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Capital Gains Tax Cuts, Investment,
and Growth

by

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I. Introduction

Tax cuts have played a prominent part in the U.S. conservative political uprisings of the early 1980s and middle 1990s. The economic objective of these cuts is to “get government off the backs” of the private economy to stimulate work, saving, and investment. Tax cuts on capital gains income are among the most controversial of these proposals. The Bush administration recommended such cuts, and they now are a major part of the tax plan that has emerged from the Republican “Contract with America” in the U.S. House of Representatives. Because much of the reward from entrepreneurial activity accrues in the form of capital gains, proponents of tax cuts argue that lower capital gains rates will be an especially potent stimulus to productive economic activity. Critics of these tax cuts, however, point out that the vast majority of capital gains income goes to relatively wealthy taxpayers. Therefore, cutting capital gains taxes would disproportionately benefit the wealthy at a time when deficit reduction plans are squeezing many federal programs that benefit the poor and middle classes.

This Brief assesses the economic benefits that the U.S. economy can expect if capital gains taxes are cut. We consider a variety of channels through which capital gains taxes might affect economic decisions and find that there is little theoretical or empirical basis for the view that lower capital gains tax rates will have a substantial effect on economic growth or the level of economic activity. The reasons for this conclusion can be divided into two broad classes. First, there are some theoretical confusions in much of the popular discussion about the capital gains tax that lead to misleading conclusions about its economic impact. Most journalistic accounts of the debate over this topic assume that when the tax on rewards from entrepreneurial activity falls more investment projects will be undertaken. We show, however, that as a first approximation, changes in taxes on profits, such as the capital gains tax, will not affect decisions by firms to undertake investment projects. Second, while there are some theoretical channels through which capital gains tax

rates affect investment activity, in particular if the capital gains tax rate is different from the tax rate on the returns from other kinds of investment, we find the empirical significance of these effects to be small, possibly negligible. The estimated decline in the effective cost of capital from the current proposal to lower the highest capital gains tax rate from 28 percent to 19.8 is between one and two percent. For assumptions that represent average values in the U.S. economy, we estimate a decline of only 1.1 percent. The proposals to index capital gains income for inflation have a somewhat larger, but still small, effect. With our average assumptions, the indexation provision reduces the effective cost of capital by 1.6 percent.

The economic effect of such changes is minimal. Theoretically, a one-time change in the cost of capital does not change the long-run growth rate of the economy, it affects the level of output only. Using assumptions that are generous to the capital gains tax cut and the indexation provision, we find that its long-term effect on output amounts to about a third of one percent of U.S. GDP. This means that we cannot expect the long-term economic impact of this controversial policy to be greater than that of roughly two months of normal economic growth, and it will take years to realize even this small benefit.

These results lead us to the conclusion that claims about a large stimulus to investment from lower capital gains taxes are often overstated. The vast majority of future investment activities that would benefit from a lower capital gains tax rate would likely have been undertaken at the current capital gains rate, which is already effectively much lower than the highest marginal tax rate on ordinary income. We therefore dispute the claim that a lower capital gains tax rate will have large beneficial effects on output, growth, or entrepreneurial activity in the U.S. economy. The debate over the appropriate capital gains tax rate should focus on other considerations. These include the distribution of tax burdens across different individuals and different time periods.

It is clear that most capital gains income accrues to relatively wealthy taxpayers and that cutting the capital gains tax rate would most benefit these individuals. Feenberg and Summers (1990), for example, show that over half of capital gains income goes to

individuals in the top one percent of the income distribution.¹ Equity considerations might therefore suggest that lower capital gains rates are undesirable. Indeed, since aspects of the current tax law already create preferences for capital gains income, one might argue that capital gains rates should be increased to achieve a more progressive tax system. The fact that nominal (rather than “real”) capital gains are taxed, however, implies that effective capital gains tax rates vary arbitrarily across time with inflation rates. Some proposals attempt to eliminate this problem by indexing capital gains taxes to inflation. Another contentious issue in the debate over capital tax cuts is whether they will increase or decrease tax revenue. Some analysts argue that “realizations” of capital gains may increase so much following a tax cut that the government may collect more revenue at lower capital gains tax rates. Such findings are controversial, however, and other studies conclude that lower capital gains tax rates will reduce revenues and increase the deficit.² Considerations of this kind likely dominate the small, even negligible impact we find of lower capital gains taxes on investment and growth. We believe it is important that the debate over this controversial tax policy focus on the right issues.

II. What is the Effective Capital Gains Tax Rate?

There have been many modifications in the tax treatment of capital gains since the inception of the federal income tax in 1913.³ Through 1921, capital gains income was treated no differently than income from any other source. For the first time in 1922, capital

¹ It is often argued that such statistics are misleading because a sizable fraction of capital gains go to people of modest means who sell a home or business and therefore have artificially inflated incomes in the year they receive capital gains. Feenberg and Summers (1990), however, examine this problem and find that it does not significantly change the conclusions.

² See Auten and Cordes (1991) and Minarik (1992) for discussion of this issue and further references.

³ For a legislative history of the tax treatment of capital gains, see Joint Committee on Taxation (1995) and Office of the Secretary of the Treasury, Office of Tax Analysis (1985).

gains were defined apart from ordinary income, and policy makers have tinkered with capital gains tax treatment ever since. There are many ways in which capital gains taxation has been modified. Various policy reforms have altered the deductibility of capital losses, the holding time necessary to constitute a long-term capital gain, the fraction of long-term capital gains income that may be excluded from taxable income, and the statutory tax rate on capital gains income.

One way to track the tax treatment of capital gains income from year to year is to consider the maximum marginal tax rate on long-term capital gains income under successive tax regimes. Although this rate varies with the situation of the taxpayer, the general trend from 1922 through 1978 has been up. Under fairly typical conditions, the maximum marginal rate rose from 12.5 percent in 1922 to 49.1 percent in 1978. With passage of the Revenue Act of 1978, the maximum marginal tax rate on capital gains income dropped to 28 percent. This figure is arrived at by combining a maximum personal tax rate on ordinary income of 70 percent with the exclusion rate of 60 percent for capital gains income. Thus, a one dollar increase of capital gains income for someone in the top tax bracket created a 40 cent increase in taxable income which was taxed at rate of 70 percent; leading to 28 cents of additional tax.⁴ The Economic Recovery Tax Act of 1981 lowered the highest personal tax rate to 50 percent and thus lowered the maximum marginal tax rate on capital gains income to 20 percent. With passage of the Tax Reform Act of 1986, the highest rate on personal income was lowered to 28 percent, but the capital gains exclusion was eliminated, raising

⁴ Calculation of previous maximum marginal rates on capital gains income is not this simple, partially because capital gains income was not subject to the same statutory rate schedule as ordinary income between 1922 and 1978. Also, beginning in 1970, the excluded portion of capital gains income was considered an item of "tax preference" and subject to another "minimum tax." At the same time, a distinction was made between "earned income" and other income. Earned income was subject to a lower, so called "maximum tax," than other income. Each dollar of excluded capital gains income shifted some of the taxpayer's total income out of favorably treated earned income and into the higher taxed other income. The separate rate schedule had the effect of lowering the maximum marginal rate on capital gains income. The "minimum tax" and "maximum tax" provisions had the effect of raising the maximum marginal tax rate on capital gains income. Together, these provisions make the calculation of the maximum marginal tax rate on capital gains income in this period complicated. The 1978 Act eliminated these provisions and simplified the calculation of effective capital gains tax rates.

the maximum marginal tax rate on capital gains to 28 percent. One of the provisions of this act was that if marginal personal tax rates were to increase in the future, the maximum marginal tax rate on capital gains was to remain at 28 percent; it would take a separate act to increase this rate. Since the passage of the 1986 Act, the highest personal marginal tax rate has in fact increased to 39.6 percent, but the maximum marginal tax rate on capital gains has not been raised.

