Public Policy Brief

Investment
Tax Credit
Reconsidered

Business Tax Incentives and
Investments
Thomas Karier

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Preface

Given the broad consensus that private sector investment is the engine of economic growth, it comes as no surprise that a number of public policies aim at stimulating private investment, especially when the economy is slumping. Some programs attempt direct manipulation of the level of aggregate (public plus private) investment via increases in spending. Others attempt to spur private investment indirectly by reducing the cost of capital. Such programs include tax incentives (such as the investment tax credit or a reduction of corporate income or capital gains tax rates) and policies aimed at lowering interest rates.

Once accepted as effective policy tools, these programs have recently come under increasing scrutiny. No longer can any program be justified on theoretical grounds alone: Empirical evidence is increasingly used to justify public spending and tax programs, particularly in the current climate of fiscal prudence and scarce economic resources.

In this issue of our *Public Policy Brief* series, Thomas Karier analyzes one long-accepted program, the investment tax credit. Introduced in 1962 and employed sporadically until its elimination in 1986, the ITC is once again being promoted as a possible means by which the public sector might induce private sector investment. Karier's extensive analysis takes into account all possible economic effects (via price changes, income effects, and multiplier effects) that an ITC might have on a firm's investment decisions. He finds that the ITC had little effect on investment spending, but rather, tended to result in a firm's distributing its savings in the form of dividends or decreasing its issuance of debt or equity instruments.

In light of the problems found with investment tax credits, Karier presents arguments for why the government should instead undertake public investment in the form of spending on physical infrastructure, education, technology, and research. Such projects might be funded through cuts in other spending areas or an increase in corporate profit taxes, which have funded a decreasing share of public spending, especially over the past decade.

In the aftermath of recent gains in private equipment spending and seemingly satisfactory economic recovery, skeptics may question the merits of even a small public investment program. Even though financing public investment must not occur at the expense of federal budget deficit reduction and long-term control of the national debt, we firmly believe that a modest program of public investment and fiscal responsibility are not mutually exclusive strategies. By publishing this research, we hope to stimulate a reconsideration of past policy so that a new policy approach to public investment might be developed.

Dimitri B. Papadimitriou
Executive Director

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Investment Credit Tax Reconsidered

I. Introduction

If the United States is to achieve a high level of economic prosperity for all its citizens, it must maintain an adequate level of investment. Unfortunately, private sector investment has often fallen short of this level. For many years the federal government attempted to remedy this deficiency by providing businesses with a variety of specifically targeted tax incentives. In 1962 businesses were offered a tax credit based on a percentage of investment in equipment. Since then additional incentives to invest have been introduced by lowering the tax rate on corporate income. And, when the tax credit was finally repealed in 1986, it was replaced by a further reduction in corporate tax rates.

As this report documents, it is not at all clear that these tax incentives had any effect on investment spending. Businesses did not demonstrate any tendency to raise investment in response either to the

investment tax credit (ITC) or to reductions in corporate tax rates. It appears that much of the benefit derived from these tax incentives went to increase dividends paid to shareholders and to replace funds that otherwise would have been obtained from the sale of stocks or bonds.

It would be easier to ignore the failure of corporate tax incentives if they did not carry such a high price. In 1981 alone corporations claimed $19 billion for ITCs, more than the entire amount spent by the U.S. Department of Energy that year. Lower corporate tax rates today cost taxpayers far more than that amount.

Because adequate investment spending is essential, especially during recessions, alternatives to tax incentives must be pursued. A logical alternative is a broad program of public investment in education, infrastructure, and technology. While education and technology require steady outlays, expenditures on transit systems, bridges, and other infrastructure could easily be temporarily expanded during recessionary periods.

There is an important question about how such a program of public investment would be financed. More than a modest expansion of public investment could be funded by simply rearranging spending priorities in the current budget. In particular, significant funds could be transferred from those government entities whose missions once depended on the now defunct Cold War. Additional funds could be secured through borrowing, especially during recessions when federal deficits provide a useful stimulus.

Another source of funds for public investment is the corporate income tax. This tax paid for 29 percent of government outlays in 1950, but only 7 percent in 1992. If these tax breaks had stimulated investment, employment, and economic growth as expected, there would be far less need for public investment today. But the need persists, and the corporate income tax could make it possible.

The economic analysis described in this report demonstrates that two important tax incentives—the ITC and corporate tax rates—had

little effect on investment spending. One has to wonder why corporate tax rates should remain so low if they do not produce higher investment and economic growth.

II. Historical Background

According to the Revenue Act of 1962, the stated purpose of the ITC is "to encourage modernization and expansion of the Nation's productive facilities and thereby improve the economic potential of the country, with a resultant increase in job opportunities and betterment of our competitive position in the world economy."

There are few macroeconomic disorders for which a large injection of investment is not considered a suitable remedy. Keynesians well understand that a surge of investment can bolster aggregate demand and revive a stagnating economy. Supply-side economists hold the additional view that inflation is best prevented by the production of abundant goods and services, for which investment is an obvious prerequisite. Investment also is essential to ensure long-run growth and higher productivity. Finally, it is widely argued that high levels of investment are necessary to ensure the competitiveness of U.S. corporations as they engage foreign rivals in the contest for world market shares. It would be difficult to exaggerate the range of benefits commonly attributed to investment spending.

Given the goal of expanding investment, how does one ensure sufficient quantity? Only government investment, including education, infrastructure, and research, is amenable to direct and immediate manipulation. Most investment in the private sector is determined by the disparate actions of hundreds of large firms and, to a lesser degree, hundreds of thousands of smaller ones. Efforts to promote investment in the private sector have, by necessity, resorted to indirect measures such as tax incentives.

The purpose of this research is to determine the effectiveness of one of these efforts, the investment tax credit. The implementation of

this credit, in effect at various times between 1962 and 1986, constitutes an important experiment in economic policy. During this period firms were permitted a credit against their income tax liability equivalent to a percentage of their investment in machinery, equipment, or furniture. Excluded from the tax credit were buildings, structural components, and intangible property.

The most difficult policy to assess is one that never changes over time; fortunately, this is not the case for the ITC. After being introduced in 1962, the credit was suspended from October 1966 to March 1967, terminated from April 1969 to August 1971, and finally eliminated in 1986. What began as a 7 percent credit in 1962 was increased to 10 percent in 1975. In addition, the original law in 1962 required a reduction in the depreciable or basis value of the investment equivalent to the size of the credit. This requirement was dropped in 1964 but partially reinstated in 1982 with a required reduction in basis value equivalent to half the credit. Additional restrictions were applied to certain industries as well as to short-lived assets and investments outside the United States. All of these changes and qualifications may have created headaches for tax accountants, but they enrich the quality of the experiment by increasing the variation in the credits over time.

III. How the Credits Work

The ITC is believed to stimulate investment in three primary ways. The first is through a price effect, that is, a response to a change in the cost of capital. By effectively reducing the price of additional capital and raising the rate of return, the tax credit is expected to stimulate additional investment. However, the actual response may be insignificant if either the change in the cost of capital is small or demand is relatively unresponsive to price changes.

Statistical studies conducted in the late 1960s often found a strong price effect for credits, largely due to the growth of investments following the introduction of the ITC in 1962. But this evidence is at

least partially suspect, since the credit was introduced in the wake of the 1960–61 recession, a time when investments were far more likely to rise than fall.

A second possible way in which a tax credit can affect investment is through cash flow. A firm qualifying for the tax credit reduces its tax liability, thus raising its after-tax profit. This income is then available for capital investment. But the available income might also be used for other purposes, such as paying higher dividends, making financial investments, buying back outstanding stock or bonds, or financing acquisitions. There is always a question about how much of any additional corporate income is spent on capital investment.

