INTRODUCTION

While intended to improve the overall taxation of capital income, the capital income tax provisions of the 1986 Tax Reform Act had a theoretically ambiguous effect on economic efficiency. On one hand, by repealing the investment tax credit (ITC) that favored equipment over structures (and making other changes), the Act reduced differences in the taxation of alternative investments and thereby encouraged a more productive allocation of capital (Joulfaian and Mackie, 1992; Gravelle, 1989; Fullerton, 1987). At the same time, however, the Act raised the overall tax burden on saving and investment, thereby increasing the tax–disincentive to save and invest. Some analysts have concluded that overall, the Act improved the taxation of capital income in the sense that it increased economic efficiency (Fullerton, Henderson, and Mackie, 1987; Goulder and Thalmann, 1993). Nonetheless, the Act left in place a number of tax rules that create differences in the taxation of alternative investments and an overall tax burden on capital income that some consider too high. In addition, more recent tax law changes, such as the 1993 tax rate increase and lengthening of the depreciation lifetime for buildings, may have had undesirable effects on the taxation of capital income, both in terms of increasing the overall tax burden on capital and increasing tax differences across investments.

This paper uses the effective tax rate/cost of capital methodology to illustrate and discuss four current problems in the taxation of capital income. One problem is that the overall level of the tax on capital income may be too high, a motivator of recent interest in consumption taxes (Aaron and Gale, 1996). A second problem is that there may be a substantial tax penalty on income from investment in the corporate sector relative to income from investment in other forms of business or in owner–occupied housing (Auerbach, 1987; Gravelle, 1994; Joulfaian and Mackie, 1992; U.S. Treasury, 1992).¹ Third, Gravelle (1989) argues that the 1986 Act reduced (but did not eliminate) the corporate/noncorporate distortion.

¹ Gravelle (1989) argues that the 1986 Act reduced (but did not eliminate) the corporate/noncorporate distortion.
the current depreciation/capital cost recovery system may not provide appropriate tax deductions for many assets, despite the changes made in 1986 (Gravelle, 2001; U.S. Treasury, 2000). Fourth, many provisions relevant to the taxation of capital income are not indexed for the effects of inflation, although more complete indexation was proposed during the debate over the 1986 Act (Fullerton, 1987; Henderson, 1985).

After using effective tax rate calculations to illustrate these problems, the paper discusses policy options. These options include: (a) modifying the tax depreciation system; (b) indexing interest, capital gains, and depreciation; (c) partially integrating corporate taxes and personal taxes; (d) cutting the capital gains tax rate; (e) eliminating the corporate alternative minimum tax (AMT); and (f) cutting personal tax rates across the board, as proposed by the Bush Administration and as enacted by the Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA).

Before beginning its analysis of current issues in capital income taxation, however, the paper reviews and critiques the effective tax rate concept, and uses the effective tax rate to illustrate several basic results in the theory of capital income taxation.

AN EFFECTIVE TAX RATE PRIMER: CONCEPT, INTUITION AND CAVEATS

This section describes the effective tax rate concept, illustrates some basic results in the calculation of an effective tax rate, and sets out the modeling and parameter assumptions used in the effective tax rate calculations presented in the second half of the paper.

Definition

The effective tax rate\(^2\) is the hypothetical tax rate that, if applied to economic income, would offer the same investment incentives implied by various features of the tax code (Auerbach, 1983a; Gravelle, 1994). It shows the total proportion of capital costs (other than depreciation) that is attributable to taxes on a barely profitable (i.e., marginal) investment. All else equal, the higher the effective tax rate, the lower the incentive to save and invest.

The effective tax rate is a forward—looking measure of investment incentives based on the expected future cash flow from a hypothetical marginal investment. It differs fundamentally from an average tax rate (Fullerton, 1984; 1986), a backward looking concept based on a measure of taxes actually paid and pre—tax income actually earned by a company or industry during some historical period. As a measure of marginal investment incentives, the effective tax rate is preferable to the average tax. The average tax rate, for example, is affected by tax provisions (e.g., tax depreciation rules that have been repealed) that may not apply to a prospective current investment.

While properly calculated effective tax rates are a good measure of marginal investment incentives, they are not relevant for purposes of comparing tax burdens on investors in particular activities or industries (Fullerton, 1984; 1986). Effective tax rates are rooted in a concept of economic equilibrium in which all investors earn the same risk—adjusted after—tax rate of return. Thus, differences in effective tax rates do not reflect differences in the returns earned by investors.

An Effective Tax Rate Assuming a Single Level of Taxation

Calculating the effective tax rate begins with a calculation of the Hall—Jorgenson user cost of capital (Hall and Jorgenson,
1967). The user cost of capital is the real pre–tax return earned on a marginally profitable investment. In other words, it is the return that is just sufficient to pay taxes and still leave the investor enough to cover his required real after–tax return and to cover economic depreciation. The user cost of capital, $c$, may be written as:

$$c = (r - \pi + \delta)(1 - uz - k)/(1 - u),$$

where $r$ is the firm’s or investor’s required after–tax nominal rate of return (i.e., the nominal discount rate), $\pi$ is the expected inflation rate, $\delta$ is the economic depreciation rate, $u$ is the statutory income tax rate, $z$ is the present discounted value of tax depreciation allowances, and $k$ is the ITC rate.

To derive the effective tax rate following Auerbach (1983a), note that a tax at rate $\theta$ on real economic income (the real after depreciation return) from the investment would yield a cost of capital of $(r - \pi)/(1 - \theta) + \delta$, since the asset must earn enough to leave a real rate of return of $r - \pi + \delta$ after payment of taxes. If this tax at rate $\theta$ is equivalent to the tax provisions considered in [1] above, then $(r - \pi)/(1 - \theta) + \delta = (r - \pi + \delta)(1 - uz - k)/(1 - u)$ which implies that:

$$\theta = (\rho - (r - \pi))/\rho,$$

where $\rho = c - \delta$ is the real pre–tax social rate of return net of depreciation.

To provide some intuition, the effective tax rate algebra can be used to illustrate a few basic tax results.

1. If the tax system is based on real economic income, then the effective tax rate equals the statutory tax rate.

A tax on economic income implies that there is no tax credit ($k = 0$) and that tax depreciation reflects the real decline in the value of the asset over time ($z = \delta/(r - \pi + \delta)$). From [1], the cost of capital is $(r - \pi)/(1 - u) + \delta$, which, when substituted into [2], shows that the effective tax rate equals the statutory tax rate.

2. Expensing (i.e., deducting immediately) an investment’s acquisition cost (as under a consumption tax) gives a zero effective tax rate.

With expensing, $z = 1$ and $k = 0$ so that the cost of capital is $r - \pi + \delta$, and the effective tax rate is zero.