Although the current maximum marginal tax rate on capital gains is 28 percent, this rate does not accurately represent the year-to-year tax burden associated with capital gains taxation in many cases; the actual burden is usually lower. Unlike personal income derived from wages, dividends, and interest, capital gains may accrue over time but are not actually taxed until the gain is realized. To illustrate the advantage from tax deferral, consider the following example. Suppose an asset grows in value at a rate of 20 percent per year for 12 years. It is fairly straight forward to show that, after 12 years, the owner of this asset will have the same after-tax wealth whether the capital gain is taxed once at a rate of 28 percent at the end of the period or twelve times at a rate of 14 percent every year.⁵ Thus, when we compare the tax rate on capital gains with the tax rates on other types of income that are actually taxed every year, we need to consider the tax deferral advantage associated with capital gains income.

It is also the case that many realizations of capital gains are not subject to taxation at all. In particular, when an asset is held until death, the new owner of the asset is not responsible for capital gains taxes on its past appreciation. If the asset is immediately sold, then, this income will not be subject to capital gains taxation at all. Even if the asset is not immediately sold, the base value for purposes of computing future taxes is adjusted to the value at the time of inheritance.

⁵ For a more detailed treatment, see Auerbach 1983, p. 919n.

For these reasons, the “effective,” year-to-year tax rate on capital gains (sometimes called the “accrual-equivalent” tax rate) is actually lower than the statutory rate. The size of this difference varies across taxpayers. For a particular class of taxpayers the effective capital gains tax rate declines with the holding period of capital asset, the growth rate in the value of the asset, and the proportion of assets acquired through inheritance. To account for the deferral advantage of capital gains income, many studies halve the statutory rate. To account for the inheritance advantage of capital gains income, the rate is often halved again.⁶ In the current tax environment, this approach would lead to an effective capital gains tax rate of only 7 percent! Also, the size of the adjustments made for deferral and inheritance effects are important for evaluating the impact of capital gains tax reform on investment and growth. Cutting the capital gains rate by 50 percent has a much bigger impact if the initial rate is 28 percent than it will if the initial effective rate is 7 percent. We have considered several possibilities for the effective initial rate to see how policy conclusions depend on this issue.

III. Economic Theory and the Capital Gains Tax

There is wide agreement in the popular press discussions that capital gains taxes discourage entrepreneurial activity and that a capital gains tax cut would therefore be a stimulus to investment and technology. For example, Steve Forbes attributes the high-technology “boom of the 1980s” to capital gains tax cuts in the late 1970s (*Forbes*, January 18, 1993, p. 26). *USA Today* (November 18, 1994) reports that “the 1986 increase in the [capital gains] tax proved a disaster for capital-hungry businesses.” Senator Connie Mack writes “[i]n effect we threw away the key to investment and economic growth in 1987 when

⁶ See King and Fullerton 1984, Feldstein and Summers 1979, Fullerton et. al. 1981, and Feldstein, Poterba, and Dicks-Mireaux 1983.

the capital gains tax rate was increased” (*Wall Street Journal*, August 29, 1995, p. A14). Views such as these seem based on the rather straightforward and intuitive notion that by lowering the tax bite on gains accruing to firms that make profitable investments, the incentive to undertake investment will be enhanced. From this view flow claims of higher growth, faster technological progress, and an overall more robust economy following a capital gains tax cut.

But things are not always what they seem on the surface, and this intuitive view deserves closer scrutiny. A deeper analysis reveals a somewhat surprising result: As a first approximation, a cut in capital gains tax rates, or any tax on the profits from investment activities, may have *no effect* on investment incentives for firms. We call this result “tax rate independence.” We lay out the logic and assumptions behind this result which will serve as a kind of benchmark for analysis. Then, we will consider how the way that the actual U.S. tax system operates might modify the benchmark conclusion.

A. The Benchmark Case: Tax Rate Independence

To understand why capital gains tax rates might not affect a firm’s investment decisions at all, consider a hypothetical firm with managers that maximize the value of the firm for its owners. Suppose that the firm managers are contemplating an investment project that they know will increase firm value by \$1 million. If the capital gains from this activity accrue to firm shareholders free of tax, their wealth rises by \$1 million. If, however, capital gains are taxed at 28 percent, shareholder wealth rises by only \$720,000.

Clearly the shareholders would prefer to be free of capital gains taxes. But how would the presence or absence of the tax affect the decision of the firms’ managers to undertake the investment project? The answer is: not at all in this simple environment. The project still increases shareholder wealth if the gains are taxed, and the firm would

sacrifice value for its shareholders if it did not invest in the project. That is, while \$1,000,000 is better than \$720,000, \$720,000 is better than nothing!

We shall refer to this result as *tax rate independence*. It shows that firms that maximize shareholder value will always undertake projects that increase shareholder value, as long as the capital gains tax rate is less than 100 percent. This result, however, relies on a strong and, in practice, unrealistic assumption. Our example assumes that the market value of the project is unaffected by the imposition of capital gains taxes. There are many practical reasons why this assumption may fail and the capital gains tax rate could matter for actual investment decisions. For example, capital gains taxes are levied on nominal rather than real gains. In addition, the returns from some investments are taxed at capital gains rates (such as gains on the sale of corporate equity) while others are taxed at different rates (such as interest and dividend income). If capital gains tax rates are cut while the tax rates on other assets are unchanged, some projects that generate capital gains may be undertaken that would have been dominated by an investment in interest-bearing assets at a higher capital gains rate. In the following discussion, we shall consider these and other issues in detail that may cause tax rate independence to fail. Yet, tax rate independence is a useful benchmark, and it is an effective counter-argument to the simple view that cutting capital gains tax rates will obviously stimulate investment because it reduces the tax bite on the gains firm owners experience from successful investment projects. Asset owners will like lower tax rates on their capital gains, but it is not so obvious that these lower tax rates should change firm decisions about whether to undertake investment projects. To obtain an effect of capital gains taxes on investment decisions, we must move beyond simple intuition.

B. Uncertainty and Risk Aversion

The tax rate independence discussion ignores two aspects of investment decisions that many analysts consider crucial to the debate over cutting capital gains taxes: risk and uncertainty. Uncertainty alone will not change tax rate independence, but the desire of entrepreneurs to avoid risk, that is, their risk aversion, may make a difference. We now consider these issues in some detail.

Continuing with the kind of example presented earlier, suppose now that the firm has a potential investment project with an uncertain rather than a sure return. The firm managers believe the project will increase firm value by \$2,000,000 with 50 percent probability, but there is also a 50 percent chance that the project fails and firm value falls by the start-up cost of the project, which we assume to be \$100,000. If the firm owners do not care about project's risk, standard economic theory predicts that the firm will undertake the project if the weighted average of possible project returns is positive. The weights in this average are the probabilities associated with each return.⁷ In our example, this calculation would be:

$$(0.5) \times \$2,000,000 + (0.5) \times -\$100,000 = \$950,000.$$

This calculation is called the “expected value” of the project. In this example, a firm with owners that do not care about the risk of this project (risk-neutral owners) would undertake the project to raise the firm's expected value. If the government imposes a tax on the capital gain when the project is successful and allows the firm owners to write off its capital loss against other income if the project fails, the projects' expected value will fall, *but the expected value will still remain positive for any capital gains tax rate less than 100 percent*. The firm should still undertake the project to increase the expected wealth of its

⁷ The theory used here assumes that firm owners wish to maximize their expected utility when they face uncertainty. This approach is the dominant form of analysis in economic theory to understand the behavior of agents that make decisions in an environment of uncertainty.

owners and tax rate independence holds.⁸ In this situation, a cut in the capital gains tax rate would not affect firms' choices to undertake investment projects.

It may seem restrictive to assume that the firm's owners do not care about the risk of the firm's project, but there are good reasons to believe that a large portion of U.S. capital investment is undertaken in just this kind of environment. Although most empirical research on individual attitudes toward risk finds that individuals are risk averse, owners will want their managers to make investment decisions without concern about risk if the owners can diversify their investments.⁹ An investor cares about the risk of her total portfolio, which is negligibly affected by the risk of any single firm when her investments are diversified. The best thing a firm's managers can do for its diversified owners is to maximize the firm's expected value. As we have seen above, this kind of behavior leads to tax rate independence where a change in the capital gains tax rate will not affect a firm's decision to undertake investment projects.