A third way in which tax credits might affect capital expenditures is based on the general Keynesian multiplier effect. Any expansion of the government deficit may create a short-run stimulus sufficient to boost aggregate demand and spark higher levels of investment spending. The effectiveness of such a deficit depends primarily on the state of the economy, such as the level of unemployment. It also depends on whether the credits are absorbed by the corporation, distributed to stockholders, or passed through to consumers in the form of lower prices. Some of these conditions are discussed in more detail later, but in general it is presumed that the multiplier effect of an ITC resembles that of any other corporate tax cut. The issue, therefore, is whether the ITC provides an incentive to invest above and beyond the fiscal stimulus induced by a reduction in corporate taxes.

Two related measures of equipment investment spending could be affected by tax credits. A tax credit could increase the share of the nation's output dedicated to producers' equipment or it could raise the annual rate of growth of investment spending. Effects on both equipment shares and equipment growth are considered in this study.

There also is a question of whether equipment and gross domestic product (GDP) should be adjusted separately for relative prices when calculating investment shares. This matters only because equipment prices have diverged from GDP prices over the course of the past 45 years. In theory, the tests could be conducted using either nominal

values or real values as long as relative prices are included in the model.[1]

A. Equipment Shares

The historical pattern between equipment investment and the ITC is presented in Figure 1. Equipment investment is measured as a share of GDP, and both are adjusted using appropriate price indexes. The investment tax credit is essentially a rate: the value of credits claimed by corporations divided by expenditures on producer's durable equipment.[2] The pattern for the ITC in the figure captures several important events: the suspension from 1969 to 1971, the increase from 7 percent to 10 percent in 1975, and the final repeal in 1986. The figure also shows that real equipment spending climbed erratically, from

Figure 1
**Equipment Shares of GDP and Investment Tax Credits**
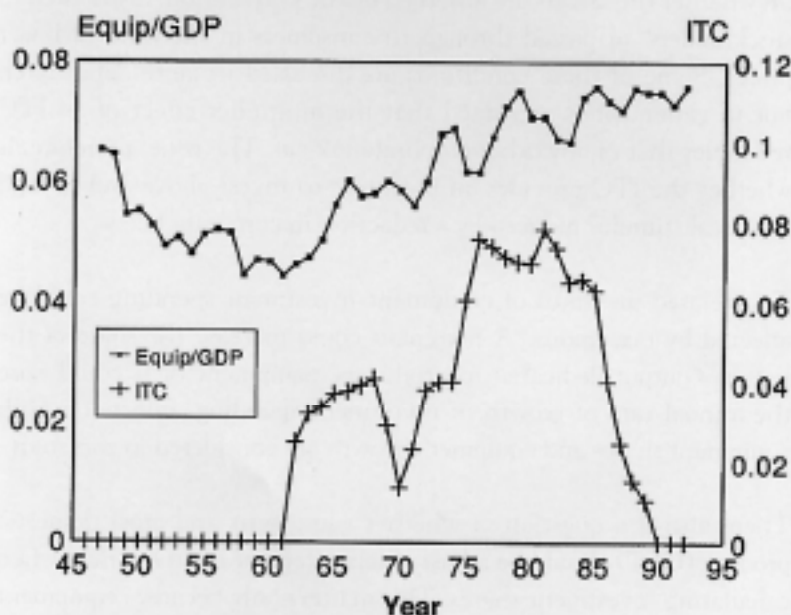
Equip/GDP is equal to producer's durable equipment divided by GDP, both adjusted for inflation. ITC is equal to total corporate investment tax credits divided by equipment investment.
Source: NIPA and Corporation Income Tax Returns, IRS.

4.4 percent in 1961 to 7.6 percent in 1992. While the beginning of this ascent corresponds with the passage of the ITC in 1962, the trend continued even after the credit was repealed in 1986.[3]

In order to assess the effect of the ITC on equipment spending, the influence of other factors must be separated from that of the ITC. A particularly important element is equipment prices.[4] As seen in Figure 2, the upward trend in real equipment investment between 1962 and 1992 coincides with a downward trend in equipment prices. This is one of the competing variables that can be used to explain changes in equipment investments.

Figure 2
Equipment Shares of GDP and Prices
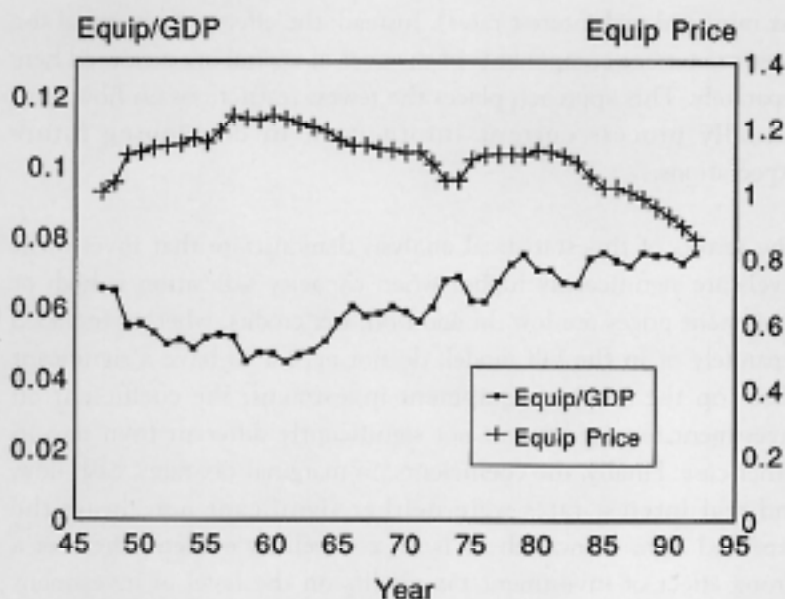
Equip/GDP is defined in Figure 1. Equip price is equal to the price deflator for producer's durable equipment divided by the price deflator for GDP.
Source: NIPA.

Equipment prices and the ITC—along with real interest rates and marginal tax rates—fall into the category of cost-of-capital variables that potentially affect investment. Capital is cheaper when tax rates, interest rates, or equipment prices are lower. Another variable that could influence equipment investment is corporate cash flow, which captures the income effect. Finally, investment could be considered to be a function of capacity utilization, as firms are more likely to invest after excess capacity has been exhausted.

For the most part these variables and this analysis (fully described in Appendix A) follow conventional lines. There is, however, one innovation that warrants an explanation. Most studies of investment behavior rely on a single measure of capital costs. This has the unfortunate characteristic of combining current variables that should have a direct effect on investment (such as equipment prices) with current variables that serve as proxies for future variables (such as marginal tax rates and real interest rates). Instead, the effects of several of the most prominent components of the cost of capital are measured here separately. This approach places the fewest restrictions on how firms actually process current information in developing future expectations.

The results of this statistical analysis demonstrate that investment levels are significantly higher when capacity utilization is high or equipment prices are low. In addition, tax credits, whether included separately or in the full model, do not appear to have a significant effect on the level of equipment investment; the coefficient on investment tax credits was not significantly different from zero in either case. Finally, the coefficients on marginal tax rates, cash flow, and real interest rates were neither significant nor always the expected sign. Hence, there is no compelling evidence here of a strong effect of investment tax credits on the level of investment spending. (Other results are discussed in more detail in Appendix A.)

The absence of a strong, positive effect of tax credits on equipment investment is an important result. However, it is equally important to consider the specific channels through which the credit is expected to work. To this end, we must investigate the price and income effects.