3. Accelerated depreciation reduces the effective tax rate below the statutory tax rate. To the extent that tax depreciation has a larger (smaller) present value than does economic depreciation—i.e., tax depreciation is accelerated relative to economic depreciation—the effective tax rate will be below (above) the statutory tax rate, thereby providing an investment incentive. For example, if $1/2$ of the cost of an investment may be expensed, with the remainder subject to economic depreciation, then the effective tax rate is equal to $(1/2)/(1 - u/2)$ times the statutory tax rate.

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3 More formally, the cost of capital is the return that equates the discounted present value of the investment’s expected cash flow with the investment’s cost, i.e., it is the pre–tax internal rate of return. It is the return on the last dollar invested in equilibrium because the investor will continue to undertake projects as long as the present value of the projects’ cash flows exceed their cost.

4 Economic depreciation is the rate at which the value of an asset falls as the asset ages (Hulten and Wykoff, 1996; Fraumeni, 1997).

5 Economic income is a measure of a taxpayer’s real economic well–being over some time period, typically taken to be one year. It is the taxpayer’s consumption plus changes in his wealth. See Goode (1977).

6 The present value of depreciation at rate $\delta$ is $\int e^{-\delta t} (e^{r - \pi} - e^{r - \pi}) dt$, where the flow is discounted by a real rate to reflect indexing. Integrating gives the expression in the text.

7 A positive ITC also lowers the effective tax rate below the statutory tax rate.
4. Both an income tax and expensing promote tax neutrality.

Both an ideal income tax and expensing would be neutral tax systems in the sense that each would impose a uniform effective tax rate on investments of all durabilities, i.e., on short lived (high $\delta$) equipment and on long lived (low $\delta$) structures. With an equal effective tax rate, all investments would have an equal social rate of return, $\rho$. The allocation of investment across assets of different durabilities would be efficient, since shifting a dollar of capital from one asset to another could not increase the return available to society.

5. An income tax distorts the decision of when to consume while expensing eliminates this distortion.

Expensing imposes no tax wedge between the pre–tax social rate of return, $\rho$, and the after–tax rate of return earned by the investor, $r – \pi$. Thus it does not distort saving decisions (i.e., the decision of how to allocate consumption over time). In contrast, an ideal income tax imposes a tax wedge of $u(r – \pi)/(1 – u)$ and so inefficiently discourages saving since the saver earns less than the investment’s social return.

**Debt Finance, Equity Finance and Personal Taxes**

In assuming that cash flows are taxed at a single rate, $u$, and that the discount rate is unrelated to $u$, the discussion above abstracts from issues related to the firm’s financial policy (i.e., its debt/equity policy and dividend policy) and from issues related to the taxation of corporate shareholders. These issues can be accounted for in a model of investment incentives, although no treatment is entirely satisfactory since economists do not have an adequate model of capital market equilibrium and the determinants of a firm’s capital structure (Auerbach, 1979a; 1983a; 1983b; 1987; Fullerton, 1986; Bradford and Stuart, 1986).

**Debt Financed Investment, the Taxation of Lenders and the Effective Tax Rate**

Because interest is deductible by the borrower, for a debt financed investment the firm’s nominal discount rate, $r_d$, is given by:

$$[3] \quad r_d = i – u(i – x\pi),$$

where $i$ is the expected nominal interest rate, $x = 1$ if interest deductions are indexed for inflation, and $x = 0$ if nominal interest is fully deductible (and taxable).

This discount rate could be used to calculate an effective tax rate at the firm level. However, the taxation of interest income to the lender may be relevant in measuring overall investment and savings incentives. After paying taxes the lender receives a real return of $i – \tau_d(i – x\pi) – \pi$, where $\tau_d$ is the statutory tax rate on interest income. If we are interested in the tax wedge between the social pre–tax return and the ultimate investor’s real after–tax return, then, following [2], the effective tax rate for a debt financed investment would be $(\rho – (i – \tau_d(i – x\pi) – \pi))/\rho$. This approach to the inclusion of debt can be used to illustrate a few basic tax results.

1. To the extent that the tax system is based on economic income, the deductibility of interest transfers the taxation of the income from the borrower to the lender.

Without an investment tax credit and with tax depreciation based on economic depreciation, $\rho = (r_d – \pi)/(1 – u)$. An ideal income tax would index for inflation both interest payments and interest receipts, since the inflationary component of the nominal interest rate represents a return of principal, and is neither an item of ex-
pense for the borrower nor an item of income for the lender. With inflation indexing, only real interest payments would be deductible so \( r_d - \pi = (i - \pi)(1 - u) \) and \( \rho = (i - \pi) \). Indexing limits the lender’s taxable income to real interest, so the lender’s real after–tax rate of return would be \( (i - \pi)(1 - \tau_d) \) and the effective tax rate equals \( \tau_d \), the lender’s statutory tax rate. The borrowing firm’s tax rate is not relevant. One implication of this is that the corporate income tax may not distort saving and investment decisions to the extent that investment is debt financed, as emphasized by Stiglitz (1973).

2. The transfer of tax liability to the lender is imperfect to the extent that the tax base deviates from economic income.

One deviation occurs because the tax system does not index interest flows for inflation (Gravelle, 1994). If interest flows are not indexed, but tax depreciation deductions are based on economic depreciation and there is no investment tax credit, the effective tax rate would be \( \Gamma \tau_d \) where \( \Gamma = \left[ i(1 - u) - \pi(u / \tau_d) \right] / \left[ i(1 - u) - \pi \right] \). When the borrower is taxed at a higher rate than the lender, then \( \Gamma < 1 \), and the effective tax rate is less than the statutory tax rate. This tax subsidy occurs because the deduction of principal reduces the borrower’s tax liability by a larger amount than the inclusion of principal increases the lender’s tax liability.

A second deviation occurs because tax depreciation allowances differ from economic depreciation (Ballentine, 1988). Consider expensing, which is the extreme case of accelerated depreciation, and assume for simplicity that the inflation rate is zero. If all of the items of income and expense were passed directly through to the lender, then the effective tax rate would be zero. However, under existing law the pass through can be imperfect because the borrower deducts the cost of the investment at his tax rate while the investment’s income is taxed to the lender at a possibly different rate. With expensing plus debt finance \( \rho = i(1 - u) \). The lender receives a net of tax return of \( i(1 - \tau_d) \), so the effective tax rate equals \( (\tau_d - u) / (1 - u) \), which is less than, equal to, or greater than zero as the lender’s tax rate is less than, equal to or greater than the borrower’s tax rate.9

Concerns over the possibility of a negative effective tax rate have induced some to suggest that expensing should be combined with elimination of the interest deduction (e.g., Ballentine, 1988; Fullerton, 1999). The tendency towards a negative effective tax rate, however, is mitigated to the extent that investment is only partially debt financed and to the extent of the

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8 The current U.S. tax system does not index interest flows for inflation. Many lenders face a relatively low tax rate (e.g., because they are pension funds or tax exempt entities). Under current U.S. law, it generally is the case that \( u > \tau_d \) so that \( \Gamma < 1 \) and debt financed investment receives a tax subsidy, especially when undertaken by corporations (as opposed to noncorporate businesses) for whom \( u \) is relatively high. Noncorporate investment also can receive a subsidy if entrepreneurs are in a higher tax bracket than are lenders. See the tax rates in Table 1.