How much investment in the economy is carried out by firms in this situation? There is no way to get a precise measure. But it is suggestive to note that the publicly traded companies tracked by the Compustat data service accounted for roughly half of aggregate U.S. plant and equipment spending. It is sensible to assume that most owners of public firms, especially large public firms, are well diversified. Moreover, a substantial portion of private firms are owned by institutional investors such as pension funds, mutual funds, life insurance companies, or even venture capital funds which also provide diversification.

⁸ In practice, there are restrictions on the way in which capital losses that can be deducted against non-capital gains income. We shall return to this issue later in this Brief.

⁹ Managers, however, may not follow owners' wishes. If it is costly for managers to find new jobs in the case of a business failure, for example, managers' personal risk aversion may be reflected in the investment decisions of the firm even if such behavior is not in the best interest of shareholders. This kind of phenomenon is called an "agency problem" in the economics research literature.

There are undoubtedly important cases, however, in which owners' personal attitude toward risk may play a role in the decision to undertake an investment project with uncertain outcomes. Substantial evidence has been compiled showing that firms' investment may be restricted by the availability of credit or the ability to sell new equity on the open market.¹⁰ In such an environment, the firm will rely more heavily on internal funds to finance investment, that is, on funds generated from firm profits or money put up from the personal wealth of firm "insiders" who have detailed knowledge about the firm's operations and opportunities. The insider group may be small, possibly consisting of just a single entrepreneur or maybe a small venture capital group. A substantial portion of insiders' wealth may be tied up in the firm and, if so, their portfolios will not be diversified.¹¹

Investment undertaken with this kind of structure is likely to be important for economic growth. Venture capital, for example, is concentrated in high-technology activities.¹² Much of the rhetoric in support of cutting capital gains tax rates argues that this is the kind of activity that lower capital gains taxes will encourage. We will now evaluate this claim.

The tax rate independence result will generally not hold for investment projects undertaken by firms with undiversified ownership by risk-averse individuals. It is possible that capital gains tax cuts would cause a firm in this situation to invest in a project that it would have rejected when its owners faced a higher tax rate. But it is usually not recognized that the opposite result can also occur: lower capital gains tax rates *might*

¹⁰ The restrictions firms face on external funds may take the form of an increased cost for credit or they may result from rationing, where firms cannot obtain external finance no matter what price they pay. The extensive empirical literature linking external finance restrictions to investment is surveyed by Hubbard (1995).

¹¹ See Fazzari and Variato (1994) for further discussion of how restrictions on firms' access to external finance lead to undiversified positions taken by firm insiders.

¹² See Al-Suwailem (1995) for discussion of venture capital. One should not exaggerate the importance of venture capital for aggregate investment. Al-Suwailem shows that total U.S. venture capital disbursements never exceeded \$4 billion dollars from 1984 to 1993. During this period, nonresidential fixed investment averaged over \$500 billion.

discourage investment for a firm with undiversified owners. We shall now explain the intuition that lies behind these results.

Consider a project with uncertain returns, like the example discussed above. Because the project has a positive expected value a risk-neutral investor will undertake it, regardless of what the capital gains tax rate is. A risk-averse investor will put less value on the project because the uncertainty associated with its returns will offset, to some extent, the benefits of the average gain. How will a change in the capital gains tax rate affect the investment decision of such an individual? A lower capital gains tax rate increases the reward he obtains if the project is successful. But to the extent that capital losses are deductible against other capital gains income, a lower capital gains rate also reduces the value of his tax deduction if the project fails. It appears that *a lower capital gains tax rate could make the project more or less valuable to a risk averse investor.*

A deeper look at the economic theory underlying this situation shows that if an investor is just slightly risk averse, a lower capital gains tax rate will increase the value she places on an uncertain project. As risk aversion rises beyond some critical level, however, lower capital gains rates will decrease an investor's valuation of the project because the benefit of lower taxes obtained when the project is successful is not sufficient to offset the loss incurred from the lower tax deduction when the project fails.¹³

A numerical example helps to illustrate this point and also shows that this apparently perverse result can arise in unremarkable circumstances. Consider an entrepreneur with \$500,000 in initial wealth who is contemplating an investment project that costs \$100,000. The project is quite risky: it succeeds with only 20 percent probability. But the payoff of the project is high, it generates a gain of \$1,000,000 (in present value) if it is successful. If

¹³ This result occurs because risk aversion implies that as individuals get more wealthy, they value increments to wealth less. Therefore, for an individual who is sufficiently risk averse, the incremental valuation of the returns from a project when the project is successful and the investor is wealthy means less to the investor than the incremental loss due to a lower tax deduction when the project fails and the investor's wealth is lower.

it is unsuccessful, the project has zero residual value. This project has a positive pre-tax net expected value of \$120,000.¹⁴ If the capital gains tax rate is 28 percent, the entrepreneur's after-tax expected wealth would rise by \$86,400 if the project is undertaken, so the investment would be made if the entrepreneur is risk neutral. Let us now assume, however, that the entrepreneur is sufficiently risk averse that she will not undertake the project at the tax rate of 28 percent. What happens if the tax rate falls to 19.8 percent? The entrepreneur's after-tax wealth is higher if the project is successful because she will pay less tax on her \$1,000,000 gain, but she loses more in the bad state of the world because the tax benefit from her \$100,000 loss is lower. With a reasonable specification of the entrepreneur's risk aversion, the lower tax rate actually *reduces* the expected utility derived from the project.¹⁵

The theory can help us understand the situations in which the perverse result is more likely. That is, we can say something about the kind of investment projects for which lower capital gains tax rates might actually discourage investment in risky projects. First, as the discussion above implies, perverse results are more likely if the investors are more risk averse. As discussed above, greater risk aversion is most likely when a project is undertaken by undiversified investors who put a substantial portion of their personal wealth at risk to undertake the project. This situation is most likely to arise in firms without good access to public securities markets due to severe information problems, an environment often associated with investments in new, high-technology industries. Second, the "perverse" result is more likely for a project with a lower probability of success, but with a higher payoff when it is successful. This situation also characterizes much of high-technology or venture capital investment. It appears that a lower capital gains tax is more

¹⁴ The project generates \$1,000,000 in profit if it is successful and a loss of \$100,000 if it fails. Since the probability of success is 0.20, the expected value of the project equals $(0.20 \times \$1,000,000) - (0.80 \times \$100,000) = \$120,000$.

¹⁵ Specifically, we assume that the entrepreneur's utility function displays constant relative risk aversion with a coefficient of 2.0. This specification has some support in the literature on decision-making under uncertainty. See, for example, Friend and Blume (1975) and Zeldes (1989).

likely to have a perverse impact on investment for those kinds of projects that proponents of capital gains tax cuts often target for assistance.

One might criticize the assumption made in the analysis above that capital losses are fully deductible against other capital gains income. If the potential investment project is part of a firm's on-going operations, the costs of unsuccessful ventures can be written off against profits from other parts of the business. (Consider the costs of unsuccessful R&D projects, for example.) In mutual funds, losses incurred on some securities will reduce the taxable gains from other successful activities undertaken by the firms in the fund. Also, even if the restriction on deducting capital losses does bind in a given year, losses can be carried forward to offset future capital gains.

The points raised in this subsection imply that the impact of tax policy on risk taking is a complex phenomenon. In some cases, lower capital gains tax rates *might* boost investment through these channels. But the aggregate effects seem limited, in that much investment is undertaken in environments for which this effect is not relevant. Furthermore, even when uncertainty and risk aversion matter for investment decisions, it is not clear that cutting the capital gains tax rate will encourage more investment. We conclude that there is no strong theoretical or empirical evidence that supports the view that a lower capital gains tax rate encourages risk taking to a significant degree.