B. The Price Effect

In an early article investigating price effects and investment behavior, Hall and Jorgenson (1967) concluded that "the investment tax credit has been a potent stimulus to the level of investment; it also shifted the composition of investment toward equipment." This highlights an important point: If the tax credit has a distinct price effect, the composition of investment should shift in favor of equipment. Figure 3 shows producer's durable equipment as a share of nonresidential investment, each separately corrected for inflation (the ITC from Figure 1 has also been superimposed on this figure). The ratio rose from 49 percent in 1961 to 73 percent in 1992. It is evident in the figure that the composition of investment shifted toward equipment when the investment tax credit was in effect, but *it shifted even more toward equipment after the credit was repealed in 1986.*

Figure 3
Equipment Share of Nonresidential Investment,
Relative Prices, and the ITC
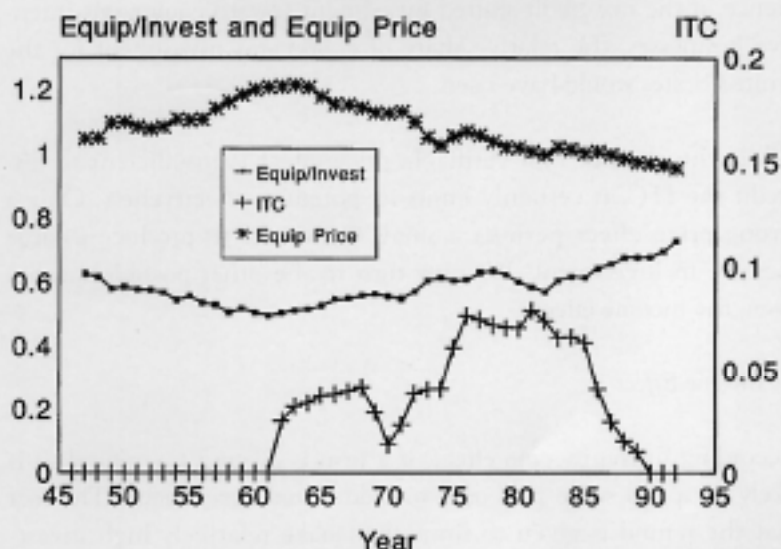
ITC is defined in Figure 1. Equip/Invest is equal to producer's durable equipment divided by nonresidential fixed investment. Equip price is equal to the ratio of price deflators for equipment and nonresidential fixed investment.
Source: NIPA and Corporate Income Tax Returns, IRS.

Figure 3 also displays a second possible explanation for the changing composition of investment, namely, that equipment prices relative to nonresidential investment fell gradually from the early 1960s to the present. A separate statistical analysis shows that relative prices are statistically significant in a model that explains 93 percent of the variation in equipment composition. The investment tax credit, however, had the wrong sign and was insignificant.[5] It therefore does not appear that the presence of the investment tax credit steers firms toward equipment investment as one would expect under the price effect.

Is there a possibility that equipment and structures are complements rather than substitutes, allowing tax credits to stimulate both forms of investment? This seems unlikely because equipment investment succeeded in rising relative to structures in the late 1980s, without the benefit of the investment tax credit. It is also worth remembering that even if a fixed proportion of structures to equipment character-ized every single business in the United States, it would not necessar-ily apply to the country as a whole, because some businesses are rela-tively more equipment-intensive and others are structure-intensive. Hence, if the tax credit shifted investment toward equipment-inten-sive businesses, the relative share of equipment investment for the United States would have risen.

While the absence of a verifiable price effect is insufficient to dis-credit the ITC, it certainly limits its potential effectiveness. Only a strong price effect permits a small tax credit to produce a large increase in investment. We now turn to the other possible mecha-nism, the income effect.

C. Income Effect

According to the income effect, if a firm is given a tax refund, it is likely to spend some part of it on additional investment. The fact that the refund is given to firms that make relatively high invest-ments should further increase this likelihood. However, even in the best of circumstances some portion of the credit is likely to be diverted to other purposes. The goal of the tax credit could be

entirely frustrated if the additional cash flow is simply used to pay higher dividends, buy back outstanding stock or debt, or replace more conventional sources of investment funds. Each of these possibilities is considered in turn.

Tax credits could be distributed to consumers in the form of lower prices or to employees in the form of higher salaries. It is curious that some analysts dismiss this response as unrealistic, but readily accept the companion view that tax *increases* are passed on in the same way to consumers or employees. If it is possible that the burden of the corporate profit tax increase can be shifted to consumers or employees, then it is at least conceivable that tax credits provide relief to the same parties. The point of this reasoning is that whatever portion of a tax credit is shifted in this manner will not be available for additional investment; a dollar of tax credit will raise after-tax corporate profits by something less than a dollar.

There are many reasons to suspect that corporations pay for most of the corporate income tax (that is, that they do not pass it along to consumers), not the least of which is their staunch opposition to it. In my own work I have observed that the size of the price increase necessary to pass on the corporate profit tax varies widely among different companies in the same industry and for the same company over time (Karier 1990). This fact alone makes it very difficult to pass on the corporate income tax without benefiting some firms at the expense of others.

No amount of hypothesizing, of course, will settle this issue. The real test is whether a reduction in average tax rates is associated with constant before-tax profits (no shifting) or falling profits (shifting). The relationship between corporate profit shares before taxes and average tax rates is presented in Figure 4, which shows that profit shares have mirrored the business cycle.[6] They also experienced a one-time drop around 1970. After averaging approximately 11 percent between 1946 to 1970, the profit share slid to about 9 percent between 1970 to 1992. Average tax rates also declined during the period, falling from over 50 percent in 1951 to less than 30 percent in 1992. Did corporations distribute the tax savings to consumers and employees, thus reducing their before-tax profits?

Figure 4
Average Tax Rates and Corporate Profit Shares (Before Taxes)
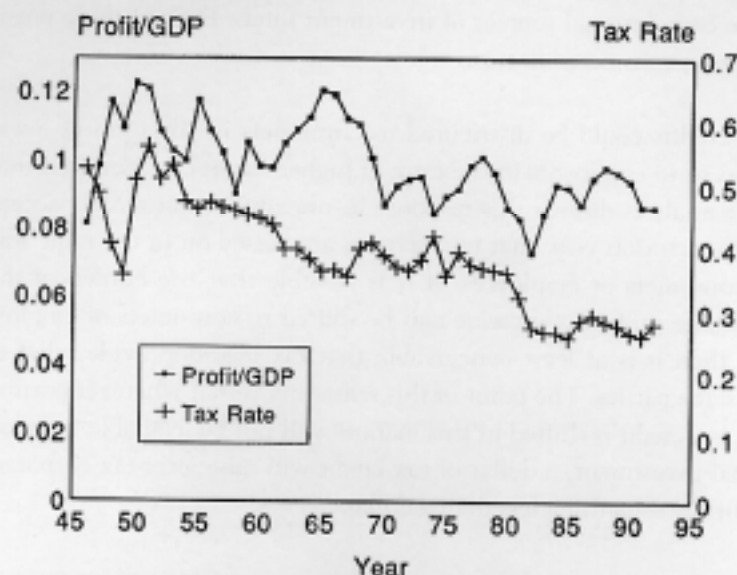

Profit is defined as corporate profits, including inventory valuation adjustments, capital consumption adjustment, and corporate net interest. Tax rate is equal to corporate profit tax liability divided by profit.
Source: NIPA.

There are two reasons to believe this was not the case. First, the pattern of decline in profit shares does not match the pattern of decline in tax rates. Whereas profit shares appear to shift to a new, lower average around 1970, the decline in tax rates is concentrated in three distinct periods: 1951 to 1954, 1960 to 1965, and 1980 to 1983.

A second objection is that other factors can easily account for most of the variation in profit shares. Changes in capacity utilization directly affect profit shares and explain much of their movement over the business cycle. Profit shares are also affected by the level of price competition in the United States, which can be stimulated by the growth of imports. A statistical test shows that these two variables—capacity utilization and import shares of gross domestic product—can account for approximately 81 percent of the variation in profit shares over this period. The predicted values of this simple model are compared to the actual values in Figure 5. The details of this statistical test are presented in Appendix B.