9 The intuition of this result can be understood by noting that expensing grants an interest free loan to the investor equal to his tax rate multiplied by the difference between the cost of the investment and economic depreciation. The loan is repaid over time as the asset depreciates but receives no additional tax deductions. The value of this loan effectively offsets the tax paid on the investment’s cash flow, bringing the total effective tax rate to zero. The offset is exact, however, only if the tax rate at which the deduction for expensing is taken equals the tax rate at which the later cash flow from the investment is taxed. With debt financed investment, however, the expensing deduction is taken at the borrower’s tax rate, while the income from the investment is taxed at the lender’s rate. If the lender’s rate is less than the borrower’s tax rate, then the interest free loan is larger than needed to offset the tax paid in later periods, generating a negative effective tax rate.

An investment incentive provided with an ITC avoids the extra kick for a debt–financed investment since the benefit of the credit is independent of the borrower’s tax rate.
double tax on corporate profits (as discussed in the next section). Calculations below suggest that the combination of partial debt finance and expensing can give some, but not all, investments a negative effective tax rate.

Shareholder Taxes and the Effective Tax Rate on Corporate Investment

The U.S. tax system imposes two levels of tax on corporate profits. Profits are taxed once under the corporation income tax as income to the company and then taxed again under the personal income tax as income to the shareholder when received as a dividend or as a capital gain on the appreciation of corporate shares or on share repurchases. Both shareholder and company taxes may be relevant in determining investment incentives.

Let \( r_e \) be the firm’s discount rate for an equity financed investment. For now, ignore inflation, and assume that the investment’s tax deductions are based on economic depreciation. Then, the investment earns a social rate of return of \( r_e / (1 - \tau) \). The shareholder’s real after tax rate of return is \( r_e (1 - \tau_e) \) and the effective tax rate is \( \tau_e = \tau + \tau_e - \tau u \), where \( \tau_e \) is the shareholder’s tax rate on equity income.

The effective tax rate reflects the double tax on corporate profits. In contrast, a noncorporate investment is taxed only once, as income to the entrepreneur. In general, the entrepreneur’s tax rate is less than the combined double tax on corporate profits so that the current classical tax system can discourage investment in the corporate sector. Comparing the effective tax rate on a corporate investment financed with equity to that on an investment financed with debt illustrates the tax advantage enjoyed by debt, since it is generally the case that \( \tau_e < u + \tau_e - \tau u \).\(^{10}\)

If the shareholder’s income is burdened by the tax on dividends then \( \tau_e \) equals his tax rate on ordinary income (\( \tau_{ei} \)). If the income is burdened by the tax rate on capital gains, \( \tau_e \) equals the shareholder’s tax rate on capital gains (\( \tau_{cg} \)). For four reasons, the tax rate on capital gains generally is below the tax rate on dividends. First, the maximum statutory tax rate on capital gains is less than the maximum statutory tax rate on ordinary income. Second, income taxes on accrued capital gains can be deferred until realization. Third, income taxes on assets held until death are eliminated by the tax–free step–up in basis. Fourth, when a company repurchases its shares, the shareholder may be able to accelerate the deduction of his basis in his stock share.

The presence of a tax advantage for capital gains suggests that investors would prefer to receive as much of their income as possible as a capital gain rather than as a dividend. This can create an incentive for firms to attempt to characterize distributions to shareholders as capital gains (e.g., by repurchasing shares) and to retain earnings rather than distribute dividends to shareholders.

Towards a Weighted Average Effective Tax Rate: Debt and Equity

Because many investments are financed using a mix of debt and equity, sometimes it is desirable to compute a “representative” effective tax rate that reflects the typical mix of financing. Such a calculation generally uses a weighted average based on the relative importance of debt and equity as sources of funding for the marginal investment (Auerbach, 1979a; 1983b; Fullerton, 1987; Gravelle, 1994). Yet such a calculation raises difficult theoretical and empirical issues—economists do not agree about how firms make capital structure choices (Auerbach, 1979a; 1983a and b; 1987; Bradford and Stuart, 1986; 1987).

\(^{10}\) Because \( u \) generally exceeds \( \tau \), this statement is true even when the investment benefits from capital gains taxation at the shareholder level.
Both individual arbitrage and firm arbitrage have intuitive appeal. The problem is that they are theoretically inconsistent. Eliminating possibilities for firm level arbitrage implies opportunities for individual level arbitrage and vice versa. This inconsistency matters in part because calculations are somewhat sensitive to the arbitrage assumption (Fullerton, 1987; Fullerton, Gillette, and Mackie, 1987). As a result of this inconsistency, these approaches to financial market equilibrium are only partially successful in explaining why investment would be financed using a mix of debt and equity. A full explanation must bring in other considerations.

Bankruptcy cost and risk represent one set of considerations that can help motivate financial market equilibrium with both debt and equity (Auerbach, 1983a and b; Bradford and Stuart, 1986; Gordon and Malkiel, 1981). Firms might trade-off the tax advantages of debt against the extra bankruptcy costs until, at the equilibrium debt/equity ratio, there is no net advantage to debt over equity. Thus, for example, under firm arbitrage investors might not be earning different rates of return on debt and on equity, once the costs of bankruptcy have been considered.

But bankruptcy cost is not the only theory motivating the use of both debt and equity. There are other tax related theories (e.g., the Miller (1977) segmenting equilibrium) as well as theories that emphasize non-tax factors (e.g., the Myers (1984) pecking-order theory). Each of these theories has strengths and weaknesses, and economists do not agree on which, if any, best models the determination of a firm’s financing decisions. The evidence in support of a strong role for taxes is mixed (see the review in U.S. Treasury, 1992). In part because these issues...
are so unsettled, most effective tax rate calculations abstract from risk (Fullerton, 1986).12

Although the debt/equity ratio may be sensitive to debt’s tax advantage over equity, most effective tax rate calculations ignore the effect of taxes on financial policy by using the same debt–equity ratio under all tax regimes (e.g., Fullerton, 1987; Gravelle, 1994). Calculations in the Treasury’s (1992) study of corporate tax integration, however, suggest that including changes in financing may have only a modest effect on measures of tax induced changes in investment incentives.

Problems in Determining the Appropriate Weights

As mentioned above, one problem in determining appropriate weights is that there is no data on how the “typical” marginal investment is financed (Fullerton, 1986; 1987; King and Fullerton, 1984). In the face of this ignorance, calculations often assume that the marginal investment is financed in the same way as the average capital stock.

