from changes in inflation.

This does not imply that the costs of inflation uncertainty can be eliminated entirely. Even if households and firms could adjust to the extent that changes in inflation did not affect real rates of return on saving and investment, the adjustments themselves would likely incur transactions and efficiency costs. Efficiency costs to the economy could result from the reallocation of resources that these adjustments involved. On the other hand, financial deregulation, which has contributed to the success of inflation hedging, might increase efficiency by eliminating artificial market barriers

to the optimal allocation of resources. The consideration of inflation hedging for the analysis of the effects of inflation uncertainty on the economy suggests instead that if economic agents were to hedge inflation completely, the only costs associated with inflation uncertainty would be the transactions and efficiency costs incurred by hedging.

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