Figure 5
Corporate Profit Shares (Before Taxes), Actual and Predicted

Profit/GDP
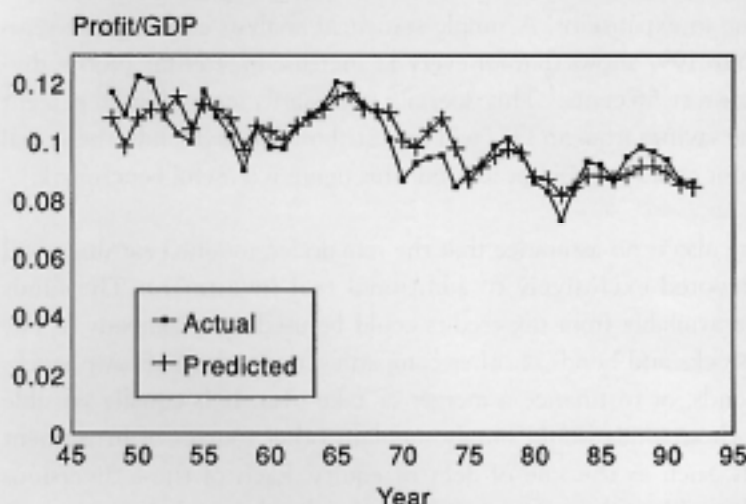
Profit is defined in Figure 4. Predicted values are based on the regression in Table A3, column 2.
Source: NIPA and author's calculations.

The test results show that there is little variation for tax rates to explain once these other variables are considered. It should be emphasized that once capacity utilization and imports are included in the model, the effect of tax rates on profits is not in the direction one would expect if shifting had taken place nor is it statistically significant.

All of this evidence points to the conclusion that reductions in the corporate tax rate, including ITCs, are not, for the most part, passed on to consumers and employees. Instead, firms are left with relatively higher after-tax income that is, at the very least, available to finance additional investment. This brings us to the next potential leakage, dividends.

The fraction of profits after taxes actually distributed as dividends from 1946 to 1992 is reported in Figure 6. In the 1980s and 1990s approximately 60 percent of after-tax income was paid out as dividends compared to approximately 45 percent during the 1950s,

1960s, and 1970s. In addition to this general increase, dividend shares tended to move countercyclically, rising in recessions and falling in expansions. A simple statistical analysis covering the years 1946 to 1992 shows that for every $1 increase in after-tax profits, dividends rose 56 cents.[7] This does not necessarily mean that 56 percent of the savings from an ITC will be distributed as dividends; the actual amount could be more or less, but this figure is a useful benchmark.

There also is no assurance that the remainder, retained earnings, will be devoted exclusively to additional real investment. The funds made available from tax credits could be used by a company to buy the stocks and bonds of other companies, to purchase its own stocks or bonds, or to finance a merger or take-over. It is equally possible that these funds would simply supplant other sources of investment funds, such as the sale of debt or equity. Each of these diversions tends to dilute the amount of the tax credit ultimately spent on new investment.

Figure 6
Dividends as a Share of After-Tax Profits

Dividends/After-Tax Profits

Year
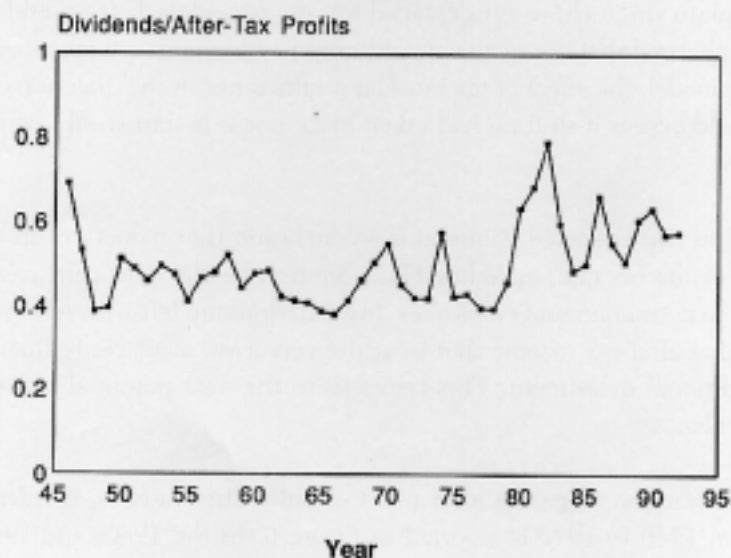
Source: NIPA.

How much of after-tax profits are spent on real property, plant, and equipment and how much are diverted to other uses? Another way to investigate this question is to look at the behavior of a large number of firms. For this purpose, a sample was drawn of 1,837 companies from the Compustat Database for 1991 (the most recent year available).[8] In that data set income was measured after taxes but before extraordinary items, and investment was equal to capital expenditure on property, plant, and equipment. (Appendix C describes the model, which includes several additional variables representing sources of investment funds, and the test used). The results show that a firm with an additional $1 of after-tax income spends only $0.12 more on property, plant, and equipment. The same firm, however, spends approximately $0.40 more on dividends, reduces its sale of stock (less repurchases) by as much as $0.21, and decreases its net sale of debt by $0.17. We can therefore conclude that firms with relatively higher after-tax income distribute more dividends and reduce the relative value of their sales of stocks and bonds. The amount that trickles down into additional investment is not large.

IV. Investment and Economic Growth

A. *The ITC and Equipment Investment*

The popular image of equipment investment was reinforced in a recent article by J. Bradford DeLong and Lawrence Summers (1991) in which the authors claimed that countries with a relatively high level of equipment investment also experienced relatively high growth rates. The surprising result was that this relationship held only for equipment investment and not for related investments in structures.

The beneficial effect of high levels of equipment investment spending, unfortunately, is not as readily apparent for the United States for the years 1950 to 1992. Figure 7 shows the ratio of spending on durable equipment to GDP and the growth rates of real GDP, calculated as five-year moving averages. There is little evidence in this fig-

ure that high levels of private investment in equipment are associated with strong economic growth.

Figure 7
Real GDP Growth and Equipment Shares of GDP

Percentage Change and Share of GDP
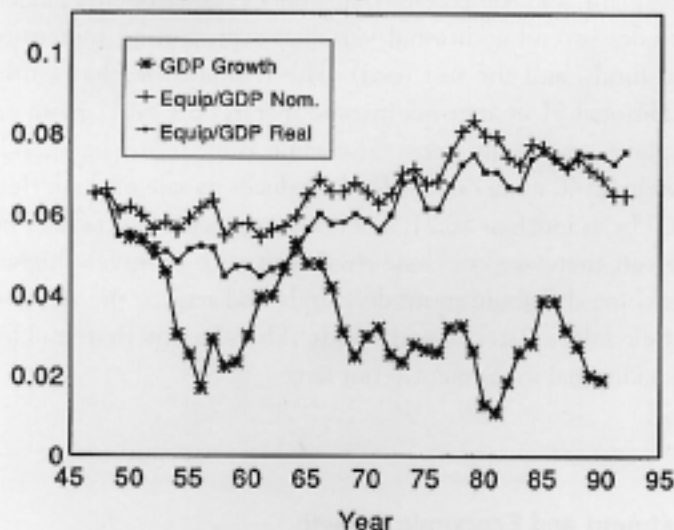
GDP growth is calculated as a five-year moving average.
Source: NIPA.

One possible explanation for this result is related to energy efficiency. Rising energy prices in the 1970s created a strong demand for more energy-efficient equipment and structures. It is conceivable that in the process of becoming more energy-efficient, U.S. capital investments contributed less to real advances in output. Figure 8 illustrates how profound the change in energy efficiency actually was. It shows the relative output of the industrial sector per unit of energy.[9] By this measure energy efficiency climbed 56 percent between 1972 and 1991. There is, however, one problem with this explanation. Energy prices leveled off in the 1980s and energy efficiency stabilized, yet high levels of equipment investment still failed to boost economic growth.