Another problem with the determination of the weights is that, as suggested by Gordon et. al. (1987) and Bosworth (1985), among others, the debt/equity ratio might be larger for structures than for equipment. Most effective tax rate calculations, however, assume a common debt/equity ratio for all investments (e.g., Fullerton, 1987; Gravelle, 1994). The choice between the two approaches can be important for some types of policy issues. As shown below, owing to less generous depreciation allowances, calculations that use a common debt/equity ratio find that structures face a higher effective tax rate than that faced by equipment. However, a greater ability to support debt may reduce or even reverse structure’s tax disadvantage relative to equipment, thereby changing conclusions about the neutrality of the tax system.

The empirical evidence on whether leverage varies by asset type is mixed. Fullerton and Gordon (1983) present Compustat data suggesting that the real estate industry might be relatively heavily leveraged. Their work supports the proposition that structures may be financed with relatively large amounts of debt. In contrast, Gravelle (1987; 1999) analyzes mortgage data and concludes that rental housing does not have a high debt/equity ratio when viewed over its lifetime. Auerbach (1985) found no evidence in firm panel data that structures were financed more heavily with debt than was equipment. Although cognizant of empirical ambiguities, some have read the evidence as offering little support for the proposition that, especially in the corporate sector, structures are financed more heavily with debt (e.g., Auerbach, 1983a).

Towards a Weighted Average Effective Tax Rate: The Relative Importance of Dividend Taxes and Capital Gains Taxes

Weights also must be assigned to taxes on dividends and to taxes on capital gains in determining the tax cost of a typical equity financed corporate investment. Two alternative weighting schemes have been advanced. Each alternative is based on a theory designed to explain why a firm pays dividends even though they are taxed more heavily than are capital gains generated by reinvested earnings or share repurchases.

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12 Gravelle (1994) and Treasury (1992) are exceptions. Gravelle (1994) includes risk by adding a 4 percentage point premium to the real after-tax interest rate in constructing her required return on equity. Her approach to modeling risk, however, does not address the inconsistency that eliminating arbitrage opportunities at the individual level creates arbitrage opportunities at the firm level. Treasury (1992) resolves the inconsistency by including the risk of costly bankruptcy in a model based on individual arbitrage.
The Old View of Dividend Taxes

The old view holds that dividends offer shareholders a non–tax benefit\(^{13}\) that offsets their tax disadvantage (Poterba and Summers, 1985; Gravelle, 1994; U.S. Treasury, 1992). Corporations set dividend payments so that, for the last dollar of dividends paid, the extra non–tax benefits of dividends equals their extra tax cost. Thus, dividend taxes discourage the payment of dividends. Dividend taxes also raise the effective tax rate on investment to the extent that firms payout current earnings as dividends, while capital gains taxes raise the effective tax rate to the extent that firms retain and reinvest current earnings or distribute earnings to stockholders via share repurchases. Since about 60 percent of earnings (after corporate tax) are distributed as dividends,\(^{14}\) under the old view the dividend tax represents an important barrier to corporate investment.

The New View of Dividend Taxes

The second alternative is based on the “new view” of dividend taxes developed by Auerbach (1979), Bradford (1981), and King (1977). Under this view, dividends offer no non–tax benefits, but are the only means available for distributing funds to shareholders. Because dividend taxes must be paid on corporate distributions, they reduce the value of corporate shares. For this reason, the new view is sometimes called the tax capitalization view.

Under the new view, because of tax savings for shareholders, firms would generally prefer to finance investment out of retained earnings rather than by issuing new shares. For investment financed by retained earnings, the dividend tax has no affect on the incentive to invest, since it reduces proportionately the investment’s after–tax cost and its after–tax return, leaving the rate of return unaffected. Instead, the capital gains tax on share appreciation acts as a deterrent to investment financed through retained earnings. To the extent that investment is financed through new share issues, however, the dividend tax can discourage investment in the corporate sector.\(^{15}\) However, new share issues have been small or negative for several years,\(^{16}\) implying that dividend taxes offer little if any disincentive to corporate investment.

The empirical evidence on the effects of dividend taxes is mixed (see, e.g., Auerbach, 1983b; 1987; Auerbach and Hassett, forthcoming; Gravelle, 1994; 1995a; Harris, Hubbard, and Kemsley, 2001; Poterba and Summers, 1985; Sorensen, 1995; U.S. Treasury, 1992; Zodrow, 1991). For example, firms rarely issue new shares, seemingly consistent with the new view’s assumption that equity comes primarily from retained earnings. On the other hand, many empirical studies show a sensitivity of the dividend payout ratio to the tax differential between dividends and capital gains, seemingly consistent with the old view. However, these papers do not offer conclusive proof that the old view is correct: in the short run taxes may change dividends under the new view. Although recognizing such ambiguities, the 1992 Treasury integration report adopted the old view of dividend taxes in making its calculations.

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\(^{13}\) For example, dividends might provide signals to investors about a corporation’s relative financial strength or future prospects.


\(^{15}\) If, however, share repurchases substitute for dividends as a means of distributing cash to shareholders, then dividend taxation might not discourage investment financed with new share issues.

\(^{16}\) Board of Governors (2001).
Additional Problems in Determining the Weights

In addition to the new view/old view debate, ambiguity arises from the forward-looking nature of effective tax rate calculations. These issues are similar to those that affect the debt/equity weights. Under the old view, for example, the marginal investment might have a dividend payout ratio that differs from the average dividend payout ratio for the corporate sector. In addition, under the old view, taxes might affect equity policy and hence affect financing weights. Most calculations, however, hold relative equity weights constant in the face of tax changes.17

Some Additional Caveats

Effective tax rate calculations make a number of additional assumptions, many of which have proven controversial. Some are reviewed below. As Fullerton (1986) points out, the list of caveats and qualifications is long, if not necessarily weighty. This list, combined with the discussion of financing issues above, shows that no one calculation can accurately measure "the" incentive to invest. Yet, despite these caveats, effective tax rate calculations offer the only forward-looking measure of investment incentives that captures the effects of such major tax provisions as statutory tax rates, investment credits, and depreciation allowances.

Discount Rate

It is common in effective tax rate calculations to assume a fairly low (e.g., 4 percent) required real after-tax rate of return. Summers (1987a and b) has been critical of this assumption. He reports survey results suggesting that firms often use a much higher rate of discount for valuing an investment's cash flow. Summers also argues that firms should use a lower discount rate for determining the present value of riskless tax depreciation allowances than for determining the present value of risky cash-flows, although his survey results are inconsistent with his theory.

It is not clear what to make of the Summers critique. His empirical results are inconsistent with his theory, making it difficult to implement his ideas. In addition, while tax depreciation may be less risky than other cash flows, it is not free from risk. Furthermore, the standard assumption of a low real after-tax discount rate that does not vary by type of cash flow seems appropriate since effective tax rate analyses typically abstract from risk.18 Summers's critique, however, correctly points out the need for caution in interpreting the results from any particular calculation. Indeed, effective tax rate calculations can be somewhat sensitive to the assumed real after-tax discount rate (Fullerton, 1987; Fullerton, Gillette, and Mackie, 1987).