C. The "Lock-in" Effect

Research on capital gains taxes has identified another channel through which the capital gains tax rate may affect the level and allocation of investment. The "lock-in" effect occurs when holders of old assets with relatively low returns have an incentive to hold onto them for tax reasons rather than sell them to invest instead in new assets with higher returns. The implication of the lock-in effect is that ventures that are more productive than existing activities remain unexploited because the tax code discourages investors from

putting their money into activities with the highest social returns. Some have argued that a reduction in the capital gains rate would mitigate the lock-in effect and enhance the productivity of the United States capital stock. For example, Senator Connie Mack writes that “[b]y reducing the capital gains tax rate ... \$1.5 trillion in locked-up gains can be released to pursue investment opportunities that create jobs and growth in the U.S. economy” (*Wall Street Journal*, August 29, 1995, p. A14).

To understand how the capital gains tax may create a lock-in friction in the flow of financial capital to its most productive uses, we need to identify the incentives faced by a portfolio holder who is considering reallocating her wealth across assets. An investor will reallocate capital across assets as long as the benefits of doing so exceed the costs. An obvious benefit of reallocation is the potentially higher rate of return achieved by selling low return assets and using the proceeds to purchase high return assets. Recall, however, that because the capital gains tax is levied upon the realization of capital gains rather than the accrual, there is also a tax benefit (which increases as an asset's holding period increases) to holding any asset. It may be that the tax benefit of holding on to a low-return asset may exceed the gain from switching to an asset with higher returns. The lower is the capital gains tax rate, the lower are the benefits from accrual and the lower is the cost of portfolio reallocation.

To illustrate the lock-in effect, consider an investor who 9 years ago purchased an asset for \$1,000 that has grown in value at an annual rate of 10 percent and is today worth \$2,357.95. Suppose further that this investor has one more year in his planning horizon and has the opportunity to purchase, for the final year, an asset that returns 11.5 percent. The investor can sell his position in the old asset and use the proceeds to invest in the higher return asset, but with a capital gains tax rate of 28 percent the investor is actually better off holding the old asset for one more year; he is locked-in to a lower return asset. If he were to sell the low-return asset now, and pay capital gains taxes, he would have \$1,977.72 ($\$1,000 + 0.72 \times (\$2,357.95 - \$1,000)$) remaining to invest in the higher return asset. After

one year of earning 11.5 percent, and paying capital gains tax, his wealth would be \$2,141.48 ($\$1,977.72 + 0.72 \times 0.115 \times \$1,977.72$). Alternatively, if he simply holds the asset paying a 10 percent return, and defers capital gains taxes for an additional year, he will have \$2,147.49 ($\$1,000 + 0.72 \times (\$2,593.74 - \$1,000)$). That is, the investor makes \$6.01 by avoiding the sale of a low return asset to buy a high return asset because of the deferral benefit of the capital gains tax. When the capital gains tax rate is 19.8%, this is no longer the case and the investor is better off selling the old asset to buy the new.

This illustration is illuminating, but also a bit misleading. Recall that the malady of the lock-in effect is the inefficient allocation of capital resources it is said to create in the aggregate. But not all investors are subject to the capital gains tax. In particular, large institutional investors like pension funds are not subject to the capital gains tax. From 1980 to 1993, the contribution from insurance and pension reserves to total annual increases in financial assets averaged 47%.¹⁶ Minarik (1992, p. 20) writes that “owners of about half of all corporate equity are entities that are unaffected by the capital gains tax because they are either non-taxable U.S. institutions or foreigners not subject to U.S. taxation on capital gains.” Thus, although some investors are locked-in, a significant proportion of financial investment is undertaken by investors who are not. With the existence of these large uninhibited organizations, it is difficult to argue that there are significant unexploited profit opportunities in capital markets that could be eliminated with a reduction in the capital gains tax rate. Put another way, although reducing the capital gains tax rate would mitigate the lock-in effect, it would not necessarily increase the productivity of the capital stock.¹⁷

In addition, even if the capital gains tax creates a lock-in effect to which *all* investors were subject, the solution is not necessarily to lower the capital gains tax rate. The lock-in effect exists because capital gains are taxed upon realization rather than accrual.

¹⁶ *Economic Report of the President*, 1995, Table B-30.

¹⁷ Some analysts argue that the lock-in effect actually enhances efficiency because it reduces the incentive for excessive trading of financial assets for short-term gain and causes investors to focus on long-term productivity.

A more comprehensive solution would be to convert the capital gains tax to an accrual-based tax. This possibility has been explored in the economics literature. There are, however, problems with such a tax. For some assets, in particular assets traded on well-organized markets, an accrual based capital gains tax is feasible because the value of these assets are set and accessible every day, so it is straightforward to determine their value. Moreover, a portion of assets traded in well-organized markets could be sold to cover the tax liability on the accrued income they generate. (Sales of shares of stock, for example, could be used to pay the tax on their accrued increase in value.) For other assets which are traded on thin markets if they are traded at all--e.g., Van Gogh paintings--valuation is difficult and there is no way to sell portions of these assets to pay for a tax liability on the accrual of their value.¹⁸

D. Capital Gains Rates, Savers, and Investors

Up to this point, the analysis has assumed that owners of firms and potential investors evaluate the net present value of investment projects at a fixed interest rate, set independently of capital gains taxation. This assumption, however, may not be correct. A change in the capital gains tax rate changes the return savers can obtain on their investments in certain kinds of firms. Lower capital gains taxes may reduce the return savers require to provide investment finance to firms and may also change the allocation of funds to different sectors of the economy. In this subsection, we shall evaluate the logic and quantitative significance of this phenomenon.

Suppose that a potential investor requires a fixed after-tax rate of return, say 10 percent, to make it worthwhile to put money into a group of firms. If one firm in the group

¹⁸ The accrual tax is discussed by Auerbach (1992) who offers suggestions about ways to overcome the practical problems mentioned in the text.

pays out all its income as dividends (and hence does not generate capital gains) and the maximum personal tax rate on dividends, as in current law, is 39.6 percent, then the firm will have to earn a pre-tax rate of return r that satisfies the equation:

$$10 = (1 - .396) r, \text{ which implies } r = 16.56.$$

That is, the firm will only be able to attract capital from this investor if it can provide a pre-tax return of 16.56 percent. If this investor is representative of the financial community, the firm will only undertake an investment project if its managers believe the project will attain a return at least this high.

Now suppose that a similar firm retains its income rather than paying it out as dividends. The owners of this firm will realize income by selling shares of this firm, which will have appreciated due to the value built up in the company by its historical retained earnings. These owners will receive capital gains income. Assume again that the representative investor in this firm also requires an after-tax return of 10 percent, but that the effective capital gains tax rate is only 28 percent (as in current law), less than the income tax rate that applies to dividends. The investor would then need to have pre-tax return of:

$$10 = (1 - .28) r, \text{ which implies } r = 13.89.$$

This firm would only need to realize a return of 13.89 percent to attract funds and make an investment project worthwhile. If the two firms were identical in all respects, except that one paid dividends and one retained earnings, one would expect that the high retention firm would undertake more projects.¹⁹ A fall in the capital gains rate to 19.8 percent, as is now being considered, would lower the pre-tax rate of return the firm must pay to investors even further. The rate would solve the equation

$$10 = (1 - .198) r, \text{ which implies } r = 12.47.$$

¹⁹ This analysis begs the question of why firms pay dividends at all given their tax consequences. One reason is likely to be that dividends provide signals of management's assessment of long-term earning potential. These signals may be valuable enough to investors to offset the tax disadvantages.

A capital gains tax rate cut, by favoring capital gains income to an even greater extent than current law, will lower the rate of return firms will have to give their investors and therefore encourage them to undertake more projects.