Figure 8
Industrial Energy Efficiency
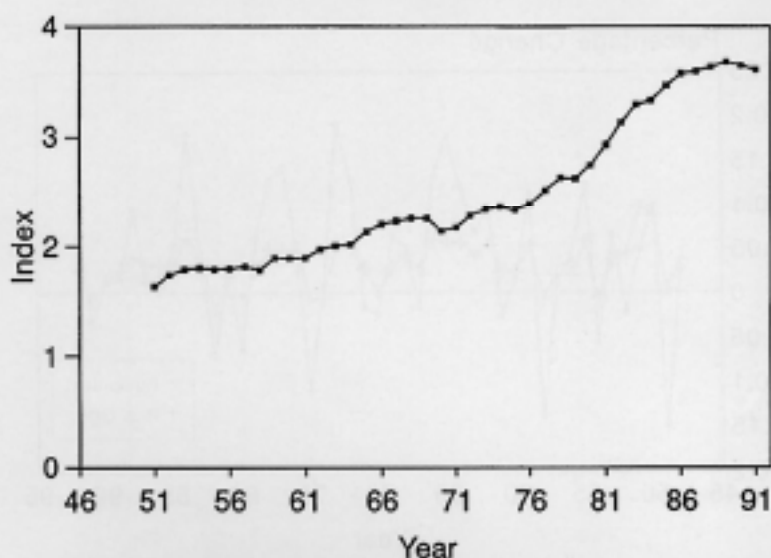
Index is equal to industrial production index divided by total energy consumed by industry in Btu.
Source: Economic Report of the President, 1993; Annual Energy Review, U.S. Department of Energy.

Most likely other factors are at the root of the slowdown in economic growth, but Figure 7 serves as a useful reminder that boosting the share of national output dedicated to equipment investment does not guarantee economic growth. This fact should not be construed to mean that investment spending is not important. There is still the familiar fact, presented in Figure 9, that annual changes in real investment spending are closely related to annual changes in real GDP. It may be difficult to sort out the causality in this relationship, but at least some part of it can be attributed to the fact that rapid changes in investment spending can alter the trajectory of economic growth. In this lies a paramount need for public policy: to compensate for the volatility of private sector investment.

Does the historical record have anything to say about the effectiveness of an ITC as a countercyclical tool? In its first few years of existence the ITC actually was used to counter the business cycle. It was

Figure 9
Annual Real Growth Rates of GDP and Equipment Investment
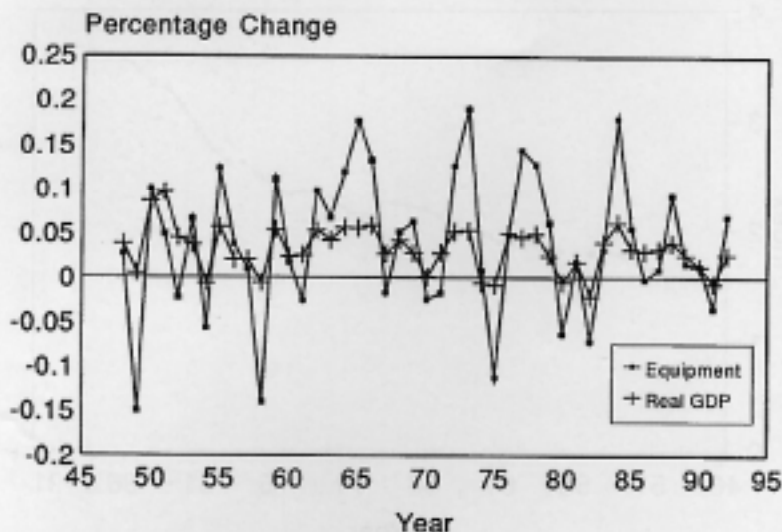
GDP and producer's durable equipment investment are both corrected for inflation and then calculated as annual growth rates.
Source: NIPA.

initially deployed when investment was relatively low and then revoked twice (in 1966 and 1969) when investment showed signs of recovering.[10] But between its reinstatement in 1971 and repeal in 1986, the credit was offered in good times and bad. The end of the credit as a countercyclical policy after 1971 marked a victory for the business sector, which had from the start insisted on a permanent tax cut.

The relationship between the investment tax credit and real growth in equipment investment was analyzed in more detail and is described in Appendix A. In general, there was no evidence that the existence of the tax credit had any significant effect on this growth rate. Only conventional business cycle variables—capacity utilization and real GDP growth—had a positive and significant effect on the growth of equipment investment.[11] There is reason to suspect from this evidence that the ITC would not have made an effective countercyclical tool.

B. *Marginal Tax Credits*

A revised form of the ITC was recently proposed by President Clinton's advisers and tested in an economic model by Meyer, Prakken, and Varvares (1993). The basic Clinton plan included some aspects of the ITC as it existed in 1985, except that it limited credits to investments exceeding some fraction (70 to 80 percent) of historic levels. The purpose of the threshold was to preserve the incentive for additional investment without rewarding all investments, thus saving the government some tax revenue.

The original proposal for the ITC in the Kennedy administration included similar marginal criteria. The Treasury's initial proposal in 1961 offered a credit of "15 percent of expenditures for new and tangible plant and equipment in excess of 100 percent depreciation" and "a credit equal to 6 percent of capital outlays greater than 50 percent of depreciation and an automatic 10-percent credit on the first $5,000 of new investment." (King 1993, p. 175). It was this graduated aspect of the investment credit that incited much of the business opposition to the original proposal. Businesses were much less interested in the incentive aspect of the credit than they were in the income-enhancing aspects, which were sharply curtailed by a graduated tax. Lobbyists for business thought they could do better, and they did, by pressuring the Kennedy administration to adopt the flat 7 percent rate that became law in 1962.

Only if the ITC works through the price effect does a marginal or graduated rate make any sense. This is because it preserves the price incentives while reducing the income effect. The problem with this approach is not theoretical but empirical. As we have seen in the past, 7 percent and 10 percent tax credits were not sufficient incentives to spark a discernible growth in equipment investment relative to structures. A marginal tax credit has the advantage of a smaller effect on the government budget but its reliance on price effects does not promise any significant growth in investment.

V. Policy Implications

For more than 20 years, the federal government provided corporations with billions of dollars of tax credits in the hope of raising the level of investment in equipment. According to the evidence presented here, these credits did not have a perceptible effect on either the growth in real equipment expenditures or the proportion of national output dedicated to equipment investment.

These observations were reinforced by more detailed investigations into how tax credits are supposed to work. Although the ITC was supposed to increase the importance of equipment in total nonresidential investment, the evidence that it did is lacking. The tax credit did not appear to have any perceptible impact on the composition of investment. Furthermore, while some of the credit may be spent directly on additional investment, the amount may be minuscule. The estimate in this study found that $0.12 or less of every additional $1 of after-tax income was spent on property plant and equipment; the remainder typically was used to pay higher dividends, buy stocks or bonds, or release firms from the need to sell as much debt or equity.

Much of the evidence presented here in regard to the ITC is directly relevant to the effectiveness of other corporate tax breaks. Marginal tax rates on corporate income have declined steadily over the past 40 years, and yet the evidence does not show any perceptible response in higher equipment investment. Generous depreciation rates have increased corporate cash flow, but only a small fraction of this is likely to see its way into new investment.

While ITCs may not contribute much to economic growth, there is no reason to abandon the effort to stimulate investment, both for countering the business cycle and for creating new job opportunities. The failure of tax incentives to stimulate private sector investment only means that future efforts may be more successful if they concentrate on raising public sector investment. Private and public investment share at least one thing in common: They are both evaluated according to whether their benefits exceed their costs. They differ,

however, since the public sector employs a broader definition for both benefits and costs. Unlike a private firm, the government is not compelled to capture its benefits in the form of higher revenue (although it could). The government also has to consider a wider range of costs than a private firm. A new public investment may be profitable, but if it displaces private firms in the process, it may be ruled out by the broader criteria applied to public investment.