The Inflation Rate19

Because the current tax system does not index such items as interest, depreciation, inventories, and capital gains, inflation can affect the level of effective tax rates as well as the variation in effective tax rates across investments (Henderson, 1985). A tax system that seems to impose the appropriate tax burden and degree of neutrality on capital income at one inflation rate may impose too high or too low a tax burden at other inflation rates. The calculations below suggest that inflation generally raises the overall burden of taxation under the present income tax system, and

17 The 1992 Treasury integration study is an exception. It found that allowing financing to change in response to tax changes had little effect on investment incentives.
18 Gravelle (1994), however, assigns a risk premium to equity.
19 The assumed relationship between the inflation rate and the nominal interest rate also can affect the degree to which changes in the rate of inflation change effective tax rates, as discussed in Bradford and Fullerton (1981) and in Henderson (1985).
that indexing could lower the tax burden on capital as well as slightly improve tax neutrality.

Measuring Economic Depreciation

Assumed rates of economic depreciation can affect both the absolute size of the tax burden on investment and the variation in the tax burden across investments of different durabilities. Most effective tax rate calculations use the economic depreciation estimates of Hulten and Wykoff (1981). These estimates are subject to a number of criticisms (see, e.g., Gravelle, 1999; Summers, 1987a and b; and U.S. Treasury, 2000) including that they are derived from data on a limited set of assets and that they are outdated. Nonetheless, they are the best estimates available and have been favorably reviewed recently (Fraumeni, 1997; Gravelle, 1999). Furthermore, modest changes in economic depreciation rates appear unlikely to substantially affect conclusions about the level and neutrality of the current tax system.

Tax Minimizing Behavior

Effective tax rate calculations typically assume that in many respects firms act to minimize taxes, e.g., by choosing the most rapid types of depreciation or by using last–in, first–out (LIFO) inventory accounting. As pointed out by Fullerton (1986), however, in other respects firms are not assumed to minimize taxes, such as by using only debt or by avoiding dividend payments. This appears to be theoretically inconsistent and may affect the conclusions of some effective tax rate analyses.

Calculations also typically assume that firms have sufficient tax liability to use all tax credits and deductions, when in fact many firms may be in a loss position and so are unable to fully absorb deductions and credits. Imperfect loss offset has an ambiguous effect on investment incentives, however (e.g., Auerbach, 1983a; 1986; and 1987; Auerbach and Poterba, 1987). On the one hand, investment incentives like accelerated depreciation and an investment tax credit would be of little value to a firm with a stock of unused tax losses. On the other hand, a stock of unused tax losses can shelter from tax the income from a new investment. The first effect may matter more for investments in equipment, which often qualify for investment incentives, while the second effect may be more important for investments in structures, which receive relatively small immediate tax benefits. For some empirical evidence on how imperfect loss offsets affect investment incentives, see Altshuler and Auerbach (1990).

External Costs and Benefits

Effective tax rate calculations typically assume that a uniform effective tax rate across all investments is most efficient for society. This assumption is valid only to the extent that particular investments do not generate benefits (or costs) that accrue to society at large, rather than to the parties directly involved in the investment decision. For example, the market will undersupply investments that generate such positive externalities. Relatively low taxes on such investments may help to correct this market failure.

It is difficult, however, to determine which investments generate external benefits. The private market may undersupply certain intangibles (Arrow, 1962; Hall, 1993), but the degree of market failure and the efficacy of taxes in addressing the market failure are open issues (Gravelle, 1994). Equipment may provide a growth externality that supports a tax subsidy (DeLong and Summers, 1991), but its existence and extent remains controversial (Auerbach, 1992; Auerbach, Hassett, and Oliner, 1994; and Solow, 1994).

Selective Inclusion of Assets, Tax Rules, and Other Public Policy Provisions

Effective tax calculations often include major federal tax provisions (rates, cred-
its, depreciation allowances) relevant to the investment incentives for a variety of assets used in several industries (e.g., Auerbach, 1983; King and Fullerton, 1984). These assets can include land, inventories, and intangibles, in addition to several types of equipment and several types of structures. Calculations sometimes differentiate between the corporate and noncorporate business sectors, and sometimes include owner-occupied housing (e.g., Fullerton, 1987; Gravelle, 1994) and non–housing consumer durables as well (Gravelle, 1983). From some perspectives, then, such calculations are relatively detailed. Yet, they do not include the effects of all potentially relevant tax and policy provisions (as pointed out by, e.g., Auerbach, 1987; Summers, 1987a; Bradford and Stuart, 1986; Fullerton, 1986; 1999; and Gordon et. al., 1987). Among the tax provisions often ignored in effective tax calculations are passive loss rules (Poterba, 1990), accounting provisions (Fullerton, Gillette, and Mackie, 1987), individual retirement arrangements calculations (Fullerton, 1986), and certain rules important for certain industries and assets such as percentage depletion (Gravelle, 1994) and the incremental research and experimentation (R&E) tax credit (Gravelle, 1994). State and local income, property and sales taxes also are left out of many calculations, but included in others (Fullerton, 1987; Joufaian and Mackie, 1992). The AMT is also typically ignored in effective tax rate analysis (Lyon, 1997), but is briefly discussed in the context of tax reform below. Capital gains taxes (Fullerton and King, 1984) and estate taxes (Poterba, 2000) raise difficult modeling issues, some of which are mentioned in passing as they arise in the analysis below. Finally, a host of nontax policies may alter investment behavior in ways ignored in effective tax rate calculations (Gordon et. al., 1987).

Cash Flow Effects of Taxes

Taxes can affect a firm’s cash flow, e.g., as when tax rates are raised or lowered. To the extent that market imperfections restrict some firms’ access to the capital market, cash flow effects might alter investment by increasing or decreasing funds available for investment (Fazzari et. al., 1988). Effective tax rate calculations typically exclude these effects.

Ignoring cash flow effects is justified, however, in many cases (Fullerton, 1986). To the extent that capital markets are perfect, cash flow has no influence on investment incentives since the amount of readily available cash does not limit investment. Even if capital markets are imperfect, effective tax rate calculations might properly ignore the cash flow from taxes since it would not effect the tax on the income from a marginal new investment. In this latter case, however, cash flow effects could alter investment incentives even though they do not alter the measured effective tax rate.

International Capital Flows

Many calculations of effective tax rates assume that the economy is closed to international capital flows. Without capital flows, domestic saving equals domestic investment and there is no distinction between taxes on investment and saving. When capital is internationally mobile, however, the link between saving and investment is broken (Slemrod, 1988; Gravelle, 1994). Hence, U.S. taxes on U.S. savers (e.g., shareholders and lenders) have no effect on incentives to invest in U.S. companies and U.S. taxes on U.S. investment (e.g., the corporate income tax) have no effect on saving by U.S. citizens. Thus, the issue of whether the economy is open to international capital flows can substantially affect the measurement of investment and savings incentives. For example, in an open economy, an increase
in the investment tax credit could stimulate domestic investment without affecting domestic saving, while a cut in personal income tax rates could stimulate domestic saving without affecting domestic investment.  