These effects seem rather large, but they ignore many complexities of the cost of capital. For example, the cost of using capital includes depreciation as well as the return that must be provided to owners. We must also recognize that firms finance some investment with debt rather than equity or retained earnings and that some of the return to equity is paid in the form of dividends rather than capital gains. These and other factors are incorporated in the formula for the cost of capital derived in the technical appendix to this Brief. When we evaluate the proposed drop in the maximum statutory capital gains tax rate from 28 to 19.8 percent with this formula, the effective cost of capital declines between 0.5 and 1.7 percent. (The exact number depends on other assumptions made in the analysis, as is discussed further in the appendix.) These changes are quite small; they correspond to what we might expect as a result of a decline in interest rates of roughly 25 basis points, on average. While the direction of the effect on investment is clear through this channel, it may be of little practical importance. We will evaluate the quantitative impact of this change more extensively in section IV of the Brief.

Other complicating factors would likely reduce these effects even further. The discussion above applies to the initial situation immediately following a cut in capital gains tax rates. Moving a step further, however, suppose that firms do undertake more projects as they perceive that they need not provide their investors with such a high rate of return. The demand for funds will rise throughout the economy and drive interest rates up, offsetting the benefit of lower capital gains rates for investment. Indeed, if aggregate saving is not very sensitive to interest rates, as some empirical studies find (see Hall, 1988 and

Skinner and Feenberg, 1990, for example), the offset may be nearly complete.²⁰ In addition, there will likely be some re-allocation of investment. The improved after-tax return on investments that generate returns in the form of capital gains will tend to attract capital away from activities that are financed with debt or those that generate dividends, raising the opportunity cost of funds for firms that use these alternative financing methods. Some might argue that such a re-allocation is good because it favors the typically more risky activities that may be undertaken in anticipation of capital gains income. But such a judgment is not easy to assess and, in any case, the lost investment for firms that rely relatively more on debt and dividends than on capital gains must be viewed as an offset to the investment gains arising from lower capital gains taxes.

E. Capital Gains and Inflation

Under the present tax law, economy-wide inflation raises the effective real tax rate on capital gains income above the statutory rate. This increase occurs because nominal rather than real gains are subject to taxation. The tax reform proposal passed by the House of Representatives would index capital gains for inflation and tax only real gains. The result would be a reduction in the capital gains tax rate paid when the economy experiences positive inflation.

To illustrate the effect inflation has on the effective real capital gains tax rate, consider a capital asset purchased for \$1000, held for five years, and then sold for \$1762--a nominal gain of \$762. This is consistent with a 12 percent annual rate of return. For a tax payer in the 28 percent bracket, the tax liability on this gain is \$213 ($\762×0.28). Suppose that through this period, the rate of inflation is 3 percent. For a \$1000 investment to just

²⁰ In a Keynesian context, when resources are not fully employed, an increase of investment demand will stimulate the saving necessary to finance it in equilibrium. Interest rates might still rise in this environment, however, due to a rise in money demand or an increase in the rate of interest charged by financial intermediaries.

maintain its original purchasing power over this period, it must increase in value to \$1159 over 5 years. The difference between the nominal gain and this gain necessary to compensate for inflation, \$603, is the real increase in the purchasing power of the asset. When the asset owner pays \$213 tax on this gain, the effective tax rate on the real (inflation-adjusted) return is 35 percent ($\$213 / \603).

In this illustration, indexing capital gains for inflation amounts to changing the basis of the capital asset from \$1000 to \$1159.²¹ The reported capital gain then decreases from \$762 to \$603, the tax liability from \$213 to \$169 ($.28 \times \$603$), and thus the tax rate on the real gain declines from 35 percent to 28 percent.

Since investors are concerned with their real purchasing power, it is this effective real tax rate on capital gains that determines the rate of return firms must yield to attract capital. As we describe above, the lower is the tax rate on capital gains income, the lower is the cost of capital for firms that pay owners with capital gains. As long as there is a positive rate of inflation, indexing capital gains for inflation will decrease the real tax rate on capital gains and decrease the cost of capital for these firms.

IV. Capital Gains Taxes, Investment, and Growth

A. Summary Results

This section brings together the discussion above to evaluate the size of the impact of proposed cuts in the capital gains tax rates on the U.S. economy. In what follows, we consider how the proposed tax changes under discussion in Congress during the fall of 1995 will affect the cost of capital and how changes in the cost of capital translate into investment

²¹ The House bill prescribes multiplying the basis of the capital asset by the ratio of the GDP deflator for the quarter in which the asset was sold to the GDP deflator for the quarter in which the asset was purchased.

and growth. Briefly, reducing the tax rate on capital gains income and indexing capital gains for inflation decreases the cost of capital to firms who pay their owners at least in part with capital gains income. We call the two channels through which the cost of capital falls the “savings” and “indexation” channels. (See sections III.D and III.E above for further discussion.) At a lower cost of capital, firms invest more, increasing the size of the U.S. capital stock. A larger capital stock in turn produces more output (GDP). We evaluate the size of this increase in output by comparing it to increases that result from normal growth. More specifically, we estimate how many days of normal growth the economy would need without the policy change to produce the increase in output that arises from the capital gains tax cut. The results are summarized in Table 1.

Table 1

**Summary Effects of Lowering the Statutory Capital Gains Tax Rate
and Indexing Capital Gains for Inflation**

	Saving Channel	Indexation Channel	Combined Effect
Percent Decrease in the Cost of Capital	1.14	1.61	2.25
Percent Increase in the Capital Stock	0.57	0.81	1.13
Percent Increase in Output	0.17	0.24	0.34
Equivalent Days of Normal Growth	25	35	50

Note: The saving channel estimates the effect of lowering the statutory capital gains tax rate from 28 to 19.8 percent. Normal growth is defined to be 2.5 percent per year. See the appendix for a detailed explanation of these figures as well as analysis of alternative scenarios.

These effects are quite small. They imply that eventually, after the capital stock has fully adjusted to the lower capital gains tax rate, the level of output will be only slightly higher than it would have been without the tax cut. The increase in output is what we would expect from normal trend growth in just a month or two. Note that this is an increase in the *level* of output. The tax cut does not change the long-run rate of growth of the economy. We shall now discuss these results in greater detail.

B. The Cost of Capital

The capital gains tax cut proposal now under consideration in the U.S. Congress, would eliminate the 28 percent cap on the taxation of capital gains that was set in the 1986 Act, but would allow an exclusion of 50 percent of capital gains income from taxes. Since the highest marginal personal tax rate is currently 39.6 percent, the maximum statutory rate on capital gains income would become 19.8 percent.²² How would this change affect the cost of capital firms use to evaluate the profitability of investment projects? One effect that we can quantify is the impact of lower tax rates on the return firms must provide to their investors to attract funds. This required return will be smaller since investors will pay lower taxes on the capital gains that accrue to their investments.

The formula derived in the appendix allows us to estimate the size of this effect. With the current tax law, we estimate the cost of capital to be 14.04 percent. This figure includes the tax-adjusted real return that firms must provide to compensate its investors for the returns they forego by investing money in the firms' projects (4.04 percent) and the depreciation rate on new capital (10 percent). We estimate that lowering the capital gains tax rate from 28 to 19.8 percent, in what we call our "benchmark" scenario, would reduce

²² As of this writing (October, 1995) Congress is considering imposing a 21 percent tax rate on capital gains income for individuals subject to the alternative minimum tax.

this figure to 13.88 percent, a decline of 16 basis points or only 1.14 percent. This case is the basis for the saving channel figures in table 1.

The benchmark uses assumptions that reflect the average across different kinds of firms and investors in the economy. The actual change in the cost of capital, however, will depend on the particular situation of firms and investors, so we also consider a number of alternative scenarios. (See the appendix for detailed calculations.) Firms with assets that depreciate faster than the assets in a typical firm would experience an even smaller proportionate decline in the cost of capital because depreciation costs are not affected by changes in the capital gains tax rate. Firms that do not pay dividends would enjoy a larger proportionate decline in the cost of capital. Since the owners of these firms take their income entirely in the form of capital gains, they are more sensitive to changes in the tax treatment of capital gains income. Shareholder behavior is also important for the magnitude of the effects. The longer shareholders wait to sell their shares and realize their capital gains, the lower is the effective capital gains tax rate. Therefore, the longer this holding period, the smaller is the effect of a given cut in the statutory capital gains tax rate.