Public investment is different in other important ways. While private investment typically contracts during recessions and shuns particularly impoverished areas, the government is capable of exercising more discretion. Any investment made during a recession or in poor areas is likely to carry a higher benefit to society.

We should also remember that the choice is not between public investment and private investment, but between public investment and a tax credit. There is the important—if not obvious—fact that a dollar spent on public investment will produce a dollar of public capital. A dollar spent on investment tax credits cannot claim an equivalent impact on private capital.

In many ways these features of public investment make it ideally suited to achieve the goals of the Revenue Act of 1962, which originally created the investment tax credit. The public sector is in a much better position to focus on projects that provide an "increase in job opportunities" and the "betterment of our competitive position in the world economy." Federal, state, and local governments are already directly involved in extensive public investment, from sewage systems to highways, roads, and bridges. Within this current system, there is considerable room for reform, both to improve its efficiency and to meet the goals that the investment tax credit failed to achieve.

Recent economic analysis has begun to identify particularly fruitful areas for public investment. There is now evidence that government expenditures on research and development provided a valuable boost to productivity in agriculture and manufacturing.[12] Even with these successes, we have yet to see the full potential of federal R&D on

productivity, since so much of it has been dedicated to the refinement of military weapons. As recently as 1990, 64 percent of federal R&D expenditures went to defense (Aaron and Schultze 1992, p. 234). The reorientation of federal R&D toward civilian projects promises an even greater return in the future.

One of the direct benefits from an investment in education is the increase in work force earnings. Two recent studies by David Card and Alan Krueger demonstrate that the returns from lowering student-teacher ratios, extending the school term, and raising teacher pay are measurable and significant (Card and Krueger 1992a, 1992b). This is another area where an increase in federal investment could make a big difference, especially when directed at cities and regions where the current level of funding is clearly inadequate.

Finally, there is the possibility of expanding the amount of physical public capital defined as infrastructure. While this capital—including roads, sewers, airports, mass transit, and water systems—generates its own stream of future benefits, it now appears to be positively correlated with private sector employment growth and productivity. In her investigation of this topic, Alicia Munnell found "that a state's investment in public capital had a significant positive impact on that state's private employment growth." She also concluded that "the evidence clearly indicated that public capital enhances the productivity of private capital" (Munnell 1990). Similar results were cited by David Aschauer in his work on the relationship between public capital and economic growth (Aschauer 1993). While these results are not free of controversy, the message is clear: The benefit from infrastructure investment is probably much larger than the immediate value of improved transportation and water quality.

Even this cursory review reveals a great potential for expanding public investment in research, education, and infrastructure. However, any serious proposal for expanding government investment also has to address the issue of funding. Large deficits in the federal budget have made any new expenditure difficult, even one that generates future benefits. The answer is to fund public investment through some combination of user fees, spending cuts, and tax increases.

For example, much of the investment in roads and highways is already funded by a gasoline tax. Additional funds for investment in ground transportation, including mass transit systems, could be raised from this tax or from user fees. There are few reasons not to charge tolls on highly congested thoroughfares and on trucks with heavy loads. It is no secret that the damage done to the nation's highways from these vehicles easily eclipses that of the far more numerous automobiles. This is just one example where the judicious application of user fees and taxes can provide adequate funding for public infrastructure investment.

Funding for federal research is easily resolved because the amount being spent is not necessarily inadequate, it is just largely misdirected. A sharp reallocation of federal funds from weapons development toward civilian projects promises a significant return without adding a cent to the budget deficit.

Even with user fees and spending reallocations, it is still difficult to imagine attaining adequate levels of public investment without some kind of tax increase. In this regard, particular attention should be directed at the corporate income tax. This tax has fallen to historic lows and, if revived, could provide important revenue to finance a broad program of public investment.

While critics will decry the adverse effect of a corporate tax increase on investment, the record examined in this report suggests otherwise. If an important tax break like the ITC failed to stimulate investment, why would the elimination of other tax breaks depress it? After all, if corporate tax cuts had achieved their objectives—higher investment, greater job opportunities, and higher economic growth—public investment would be far less urgent today.

Appendix A

Investment and Tax Credit

This section describes the statistical tests used to investigate the relationship between ITCs and equipment investment. The tests utilized aggregate annual data for the United States for the years 1946 to 1992. The hypothesis being tested is whether equipment investment should be a function of three sets of variables: cost of capital, cash flow, and capacity utilization.

Conventional estimates of capital costs typically combine several parameters (such as capital prices, tax rates, real interest rates, and tax credits) into a single annual value. In fact, this method produces a single value that is equivalent to an annual rent payment whose present value over the lifetime of the equipment (properly discounted for time, depreciation, and future taxes) is equal to the current price (Hall and Jorgenson 1967). It is easy to forget that at any moment in time, a firm knows for certain only the purchase price and tax credit; all other variables (such as real interest and tax rates) apply to the future and, therefore, are unknown. Consequently, the approach used here is to include each variable separately under the presumption that unknown variables may have less influence on investment decisions.

One of the cost-of-capital variables is the real interest rate, represented by the prime rate of interest less the rate of inflation (as measured by the GDP deflator). Another cost-of-capital variable is the corporate tax rate, which is equal to the statutory tax rate on corporate income. Equipment prices are represented by the ratio of the price deflator for producer's durable equipment to the GDP deflator. In addition, the ITC is included as the ratio of total corporate investment tax credits to producer's durable equipment.

Other variables included in the model were capacity utilization for manufacturing and cash flow, equivalent to the sum of the consumption of fixed capital for corporations and undistributed corporate profits. The dependent variable, equipment investment, was adjusted

for inflation and then divided by GDP, similarly adjusted. All of the variables were obtained from the National Income and Product Accounts (NIPA), except for the prime interest rate and capacity utilization, which were obtained from *The Economic Report of the President, 1993*.

Not surprisingly, the model using ordinary least squares demonstrated a high degree of first order serial correlation. Therefore, the results presented in Table A1 are based on a correction for autocorrelation.

In column 1, the cash flow variable alone was tested and found to have an insignificant effect on equipment investment. This conclusion did not change in the full model, the results of which are listed in column 3. The effect of the ITC alone is tested in column 2 and the full model in column 3. In neither case is the ITC found to have had a significant effect on equipment investment. Equipment investment did respond significantly to two variables: equipment prices and capacity utilization. Low equipment prices and high capacity utilization both appear to stimulate equipment investment.

It should be emphasized that, according to these results, equipment prices have had a negative effect on real equipment investment. Because the elasticity implied by the coefficient on equipment prices is nearly one, changes in equipment prices will have almost no effect on the nominal amount of equipment investment.[13]

This result may simply be a characteristic of the demand for equipment goods, but there are two other possibilities. If firms make decisions about how much to spend on investment independent of investment good prices, the regression results would not be any different; firms would simply allocate a certain amount of funds for investment based on their current level of capacity utilization. If equipment prices are unusually low, firms would spend the same nominal amount but get more for their money. In this case equipment prices and real investment would also be negatively related with an elasticity approximately equal to one.

There is another consideration. Because price indexes in the national accounts are adjusted for quality improvement, falling equipment

Table A1
Estimated Effects of Selected Variables on
Real Equipment Investment as a Share of GDP
(1950–1992 annual observations)

Independent Variable	Estimated Coefficients (standard errors in parentheses)		
	Cash Flow Only	ITC Only	Full Model
Cash flow/GDP	.028 (.103)		−.019 (.082)
Real interest rate			.019 (.024)
Tax rate			−.013 (.015)
Equipment prices			−.050** (.016)
Investment tax credit		.011 (.062)	.032 (.049)
Capacity utilization[a]			.049** .009
Constant	.061** (.012)	.063** (.009)	.081 (.022)
Adjusted R^2	.89	.89	.95
Durbin-Watson	1.55	1.54	1.55

* = significantly different from zero at the 5 percent level.
** = significantly different from zero at the 1 percent level.
[a]Coefficient and standard error multiplied by 100.
Source: NIPA; *Economic Report of the President, 1993.*

prices could simply reflect a steady improvement in quality. At least since the late 1970s this has been especially true for computer equipment. When firms buy more equipment, it may appear that they are responding to lower prices when in fact they are motivated by the higher quality. The simple correlation between equipment prices and investment can be misleading because it fails to tell the complete story. It is unfortunate that further exploration of these issues is beyond the scope of this research.