AN EFFECTIVE TAX RATE MODEL

This section briefly summarizes the effective tax rate model used in the calculations below. The model is derived from that developed by Fullerton and his colleagues (see, e.g., Fullerton and Henderson, 1989; and Fullerton, 1987). I use the model to calculate the effective tax rate for each of up to 35 depreciable assets, plus land, inventories, and intangibles. I perform separate calculations for assets used in the corporate sector, in the noncorporate business sector and in the owner–occupied housing sector.

The Model

For each asset, the user cost is calculated as in [1], assuming that the asset is never sold. The expected inflation rate, $\pi$, is the same for all investments. For business investment, the statutory tax rate, $u$, varies according to whether the investment is undertaken by a corporate firm or by a noncorporate firm. Within each sector, however, the statutory tax rate and the discount rate are assumed to be constant across assets. In contrast, the assumed rate of economic depreciation, the tax depreciation rules used to calculate $z$, and the investment tax credit rate, $k$, all can vary across assets. Land and inventories are assumed not to depreciate and receive no tax depreciation allowances. Calculations for inventories assume firms minimize taxes by choosing LIFO accounting. LIFO accounting is modeled as postponing indefinitely all taxes on inflationary increases in the value of inventories.

The discount rate for each sector is calculated according to individual tax arbitrage and abstracts completely from issues involving risk. Consider first the corporate sector’s discount rate. For corporate investment that is debt financed, the discount rate is the after–tax interest rate (as in [3] above), with $u$ interpreted as the statutory tax rate on corporate income. For equity financed investments in the corporate sector, the shareholder...
equates the after-tax return from an investment in corporate shares with the after-tax return from lending. Accordingly:

\[ r_{\text{div}} = \frac{[i - \tau_d(i - x\pi)]}{(1 - \tau_{\text{div}})} \]

which gives the discount rate for an equity-financed corporate investment burdened by the shareholder’s tax on dividends, while:

\[ r_{\text{cg}} = \frac{[i - \tau_d(i - x\pi) - \tau_{\text{cg}}\pi y]}{(1 - \tau_{\text{cg}})} \]

gives the discount rate for an equity-financed corporate investment burdened by the shareholder’s tax on capital gains, where \( y = 0 \) if capital gains are not indexed for inflation and \( y = 1 \) if capital gains are indexed for inflation.

The weighted average corporate discount rate is:

\[ r_c = w_d r_d + w_{\text{div}} r_{\text{div}} + w_{\text{cg}} r_{\text{cg}} \]

where the \( w_i \) are the weighting factors (\( \sum w_i = 1 \)).

For noncorporate firms the discount rate for a debt-financed investment is the borrower’s after-tax interest rate and the discount rate for an equity-financed investment maintains equality between the investment’s after-tax rate of return and the after-tax rate of return available from lending. The discount rate for a typically financed noncorporate investment is computed as a weighted average of these two.

Investment in owner-occupied housing (and the associated land) is exempt from income taxes. Its cost of capital is given by the rate of inflation, \( \pi \), and an assumed real after-tax rate of return required by all investors, \( s \). Modified Fisher’s Law is used to calculate the nominal interest rate as:

\[ i = \frac{s + \pi(1 - x\tau_d)}{(1 - \tau_d)}. \]

For each asset, after calculating the user cost of capital, the model subtracts the economic depreciation rate to compute the social rate of return, \( \rho \). The model then calculates each asset’s effective tax rate following [2] as \( (\rho - s) / \rho \).

**Key Parameter Values**

Table 1 summarizes the statutory tax rates used in the calculations. These tax rates include federal income taxes only. The statutory corporate tax rate is set at 35 percent, based on the tax rate that applies to the largest corporations. The statutory tax rate on noncorporate business income and the tax rate at which home mortgage interest is deducted are computed as income weighted marginal tax rates using the U.S. Treasury’s Individual Tax Model. The calculation of tax rates on interest income, dividends, and capital gains also begins with an income-weighted average of the tax rate on an extra dollar of each type of income from income taxes. Its cost of capital is given by

\[ 1, \text{ when } z = k = u = 0. \]
the Individual Tax Model. These tax rates are then adjusted for the holdings of corporate debt and equity by tax–exempts, banks, and insurance companies. Based on data from the American Housing Survey reported in Brady et. al. (2000), the calculations assume that 60 percent of those with home mortgage debt itemize. Deferral and tax–free step–up in basis at death reduce the accrual equivalent capital gains tax rate below the straight statutory rate.

Based on historical corporate data, the calculations assume that 35 percent of corporate investment is debt financed ($w_d = .35$). The same 35 percent share for debt is used in calculating the weighted average discount rate for the noncorporate business sector and for owner–occupied housing. Most calculations reflect the old view of dividend taxes using the 60 percent historical dividend by payout ratio ($w_{div} = .39$, $w_{cg} = .26$).

The real after–tax rate of return, $s$, is assumed to be 4 percent, and in most calculations the inflation rate is assumed to be 3 percent.

Table 2 shows the economic depreciation rate and the tax depreciation allowances assumed under current law for each asset. The economic depreciation rates are derived from the work of Hulten and Wykoff (1981), Jorgenson and Sullivan (1981), and Fullerton and Lyon (1988). The tax depreciation rules for each asset rely heavily on the mapping in Jorgenson and Sullivan (1981), but reflect some modifications as given in Gravelle (1994) and in Fullerton, Gillette, and Mackie (1987). Under current law, the investment tax credit is set to zero for all assets.

The model also computes summary measures of tax incentives. For example, the model calculates an average effective tax rate for corporate equipment, corporate structures, and for the corporate sector as a whole. These summary measures are calculated using 1996 capital stock weights.

**EFFECTIVE TAX RATES UNDER CURRENT LAW**

**Differences Between Economic Depreciation and Tax Depreciation**

One important determinant of effective tax rates is the relationship between tax depreciation and economic depreciation. Tax depreciation that has a higher present value than does economic depreciation (i.e., accelerated tax depreciation) provides an investment incentive. The calculations in Table 2 suggest that for equipment (assets 1–20) tax depreciation is...
# Table 2: Cost Recovery Parameters