One must keep in mind that the effects presented in the first row of table 1 probably overstate the impact of the saving channel. These estimates do not account for the fact that if the demand for funds increases after the initial decline in cost of capital, savers will require higher returns to fund additional new investment. The tax cut itself could therefore lead to changes in capital markets that increase interest rates to some extent, which is not accounted for in the estimates in table 1.

In addition, the impact of the saving channel may be overstated as a result of our treatment of the “effective” capital gains tax rate (see section II for further discussion of the effective rate). There are several ways that researchers studying this issue account for the fact that investor behavior reduces the effective tax rate on capital gains income below the statutory rate. A common practice is to halve the statutory rate to account for deferral benefits and to halve the resulting rate again to account for the step-up of the cost basis for

a capital gain upon inheritance. The estimates in table 1 are based on an approach that does not reduce the effective capital gains tax rate to this degree (see the appendix). Table A.1 in the appendix shows that the cost of capital declines by only 0.48 percent with the conventional (double-halving) method compared with the 1.14 percent decline we use for the calculations in table 1.

The size of the saving channel effects presented in table 1, moreover, could easily be dominated by changes of interest rates from other causes. A 100 basis point change in real interest rates, which is not uncommon over a period of a couple of years, leads to effects on the cost of capital that are more than three times larger than anything that appears in table 1. Even an interest rate change of just 25 basis points will have an effect on the cost of capital that is larger than the effects reported there. The capital gains tax cut proposal under consideration simply does not do much to effective investment incentives in the U.S. economy.

The estimated effect of the inflation indexation channel on the cost of capital appears in the second column of table 1 (holding the statutory capital gains tax rate constant at 28 percent). With anticipated inflation at the 3 percent rate that we use for our benchmark calculations, indexing capital gains income alone would reduce the cost of capital from 14.04 percent to 13.81 percent, a 1.61 percent decline. The decline in the cost of capital is modestly larger than what we obtained for the saving channel. The pattern of results for firms in varying situations and shareholders with different behavior is similar to the alternative scenarios discussed above for the saving channel. See the appendix for further details.

The results in the third column of table 1 combine the indexation and saving channels. We estimate that these policy changes together would reduce the cost of capital from 14.04 percent to 13.72 percent, a decline of 2.25 percent. The total effect is a little smaller than the sum of the two channels evaluated individually. This result occurs because the indexation feature is less valuable as the capital gains tax rate declines.

C. Investment, Output, and Growth Effects from Capital Gains Tax Cuts

What effect will the modest reductions in the cost of capital discussed in the previous subsection have on the U.S. economy? How much more investment will result? What will be the effect on output, growth, and living standards? We address these questions in this subsection with a widely used economic tool, the neoclassical growth model.²³ According to this model, the long-term rate of growth of output is determined by the rate of labor force growth plus the rate of technical progress. Changes in the cost of capital, and therefore the capital gains tax rate, will not affect either of these rates. Therefore, the model predicts that a capital gains tax cut will not change the long-term rate of growth.²⁴ A lower cost of capital, however, can increase the demand for capital and raise investment. This effect increases the productive capacity of the economy and causes the level of output to rise. During the transition period to the new higher level of output, economic growth will be temporarily higher.

To estimate the size of this effect, we must first consider how much additional investment will result from the change in the cost of capital presented in the first row of table 1. In spite of the importance of this issue for a variety of important policy questions, economic research has not been able to reach agreement about the sensitivity of investment to the cost of capital. We shall assume, however, that a one percent drop in the cost of capital leads to a one-half percent increase in the long-term level of the capital stock. An

²³ This model was pioneered by Solow (1956) and is often called the Solow growth model. This discussion focuses only on "supply-side" effects. To the extent that Keynesian demand insufficiency prevents actual results from reaching full employment output, the effects discussed here will overstate actual results.

²⁴ Some recent theoretical models of "endogenous" economic growth allow for the possibility that changes in capital investment will affect the rate of technical change. The empirical relevance of these models has yet to be determined. We discuss some of the possible implications of endogenous growth in the next section.

effect of this magnitude is relatively large relative to findings from existing research.²⁵ We also need to know how much extra output can be produced from a given rise in the capital stock. There is wide agreement in research on economic growth that a one percent increase in the capital stock raises output by about 0.3 percent.²⁶

These estimates provide the information necessary to evaluate the amount of growth that can be expected from the capital gains tax cut proposals. Consider first the effect of the capital gains tax cut through the saving channel (the first column of table 1). With our benchmark assumptions, the reduction in the maximum capital gains tax rate lowers the cost of capital by 1.14 percent. This reduction raises investment enough to increase the capital stock by 0.57 percent (0.5×1.14). A 0.57 percent rise in the capital stock can be expected to raise the economy's potential output by 0.17 percent (0.3×0.57). For an economy that has a trend rate of output growth of about 2.5 percent per year, this change represents a long-term increase in the level of output equal to the growth the economy would experience in about 25 days! If we add the inflation indexation provision, we would get almost 50 days of growth (as shown in the third column of table 1). These changes are very small. They imply that after all the adjustments take place to the lower capital gains tax rates (which could take as long as a decade or more), output and living standards might reach a level in early January that they would have attained some time in late February without the capital gains tax cut and inflation indexation. This magnitude pales by comparison to the output losses the U.S. economy has experienced due to recessions and slow growth, even during the relatively good economic performance of the postwar period. Additional effects that we have not quantified (the effects due to uncertainty or the "lock-in" effect, for example)

²⁵ In an extensive survey of investment research, Chirinko (1993) concludes that the cost of capital has a "modest" effect on investment and the demand for capital. In an earlier Levy Institute Policy Brief, Fazzari (1993) finds little effect of the cost of capital on investment.

²⁶ See Mankiw, Romer, and Weil (1992) for estimates in this range in a recent cross-country study of economic growth. This research also finds that the neoclassical growth framework used here does a good job of explaining cross-country growth results.

might increase the impact of the capital gains tax cut to some extent, but the discussion in section III suggests that these effects are likely to be small, even negligible. Furthermore, the analysis summarized in table 1 does not account for some effects that could reduce the impact of the capital gains tax cut even further, such as the increase in interest rates that might arise from higher investment demand.

V. Policy Implications

The view that lower capital gains taxes will somehow stimulate much investment and growth has little support. The effects estimated here show that the likely benefits for the aggregate U.S. economy from this controversial tax cut are almost negligible. The distributional implications of a capital gains tax cut are also troubling in the absence of much effect on aggregate living standards. The benefits of a capital gains tax cut will accrue disproportionately to the wealthy, and there is little evidence that the economy will experience much of a gain in output, employment, or living standards that might justify such a regressive tax policy.

We have a somewhat different view on the proposal to index capital gains income for inflation. Our analysis shows that we should not expect any substantial increase in investment or economic growth as the result of capital gains indexation. Yet, it seems arbitrary that the level of effective capital gains taxation varies with inflation rates.²⁷ Indexing capital gains to inflation for tax purposes, however, does not justify cuts in the already low capital gains tax rate. At current inflation rates, implementation of capital gains indexing, as it is now proposed, would reduce the capital gains tax rate. It may be better to

²⁷ Furthermore, while the impact of indexing is minimal in the current inflation environment, our results show that the effect is more substantial as inflation approaches double-digit rates. See the discussion in the appendix.

consider indexing capital gains for inflation, but increasing the capital gains tax rate to roughly maintain current effective levels of capital gains taxation.