An additional set of tests was conducted using the annual growth of real equipment investment as the dependent variable. The results are reported in Table A2. The ITC continues to have an insignificant effect when tested alone or in the full model. Cash flow has a significant, positive effect on equipment growth when estimated alone, but

Table A2
Estimated Effects of Selected Variables on
Growth in Real Equipment Expenditures
(1951–1992 annual observations)

Independent Variable	Estimated Coefficients (standard errors in parentheses)		
	Cash Flow Only	ITC Only	Full Model
Cash flow/GDP	3.80* (1.67)		1.910 (1.300)
Real interest rate			.380 (.299)
Tax rate			.284 (.239)
Equipment prices			−.317 (.160)
Investment tax credit		5.43 (.439)	.200 (.421)
Capacity utilization[a]			.856** .195
Growth–real/GDP			2.000** (.310)
Constant	−.276 (.139)	.022 (.017)	.682** (.243)
Adjusted R^2	.09	.01	.78
Durbin-Watson	2.01	1.98	1.95

* = significantly different from zero at the 5 percent level.
** = significantly different from zero at the 1 percent level.
[a]Coefficient and standard error multiplied by 100.
Source: NIPA; *Economic Report of the President, 1993.*

not in the full model. Only capacity utilization and the growth rate of real GDP have a significant effect on equipment growth, which in both cases is positive. The coefficients on these two variables are likely to overstate the actual effects, as the variables themselves are likely to be influenced by equipment growth.

In this study cash flow is not found to make a significant contribution to equipment investment. Although a small percentage of additional income is likely to be spent on new investment, the result is not large enough to show up in this analysis. There are, however, many opportunities to overstate this relationship.

It should be remembered that cash flow consists of two distinct components: capital consumption allowances and undistributed profits. Capital consumption allowances are likely to be correlated with current investment levels due to the simple fact that both are correlated with past investment. This relationship was found to hold when using the annual aggregate data described in this Appendix and the company observations described in Appendix C. Because of this, there is a tendency to overstate the effect of cash flow on investment. The problem was largely eliminated in this model by correcting for autocorrelation. Once the correlation between current investment levels and past investment levels was reduced, the correspondence between cash flow (depreciation in particular) and current investment diminished.

The other component of cash flow is undistributed profits. This component is less likely to be related to past levels of investment spending but is more likely to be correlated with other business cycle variables, including growth of real investment spending. To some extent this is due to the fact that an increase in undistributed profits will increase investments, but there also is the fact that both profits and investments are independently related to the business cycle. This may be the reason why cash flow was no longer significant when business cycle variables were included in the statistical tests (as shown in Table A2, column 3).

Appendix B

Tax Incidence

This section explains the statistical model and test of the relationship between before-tax profits and tax rates. To the extent that corporate taxes (and tax reductions) are passed through to consumers and employees, average tax rates should be positively related to before-tax profits. This was tested using a profit model based on my previous work (Karier 1993).

By definition,

(1) $\pi = pq - (ac)q = q(p - mc + mc - ac) = q(p - mc) + q(mc - ac)$

where

π = profits before taxes
p = price
q = output
ac = average cost
mc = marginal cost

Dividing both sides by revenue produces the result,

(2) $\pi/R = (p - mc)/p + q(mc - ac)/R$

where

R = revenue

The first term on the right side of equation (2) is defined as the markup over marginal costs. When firms maximize profits, this term is equal to the inverse of the elasticity of demand, defined as monopoly power. The second term, including the difference between marginal cost and average cost, is related to capacity utilization. Presuming conventional short-run cost curves, marginal cost is likely

to exceed average cost when capacity is tight, a relationship that is reversed when capacity is underutilized.

To the extent that higher taxes are passed through to consumers, firms must increase their markups, resulting in higher profits before taxes. Alternatively, if higher taxes are passed through to employees, who are forced to accept lower wages, then marginal costs decrease and markups still rise. Therefore, tax rates should be positively related to profits before taxes if taxes are passed through either to consumers or employees.

Another factor that is likely to affect monopoly power is the level of foreign competition represented by imports. The greater the competition from imports, the lower the level of monopoly power and markups.

This model was estimated using annual data for the years 1948 to 1992. Profit shares were equal to corporate profits with inventory and capital consumption adjustments, plus net interest paid by the corporate sector, divided by GDP. The tax rate used was the corporate profit tax liability divided by the same profit measure. Imports simply were divided by GDP and, like each of the preceding variables, were obtained from the NIPA. Finally, capacity utilization was obtained for manufacturing from the *Economic Report of the President, 1993*. Estimation of this model is presented in Table A3, with corrections for first order serial correlation.

Column 1 of the table shows the results of regressing only tax rates on profit shares. The coefficient on tax rates is positive and significant at the 5 percent level. This result captures the fact that both series have been declining over the past 45 years (refer to Figure 4). This correlation is suspect, however, since the timing for the declines in profit shares and tax rates were visibly different.

As column 3 in Table A3 illustrates, the coefficient on tax rates changed signs and was far from significant once capacity utilization was added to the model. This result also is evident in column 4, which includes the import variable. Profits were significantly higher

when capacity utilization was higher and imports lower. This simple model captured 81 percent of the variance in profit shares. The lack of significance for the tax rate coefficient, or even the correct sign, provides little evidence that the cash generated from tax reductions were passed through to consumers or employees. The conclusion is that tax reductions during this period contributed to relatively higher after-tax profits.

Table A3
Estimated Effects of Selected Variables on
Before-Tax Corporate Profits as a Share of GDP
(1948–1992 annual observations)

Independent Variable	Tax Rates Only	Full Model Less Taxes	Full Model Less Imports	Full Model
		Estimated Coefficients (standard errors in parentheses)		
Tax rate	.063*		−.021	−.029
	(.028)		(.028)	(.024)
Capacity utilization[a]		.125**	.126**	.137**
		(.019)	(.023)	(.022)
Imports/GDP		−.247**		−.290**
		(.065)		(.075)
Constant	.076**	.015	.005	.019
	(.011)	(.017)	(.017)	(.017)
Adjusted R^2	.63	.64	.83	.81
Durbin-Watson	1.70	1.61	1.64	1.59

* = significantly different from zero at the 5 percent level.
** = significantly different from zero at the 1 percent level.
[a]Coefficient and standard error multiplied by 100.
Source: NIPA and *Economic Report of the President*, 1993.

Appendix C

Company Data

A second series of tests were conducted to investigate the relationship between after-tax income and investment. The tests were applied to a sample of 1,837 firms drawn from the Compustat database for the most recent year of available data (1991). Since the data represents a cross-section, the cost-of-capital variables were dropped, but additional cash flow variables were added. The dependent variable was based on net capital expenditures for property, plant, and equipment. Cash flow was separated into three components: depreciation and amortization, income before extraordinary income (ordinary income), and extraordinary income. Other variables were included to control for other sources (and, when negative, uses) of funds. These other variables included the cash obtained from the net sales of financial investments, the net sales of the company's own stock, and the net sales of the company's debt. All of these variables were divided by company net sales to obtain a share.

The results of estimating this model using ordinary least squares are presented in the first two columns of Table A4. It should be noted that the coefficients on three of the additional variables—net investment, net debt, and net stock—were all found to be positive, as expected, and significant at the 1 percent level. Also significant were the cash flow term and two of its components, depreciation and ordinary income. Only extraordinary income appears to be unrelated to the level of investment spending. The coefficient on ordinary income in column 2 indicates that firms with an additional $1 of income spend $0.12 more on investment.