<table>
<thead>
<tr>
<th>Asset</th>
<th>Economic Depreciation Rate</th>
<th>Tax Life</th>
<th>Tax Recovery Method</th>
<th>Present Value of Economic Depreciation ($)</th>
<th>Present Value of Tax Depreciation (relative to econ. depreciation) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Furniture and Fixtures</td>
<td>0.110</td>
<td>7</td>
<td>200%</td>
<td>0.73</td>
<td>114.4</td>
</tr>
<tr>
<td>2 Fabricated Metal Products</td>
<td>0.092</td>
<td>7</td>
<td>200%</td>
<td>0.70</td>
<td>120.4</td>
</tr>
<tr>
<td>3 Engines and Turbines</td>
<td>0.079</td>
<td>15</td>
<td>150%</td>
<td>0.66</td>
<td>97.9</td>
</tr>
<tr>
<td>4 Tractors</td>
<td>0.163</td>
<td>5</td>
<td>200%</td>
<td>0.80</td>
<td>110.1</td>
</tr>
<tr>
<td>5 Agricultural Machinery</td>
<td>0.097</td>
<td>7</td>
<td>150%</td>
<td>0.71</td>
<td>114.5</td>
</tr>
<tr>
<td>6 Construction Machinery</td>
<td>0.172</td>
<td>5</td>
<td>200%</td>
<td>0.81</td>
<td>109.0</td>
</tr>
<tr>
<td>7 Mining &amp; Oil Field Machinery</td>
<td>0.165</td>
<td>7</td>
<td>200%</td>
<td>0.80</td>
<td>104.2</td>
</tr>
<tr>
<td>8 Metalworking Machinery</td>
<td>0.122</td>
<td>7</td>
<td>200%</td>
<td>0.75</td>
<td>111.4</td>
</tr>
<tr>
<td>9 Special Industrial Machinery</td>
<td>0.103</td>
<td>7</td>
<td>200%</td>
<td>0.72</td>
<td>116.5</td>
</tr>
<tr>
<td>10 General Industrial Equipment</td>
<td>0.122</td>
<td>7</td>
<td>200%</td>
<td>0.75</td>
<td>111.4</td>
</tr>
<tr>
<td>11 Office and Computing Machinery</td>
<td>0.273</td>
<td>5</td>
<td>200%</td>
<td>0.87</td>
<td>101.4</td>
</tr>
<tr>
<td>12 Service Industry Machinery</td>
<td>0.165</td>
<td>7</td>
<td>200%</td>
<td>0.80</td>
<td>104.2</td>
</tr>
<tr>
<td>13 Electrical Machinery</td>
<td>0.118</td>
<td>7</td>
<td>200%</td>
<td>0.75</td>
<td>112.3</td>
</tr>
<tr>
<td>14 Trucks, Buses, and Trailers</td>
<td>0.254</td>
<td>5</td>
<td>200%</td>
<td>0.86</td>
<td>102.3</td>
</tr>
<tr>
<td>15 Autos</td>
<td>0.333</td>
<td>5</td>
<td>200%</td>
<td>0.89</td>
<td>106.3</td>
</tr>
<tr>
<td>16 Aircraft</td>
<td>0.183</td>
<td>7</td>
<td>200%</td>
<td>0.82</td>
<td>102.2</td>
</tr>
<tr>
<td>17 Ships and Boats</td>
<td>0.075</td>
<td>10</td>
<td>200%</td>
<td>0.65</td>
<td>119.4</td>
</tr>
<tr>
<td>18 Railroad Equipment</td>
<td>0.066</td>
<td>7</td>
<td>200%</td>
<td>0.62</td>
<td>134.7</td>
</tr>
<tr>
<td>19 Instruments</td>
<td>0.150</td>
<td>7</td>
<td>200%</td>
<td>0.79</td>
<td>106.3</td>
</tr>
<tr>
<td>20 Other Equipment</td>
<td>0.150</td>
<td>7</td>
<td>200%</td>
<td>0.79</td>
<td>106.3</td>
</tr>
<tr>
<td>21 Industrial Buildings</td>
<td>0.036</td>
<td>39</td>
<td>SL</td>
<td>0.47</td>
<td>72.2</td>
</tr>
<tr>
<td>22 Commercial Buildings</td>
<td>0.025</td>
<td>39</td>
<td>SL</td>
<td>0.38</td>
<td>88.9</td>
</tr>
<tr>
<td>23 Religious Buildings</td>
<td>0.019</td>
<td>39</td>
<td>SL</td>
<td>0.32</td>
<td>106.2</td>
</tr>
<tr>
<td>24 Educational Buildings</td>
<td>0.016</td>
<td>39</td>
<td>SL</td>
<td>0.32</td>
<td>106.2</td>
</tr>
<tr>
<td>25 Hospital Buildings</td>
<td>0.023</td>
<td>39</td>
<td>SL</td>
<td>0.37</td>
<td>93.7</td>
</tr>
<tr>
<td>26 Other Nonfarm Buildings</td>
<td>0.045</td>
<td>39</td>
<td>SL</td>
<td>0.53</td>
<td>64.6</td>
</tr>
<tr>
<td>27 Railroads</td>
<td>0.018</td>
<td>20</td>
<td>150%</td>
<td>0.51</td>
<td>184.3</td>
</tr>
<tr>
<td>28 Telephone and Telegraph</td>
<td>0.033</td>
<td>15</td>
<td>150%</td>
<td>0.45</td>
<td>143.8</td>
</tr>
<tr>
<td>29 Electric Light and Power</td>
<td>0.030</td>
<td>20</td>
<td>150%</td>
<td>0.43</td>
<td>133.5</td>
</tr>
<tr>
<td>30 Gas Facilities</td>
<td>0.030</td>
<td>15</td>
<td>150%</td>
<td>0.43</td>
<td>151.7</td>
</tr>
<tr>
<td>31 Other Public Utilities</td>
<td>0.045</td>
<td>15</td>
<td>150%</td>
<td>0.53</td>
<td>122.8</td>
</tr>
<tr>
<td>32 Farm Structures</td>
<td>0.024</td>
<td>20</td>
<td>150%</td>
<td>0.53</td>
<td>152.5</td>
</tr>
<tr>
<td>33 Mining, Shals, and Wells</td>
<td>0.056</td>
<td>5</td>
<td>200%</td>
<td>0.58</td>
<td>151.5</td>
</tr>
<tr>
<td>34 Other Nonbuilding Facilities</td>
<td>0.029</td>
<td>39</td>
<td>SL</td>
<td>0.42</td>
<td>81.4</td>
</tr>
<tr>
<td>35 Residential Buildings</td>
<td>0.015</td>
<td>27.5</td>
<td>SL</td>
<td>0.27</td>
<td>162.8</td>
</tr>
<tr>
<td>36 Intangibles</td>
<td>0.214</td>
<td>1</td>
<td>EXP</td>
<td>0.75</td>
<td>132.7</td>
</tr>
<tr>
<td>37 Inventories</td>
<td>0.000</td>
<td>n/a</td>
<td>LIFO</td>
<td>0.00</td>
<td>100.0</td>
</tr>
<tr>
<td>38 Land</td>
<td>0.000</td>
<td>n/a</td>
<td>Sale</td>
<td>0.00</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Author’s calculations as explained in the text.