One important assumption that drives these results is that a cut in the capital gains tax rate does not affect the rate of technical progress. This assumption that technical change is exogenous, while a standard part of neoclassical growth theory, has been questioned in recent research on “endogenous” sources of economic growth.²⁸ Yet, even if the growth process is more complex than the standard neoclassical model implies, cutting the capital gains tax rate seems like an inefficient way to stimulate technical change. A capital gains tax cut policy is completely unfocused; it benefits old as well as new capital, stagnant as well as growing industries, and assets such as real estate that have little to do with technical progress.²⁹ Poterba (1989, p. 48) writes that “less than one third of reported [capital] gains are the result of the appreciation of corporate equity.” Feenberg and Summers (1990, p.3-4) argue that “only a small fraction of the benefits [from capital gains tax cuts] go to venture capital or small businesses” and “between 75 and 80 percent of the first five years’ tax relief will be a windfall to assets that are already in place.” Finally, Minarik (1992, p. 22) states that “a capital gains tax cut would divert resources into low-value commercial real estate just as the 1986 tax reform brought those resources back into equipment.” Policy makers are more likely to be successful at boosting technical change through policies like research and development tax credits. Even the much-maligned investment tax credit focuses more sharply on the progressive sectors of the economy than capital gains tax cuts.³⁰

²⁸ See the symposium on “New Growth Theory” in the Winter 1994 *Journal of Economic Perspectives*.

²⁹ While it may be possible to focus capital gains tax cuts on the returns from particular activities, this does not seem to be the intention of current proposals. Moreover, differentiating the capital gains tax treatment across assets could create incentives to create unproductive tax shelters.

³⁰ The investment tax credit as implemented in the past, however, suffers from similar problems to the capital gains tax cut: it benefits many activities that would have been undertaken in the absence of the credit. An investment tax credit policy may be more effective per dollar of federal revenue lost if it can be designed to apply to net or incremental investment only. See Meyer, Prakken, and Varvares (1993) for further discussion.

The channels through which a change in the rate of taxation of capital gains income might influence investment activity and economic growth are complex; at least more complex than one who follows the mainstream debate on this issue might think. Sound, measured policy can be set only with an understanding of the nature and efficacy of these channels. The considerations explored in this paper do not offer much encouragement for the view that lower capital gains tax rates will have substantial beneficial effects on investment or growth. This conclusion does not settle the issue of what the capital gains rate should be. Other issues that we do not consider in detail here, primarily distributional in nature, enter into such a decision. Yet, as Joseph Minarik (1992, p. 16) writes,

The real issue is whether taxing some people at a different rate than others having the same income level is appropriate. Under the principles of comprehensive income taxation, a burden of proof rests with anyone who argues that one taxpayer should be charged a lower rate than everyone else at his income level. Thus, those who advocate an exclusion for capital gains incur this burden of proof.

Our findings call into question one of the major arguments that is invoked to provide this “burden of proof” to support of lower capital gains tax rates and our analysis therefore weakens the case for capital gains tax cuts.

Appendix: The Cost of Capital

Indexing capital gains for inflation and reducing the capital gains tax rate is thought to increase aggregate investment because it lowers the cost of capital to firms that pay their owners in part with capital gains. In this appendix, we bring together the elements of the after-tax cost of new capital investment.

The cost of capital is “the price paid for the use of capital resources over a defined period of time” (Auerbach 1983 p. 905). The real annual after-tax cost of capital consists of annual maintenance and depreciation costs, as well as opportunity costs. If the after-tax purchase price of an asset is P^* , and the asset depreciates at a rate δ , then the annual cost of maintenance is δP^* . Even if an asset does not depreciate and requires no maintenance, there is still an opportunity cost associated with purchasing an asset rather than putting funds into interest-bearing assets. The higher the interest rate, the higher is the opportunity cost of capital. Suppose one dollar returns r dollars of interest in real terms. The real opportunity cost of a unit of capital with an after-tax price of P^* then is given by rP^* . The total after-tax cost of a unit of capital is then $(r + \delta) P^*$.

The after-tax purchase price of an asset is the price paid for the asset, P_C , less tax benefits derived from the investment tax credit and the capital consumption allowance. If one dollar spent on a capital asset generates an investment tax credit of k dollars and a flow of depreciation allowances (when discounted to present value) of z dollars, then the after-tax purchase price of an asset is given by $P_C (1 - k - \tau z)$, where τ is the statutory tax rate on corporate income.

Let c be the nominal opportunity cost of a one dollar capital investment and π be the expected rate of inflation. Then r can be replaced by $c - \pi$. The total after-tax cost of a unit of capital is

$$P_C (1 - k - \tau z)(c - \pi + \delta).$$

For each dollar spent on new capital equipment, $(c - \pi + \delta)$ dollars are spent on maintenance and opportunity costs. The term $(1 - k - \tau z)$ adjusts this cost for the investment tax credit and the capital consumption allowance. The capital gains tax and indexation influences only the opportunity cost of capital, c . Percentage changes in the total after-tax

cost of capital due to changes in the capital gains tax rate and indexation, then, equal percentages changes in $(c - \pi + \delta)$. For this reason, we restrict attention in Tables A.1 through A.3, below, to quantity.

The Opportunity Cost of Capital

Suppose the nominal interest rate is i and a firm finances a new investment project entirely by issuing debt at this rate. Before corporate taxes, each dollar of capital spending generates i dollars of interest expenses. Since interest expenses, however, are deductible from corporate income, the after-tax annual cost of one dollar of debt-financed investment is $(1 - \tau) i$, where τ is the tax rate on corporate income. This value can also be considered the opportunity cost of spending one dollar on new capital rather than investing instead in bonds that return i before corporate taxes.

Suppose a firm finances a new investment project with equity, which involves spending the proceeds from either new share issues or retained earnings. Since new share issues actually finance only a small proportion of new capital spending (approximately 4.9 percent), we ignore them and focus entirely on retained earnings.³¹ There is no explicit cost of using retained earnings to finance capital spending, but we show below that this cost can be expressed as a function of observed variables. We refer to the opportunity cost of using one dollar of retained earnings to finance new investment as i_{eq} . Since this cost is not deductible from corporate income, the before and after-tax corporate costs are the same.

The typical firm finances its new capital spending with a mix of both debt and equity. The nominal opportunity cost of capital faced by the typical firm can be expressed as a weighted average of the costs attributable to both of these sources. Let the fraction of new investment financed with debt be L . Then the opportunity cost of capital is

$$(eq. 1) \quad c = (1 - L) \cdot i_{eq} + L \cdot (1 - \tau) \cdot i.$$

³¹ See Henderson.

We next consider the personal tax treatment of capital income and its influence on the opportunity cost of capital.

There are two ways to own capital, one as an equity holder (a stock holder) and the other as a debt holder. If, say, stock holders earn an after-tax rate of return in excess of that earned by debt holders, the latter will sell debt and buy stock.³² The price of equity rises, the price of debt falls, and their rates of return converge. We expect the reverse to be true if debt returns more than equity. In equilibrium, we expect that the after-tax rates of return to debt and equity will be equal.

Since interest payments are treated as ordinary personal income, the after-tax rate of return to debt is $i(1 - \tau_p)$, where τ_p is the marginal tax rate on personal income. The after-tax rate of return to equity, i.e., investment financed with retained earnings, is not as simple because the returns from equity investment can be paid out as dividends or as capital gains. For purposes of personal taxation, dividends and capital gains are treated differently. The return to equity is a weighted average of the returns from dividend payments and from capital gains. We assume that the weights are the shares of corporate income (net of interest expenses) paid out as dividends, d , and plowed back as retained earnings, $(1 - d)$.

Since dividends are treated as ordinary income, the after-tax rate of return from dividend payments is $i_{eq} \cdot (1 - \tau_p)$. The after-tax rate of return from capital gains is $i_{eq} - (i_{eq} - \pi \cdot \gamma) \cdot \tau_{cg}$, where τ_{cg} is the effective marginal personal tax rate on capital gains income, π is the rate of inflation, and γ is unity if capital gains are indexed for inflation, zero otherwise. Note that when capital gains are indexed for inflation, real returns are taxed and when capital gains are not indexed for inflation, nominal returns are taxed. The weighted sum of these two terms, and hence the after-tax rate of return to equity, simplifies to $i_{eq} \cdot (1 - \bar{\tau}) + (1 - d) \cdot \tau_{cg} \cdot \pi \cdot \gamma$, where $\bar{\tau} = d \cdot \tau_p + (1 - d) \cdot \tau_{cg}$.