A second test looked at the change in investment spending among the same firms for the years 1990 and 1991. The numerator for each variable was recalculated as the difference between 1990 and 1991 and divided by net sales in the latter year. The results of this regression are reported in column 3 of Table A4. The results for depreciation, net investment, net debt, and net stock were positive and highly significant. The coefficient on ordinary income reversed signs

and continued to be significant. At least for this one year, firms that experienced an increase in income were more likely to reduce their level of investment spending. Increases in all other sources of funds had the expected effect of raising investment.

If only a small fraction of higher income is spent on real investment, what happens to the rest? Other tests explored the relationship between dividend payments and company income (including extraordinary income). The results of these regressions indicate that firms with an additional $1 of income in 1991 distributed approximately $0.40 of that amount in dividends. This is comparable to the estimate of $0.56 obtained from an analysis of annual data for the United States for the years 1946 to 1992.[14]

Additional tests were conducted to investigate the relationship between income and other sources of cash flow. It was expected that higher levels of income would substitute for these other sources. This is, in fact, what the results in Table A5 suggest. In columns 1 and 2 the estimated coefficients on income were minus .211 and minus .165, which means that firms with $1 more of income were likely to have $0.16 to $.21 less in cash from the sale of stock. Recall that the stock variable is equal to the amount of cash raised from the sale of a company's own stock, less cash used to buy back its own stock. It is possible that firms with higher income either sold less new stock or bought more outstanding stock. In either case the result means that fewer funds were available for investments. Columns 3 and 4 provide estimates of the same effect for net debt. It appears that firms with $1 of additional income received $0.08 to $0.17 less from the sale of debt. In conclusion, it appears that only a small fraction of additional income is spent on investment. There is some evidence that the difference is either allocated to dividends or used in lieu of additional equity or debt.

Table A4
Estimated Effects of Selected Variables on Investment as a Share of Sales from a Sample of 1,837 Firms

Independent Variable	Estimated Coefficients (standard errors in parentheses)		
	Cash Flow Aggregate[a]	Cash Flow Separated[a]	Change Between 1990 and 1991
Cash flow/sales	1.84** (0.14)		
Depreciation/sales		.907** (.025)	.847** (.035)
Ordinary income/sales		.122** (.011)	−.058** (.015)
Extraordinary income/sales		−.017 (.074)	−.123 (.122)
Cash flow/sales (−1)		.006 (.011)	
Net stock/sales	.166** (.012)	.141** (.010)	.145** (.014)
Net debt/sales	.232** (.020)	.359** (.017)	.175** (.015)
Net investment/sales	.232** (.039)	.228** (.031)	.084** (.040)
Constant	.052** (.003)	.009 (.003)	−.007 (.004)
Adjusted R^2	.29	.54	.38
Durbin-Watson	2.04	1.98	1.99

* = significantly different from zero at the 5 percent level.
** = significantly different from zero at the 1 percent level.
[a] All values in 1991.
Source: Compustat.

Table A5

Estimated Effects of the Relationship Between Income and Other Sources of Cash Flow from a Sample of 1,837 Firms

Independent Variable	Dependent Variable (standard errors in parentheses)			
	Net	Stock/Sales	Net	Debt/Sales
Depreciation/sales	.034 (.061)	.051 (.060)	.078* (.040)	.120** (.035)
Ordinary income/sales	−.211** (.257)	−.165** (.027)	−.173** (.017)	−.076** (.016)
Extraordinary income/sales	.420* (.178)		−.223* (.105)	
Net stock/sales	.004 (.014)			
Net debt/sales		.010 (.039)		
Net investment/sales		.389** (.074)		.823** (.040)
Constant	.044** (.007)	.041** (.007)	−.0003 (.004)	−.006 (.004)
Adjusted R^2	.039	.058	.066	.248
Durbin-Watson	2.01	1.98	1.95	1.95

* = significantly different from zero at the 5 percent level.
** = significantly different from zero at the 1 percent level.
Source: Compustat.

Endnotes

1. In nominal terms, the ratio of equipment investment to gross domestic product is written as (E/Y) and in real terms (E'/Y'). The two ratios are related in the following form:

$$E/Y = (E'/Y')(P_E/P_Y)$$

where P = price. It therefore should not matter which ratio is used as long as the relative price, P_E/P_Y, is also accounted for.

2. After 1983 the ITC, as reported by the U.S. Internal Revenue Service, was combined with other business credits. This is one of the reasons why the series does not fall to zero in 1986.

3. The correlation coefficient between the two variables is .51.

4. This is equal to the ratio of the price deflator for producer's durable equipment divided by the GDP deflator.

5. The ratio of real equipment spending (E') to real nonresidential investment (N') for 1947 to 1992 is regressed on the investment tax credit and the ratio of price indexes for E and N. An adjustment was made for autocorrelation. The results (with standard errors in parentheses) are

$$E'/N' = 1.16 - .20\, ITC - .52\, P_E/P_N$$
$$ (.122) \quad (.25) \qquad (.11)$$
$$R^2 = .93$$
Durbin-Watson = 1.67

6. Profits (equal to total corporate profits with inventory and capital consumption adjustments plus net interest paid by the corporate sector) are divided by GDP to obtain a share. Average corporate tax rates are equal to total corporate tax liabilities divided by the same profit measure. Data are from the National Income and Product Accounts (NIPA).

7. In this case dividends (D) paid by U.S. corporations from 1946 to 1992 were regressed on corporate after-tax income (I).

Estimates were adjusted for autocorrelation. The results (with standard errors in parentheses) are

$$D = -2.53 + .564I$$
$$\quad\quad (2.87) \quad\quad (.025)$$

Adjusted R^2 = .97
Durbin-Watson = 1.7

8. Companies with sales of less than \$10 million or income losses greater than \$1 billion were excluded. Companies for which these or other cash flow variables were missing in either 1990 or 1991 were also excluded.

9. The measure is equal to the industrial production index reported in *The Economic Report of the President, 1993*, divided by industrial energy (consumed in British thermal units), reported in the *Annual Energy Review*, U.S. Department of Energy.

10. Another reason to repeal the ITC, offered in 1966 by Senator Albert Gore, Sr. was its quality as a special subsidy to capital. See King (1993), p. 287.

11. At least part of this significance can be attributed to reverse causality, that is, higher investment contributes to higher GDP growth and capacity utilization.

12. See Chavas and Cox (1992) for agriculture and Nadiri and Manuneas (1991) for manufacturing.

13. The actual elasticity, calculated at the means, is .91.

14. Dividends (D) were regressed on after-tax company income (I) for the same sample of 1,837 firms in 1991. The result (with standard errors in parentheses) was

$$D = 5.49 + .395I$$
$$\quad\quad (1.65) \quad\quad (.007)$$

Adjusted R^2 = .61
Durbin-Watson = 2.00

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Besides working on his forthcoming book, Karier is doing research in the area of recalculating profits for nonfinancial corporations. Karier contends that adjustments in the National Income and Product Accounts (NIPA) leave misleading deficiencies in corporate profits data (for example, they fail to include interest on debt and fail to incorporate the effect of inflation on debt). He therefore proposes to calculate a new profit series that makes two adjustments to the NIPA data. The first is the addition of interest payments to total profits, and the second

is the adjustment of corporate debt for inflation in a manner analogous to the adjustment of capital consumption changes. His recent publications include "U.S. Foreign Production and Unions," in *Industrial Relations* (forthcoming); and "Competitiveness and American Enterprise" and "The Heresies of John Kenneth Galbraith," in the January–February 1994 and July–August 1993 issues, respectively, of *Challenge: The Magazine of Economic Affairs*. Dr. Karier received his Ph.D. from the University of California at Berkeley.