Equating the after-tax returns to equity and debt and solving for i_{eq} gives

³² We are ignoring issues of risk. Normally, we expect that equity holders will require some risk premium that will keep rates on equity higher than rates on debt. This issue will not significantly affect the analysis.

$$i_{eq} = \frac{i \cdot (1 - \tau_p) - (1 - d) \cdot \tau_{cg} \cdot \pi \cdot \gamma}{1 - \bar{\tau}}.$$

Given that savers can hold wealth as debt or equity, this expression defines the internal rate of return that equity financed investment must earn to remain competitive with debt.

Substituting this expression into eq. 1 gives the nominal opportunity cost of capital faced by the typical firm:

$$(eq. 2) \quad c = (1 - L) \cdot \left[\frac{i \cdot (1 - \tau_p) - (1 - d) \cdot \tau_{cg} \cdot \pi \cdot \gamma}{1 - \bar{\tau}} \right] + L \cdot (1 - \tau) \cdot i.$$

Parameter Values

Compustat data were used to estimate d and L . Compustat tracks firm-level data for publicly traded organizations and covers roughly half of the United States non-residential capital stock. For the years 1973 through 1992, the following data were summed across the sample: current debt (CD), long-term debt (LTD), total assets (TA), common dividends ($CDIV$), preferred dividends (PD), and after-tax, before-extraordinary income (I). For each year, $L^* = \frac{CD + LTD}{TA}$ and $d^* = \frac{CDIV + PD}{I}$ were calculated. The values of L^* and d^* were then averaged across years to obtain $L \approx 0.3$ and $d \approx 0.5$. Our benchmark firm, therefore, finances 30 percent of its investment with debt and the remainder with retained earnings. Half of the return to the benchmark firm's owners is dividends, and half accrues as capital gains.

In our benchmark case, we assume a real opportunity cost of placing money in a firm's assets of 6 percent. Owners are assumed to realize capital gains after 10 years. Feenberg and Summers (1990) write that "[m]ost capital gains are realized on assets that were held for 10 or more years," Nominal asset values subject to capital gains taxes are assumed to grow at 10 percent per year.

Empirical Calculations

With the cost of capital formula and the parameter value assumptions discussed above we can estimate the impact of changes in the capital gains tax rate on the cost of capital.

Table A.1

**Change in the Cost of Capital From Lowering the Statutory
Capital Gains Tax Rate From 28 to 19.8 Percent**

Case	Cost of Capital 28 Percent Rate	Cost of Capital 19.8 Percent Rate	Percentage Change
Benchmark	14.04	13.88	-1.14%
High Depreciation Assets	24.04	23.88	-0.67%
Zero Dividend Firms	13.29	13.06	-1.74%
Short Holding Period	14.24	14.01	-1.61%
Low Effective C.G. Rate	13.74	13.67	-0.48%

Table A.1 presents the effective, after-tax cost of capital for firms in various circumstances under both a 28 percent and a 19.8 percent statutory capital gains tax rate. With the current tax law, we estimate the effective cost of capital, using the benchmark assumptions, to be 14.04 percent. Lowering the capital gains tax rate from 28 to 19.8 percent would reduce this figure to 13.88 percent through the saving channel, a decline of 16 basis points or only a little over one percent. How does this result change if we consider firms in different situations? Table A.1 shows that the change is even smaller in percentage terms (under one percent) for high depreciation assets, which is likely relevant for high technology items like computers. (The high depreciation case reported in table A.1 assumes

a 20 percent, rather than a 10 percent, depreciation rate.) This result occurs because a bigger part of the cost of capital arises from depreciation in this case. The lower cost of funds that the firms enjoy due to lower capital gains taxes therefore has a smaller proportionate effect.

The percentage decline in the cost of capital is larger than the benchmark for zero-dividend firms. The owners of these firms take their returns entirely in the form of capital gains, and hence such firms are more sensitive to the tax treatment of capital gains. The effect of the tax cut is also somewhat larger if asset owners hold their assets for a shorter period of time before realizing capital gains. A short holding period reduces the benefits of deferral and therefore increases the effective capital gains tax rate. As a result, a given cut in statutory rates has a larger effect on people who hold assets for a relatively short period. (The short holding period entry in table A.1 assumes a 5-year rather than a 10-year horizon.) However, if we take the approach to computing the effective capital gains tax rate followed in much of the relevant research and cut the statutory rate by 50 percent for the deferral benefit and again by 50 percent for the elimination of capital gains for inheritance, the percentage fall in the cost of capital is cut by a factor of more than two, relative to the benchmark case (as reported in the low effective capital gains rate entry in table A.1).³³

Some analysts would argue that the 6 percent real return assumed in the benchmark case is high. Although the stock market has managed to generate such returns historically, real interest rates on low-risk assets are typically much lower. If we use a real rate of return of 3 percent, the benefits of a capital gains tax cut are reduced.

The experiments reported in table A.1 are based on the simplifying assumption that firms do not change their financial policies (dividend pay out and debt leverage) in response to a change in capital gains tax rates. Yet, we would expect that firms might adjust these

³³ This approach was derived originally by Bailey (1969). Also see King and Fullerton (1984).

policies as the relative tax rates on different kinds of corporate source income change.³⁴ Lower capital gains taxes would likely encourage firms to retain more of their earnings and finance a lower share of their investment with debt. The effects of these two factors on the cost of capital tend to offset each other. Lower dividend pay out reduces the cost of capital as firms substitute a lower tax form of income payment (capital gains) for a more highly taxed form (dividends). Lower leverage increases the cost of capital, for our parameter values, because the deductibility of interest for corporate tax payments reduces the cost of debt below the cost of equity finance. Even if these two factors do not exactly offset, it is unlikely that the changes in financial policy would be large enough to have an important impact on the results presented in table A.1.

Table A.2
Change in the Cost of Capital From Indexing
Capital Gains Taxes for Inflation

Case	Cost of Capital No Indexation	Cost of Capital With Indexation	Percentage Change
Benchmark	14.04	13.81	-1.61%
High Depreciation Assets	24.04	23.81	-0.94%
Zero Dividend Firms	13.29	12.90	-2.92%
Short Holding Period	14.24	13.92	-2.21%
Low Effective C.G. Rate	13.74	13.65	-0.70%

³⁴ See Auerbach (1983) for a discussion of effects of this kind.

Table A.2 reports the effects of holding the statutory capital gains tax rate at 28 percent and simply indexing capital gains income for inflation. The indexation effect is slightly larger than the effect of cutting the statutory rate in the benchmark case, and the patterns across different firm situations and shareholder behaviors are similar.

We have also analyzed a high expected inflation scenario for which we increased the expected inflation rate from 3 to 10 percent. In this situation, not surprisingly, the indexation proposal is especially valuable, lowering the effective cost of capital by 6.02 percent. This situation, however, does not represent the current circumstances of the U.S. economy, and, with a central bank that seems determined to avoid any acceleration of inflation, it is not likely that this scenario will be relevant in the foreseeable future.

Table A.3

Change in the Cost of Capital From Indexation and Saving Channels Combined

Case	Cost of Capital Current Law	Cost of Capital Proposed New Law	Percentage Change
Benchmark	14.04	13.72	-2.25%
High Depreciation Assets	24.04	23.72	-1.31%
Zero Dividend Firms	13.29	12.80	-3.69%
Short Holding Period	14.24	13.79	-3.10%
Low Effective C.G. Rate	13.74	13.61	-0.96%

Table A.3 reports the predicted effects of simultaneously reducing the statutory rate on capital gains income and indexing capital gains income for inflation. The total effect is a little smaller than the sum of the two channels evaluated individually. This result occurs because the indexation feature is less valuable as the capital gains tax rate declines.

The figures in tables A.1 through A.3 are the basis for the estimates that appear in the summary table 1 in the main text.

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