Note: All calculations assume a 4.0 percent real rate of return and a 3.0 percent inflation rate. 200% (150%) means double (150%) declining balance with an optimal switch to straight line, SL means straight line, EXP means expressing, LIFO means last-in-first-out, and SALE means cost is recovered only upon sale.
somewhat accelerated relative to economic depreciation, at least at current rates of inflation. In contrast, tax depreciation tends to be somewhat decelerated for many important types of nonresidential structures (e.g., industrial and commercial buildings). Public utility property and residential buildings receive somewhat accelerated tax depreciation allowances. Intangibles, which include advertising and R&E in these calculations, are expensed and so receive favorable cost recovery treatment under the tax code.30

Effective Tax Rates Across Assets and Sectors

The depreciation/cost recovery calculations in Table 2 suggest that effective tax rates will vary across assets (e.g., equipment vs. structures). This is borne out by the effective tax rate calculations in Table 3. For comparison purposes, note that economic depreciation would give each corporate asset a 37.9 percent effective tax rate.31 In contrast to that norm, corporate effective tax rates vary dramatically around a 32.2 percent weighted average rate, and range from about 4 percent for intangibles to over 40 percent for industrial buildings.32 In general accelerated depreciation gives corporate investment in equipment, public utility property, and intangibles a relatively low effective tax rate, while decelerated depreciation gives corporate investment in nonresidential structures a relatively high effective tax. Corporate investments in land and inventories face an effective tax rate that is consistent with economic cost recovery but that is above the average for the corporate sector. The current cost recovery system thus encourages investment in equipment, public utility property, and intangibles, at the expense of more productive investment (i.e., investment with a higher pre–tax return) in nonresidential structures, land, and inventories.30

Because tax depreciation is on average accelerated relative to economic depreciation, the current depreciation system also lowers the weighted average effective tax rates on investment in the corporate and

---

**TABLE 3**

**EFFECTIVE TAX RATES UNDER CURRENT LAW: CORPORATE ASSETS AND ECONOMY WIDE SUMMARY MEASURES**

<table>
<thead>
<tr>
<th>A. Corporate Assets</th>
<th>Effective Tax Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Furniture and Fixtures</td>
<td>27.7</td>
</tr>
<tr>
<td>2 Fabricated Metal Products</td>
<td>25.5</td>
</tr>
<tr>
<td>3 Engines and Turbines</td>
<td>38.4</td>
</tr>
<tr>
<td>4 Tractors</td>
<td>27.3</td>
</tr>
<tr>
<td>5 Agricultural Machinery</td>
<td>28.9</td>
</tr>
<tr>
<td>6 Construction Machinery</td>
<td>28.0</td>
</tr>
<tr>
<td>7 Mining &amp; Oil Field Machinery</td>
<td>33.5</td>
</tr>
<tr>
<td>8 Metalworking Machinery</td>
<td>29.1</td>
</tr>
<tr>
<td>9 Special Industrial Machinery</td>
<td>26.8</td>
</tr>
<tr>
<td>10 General Industrial Equipment</td>
<td>29.1</td>
</tr>
<tr>
<td>11 Office and Computing Machinery</td>
<td>35.5</td>
</tr>
<tr>
<td>12 Service Industry Machinery</td>
<td>33.5</td>
</tr>
<tr>
<td>13 Electrical Machinery</td>
<td>28.6</td>
</tr>
<tr>
<td>14 Trucks, Buses, and Trailers</td>
<td>34.2</td>
</tr>
<tr>
<td>15 Autos</td>
<td>39.3</td>
</tr>
<tr>
<td>16 Aircraft</td>
<td>35.3</td>
</tr>
<tr>
<td>17 Ships and Boats</td>
<td>28.7</td>
</tr>
<tr>
<td>18 Railroad Equipment</td>
<td>22.2</td>
</tr>
<tr>
<td>19 Instruments</td>
<td>32.0</td>
</tr>
<tr>
<td>20 Other Equipment</td>
<td>32.0</td>
</tr>
<tr>
<td>21 Industrial Buildings</td>
<td>42.6</td>
</tr>
<tr>
<td>22 Commercial Buildings</td>
<td>39.1</td>
</tr>
<tr>
<td>23 Religious Buildings</td>
<td>37.0</td>
</tr>
<tr>
<td>24 Educational Buildings</td>
<td>37.0</td>
</tr>
<tr>
<td>25 Hospital Buildings</td>
<td>38.6</td>
</tr>
<tr>
<td>26 Other Nonfarm Buildings</td>
<td>45.3</td>
</tr>
<tr>
<td>27 Railroads</td>
<td>28.2</td>
</tr>
</tbody>
</table>

30 These calculations ignore the effect of the incremental R&E tax credit.
31 This can be seen from the effective tax rate on land and inventories, which receive the equivalent of economic depreciation.
32 Gravelle (2001) notes that tax depreciation allowances treat equipment and structures more neutrally at inflation rates of about 5 percent, as commonly expected when the 1986 Act was passed, than at the currently expected lower rates of inflation, such as the 3 percent rate assumed in Table 3. This result occurs because increases in inflation tend to increase the relative tax burden on short–lived assets, and is supported by the calculations in Table 5 below.
33 Although not shown in the table, a similar pattern of effective tax rates is observed in the noncorporate sector. Noncorporate residential rental property, however, has an effective tax rate slightly below the weighted average for the noncorporate sector.
noncorporate business sectors below that associated with economic depreciation and so helps to reduce the tax disincentive to save and invest.35

Tax differences other than depreciation create differences in effective tax rates across sectors. The double tax on corporate profits discourages corporate investment by giving it a higher effective tax rate than that imposed on investment in the noncorporate business sector.36 The current tax system also discourages business investment generally, relative to investment in owner–occupied housing, which receives a very low effective tax rate because implicit rental income is tax exempt.37

Overall, the economy–wide weighted average effective tax rate is just under 20 percent. This is lower than the 26.0 percent marginal tax rate on wages38 and slightly lower than the 22.1 percent effective tax rate implied by economic depreciation for business plant and equipment (see Table 6). However, it is well above the zero rate required to eliminate the tax distortion in the decision of how much to save and invest.

Effective Tax Rates Across Industries

Table 4 shows effective tax rates across 18 private industries. The tax cost of investment differs across industries because of differences in the legal form of organization and in the asset mix. Industries that are largely noncorporate, such as real estate and farming, face a relatively low effective tax rate. Industries that are substantial users of assets that receive relatively generous tax depreciation allowances (e.g., Motor Vehicles and Transportation Equipment that invest heavily in intangibles) also can face relatively low effective tax rates, even though they may be heavily incorporated. These differences in effective tax rates across industries suggest that the capital tax provisions may distort the pattern of output in favor of relatively low tax industries.

34 The weighted average effective tax rate for the total noncorporate sector is 20.0 percent, slightly less than the 23.9 percent rate that would be generated by economic depreciation (as determined in a calculation not reported in the tables).
35 This conclusion could change at a higher rate of inflation.
36 The asset mix also differs between the sectors and can affect the weighted average effective tax rate for each sector.
37 The effective tax rate on owner–occupied housing is above zero because only 60 percent of those with mortgage debt itemize.
38 Calculated using the Treasury Individual Tax Model.
Effective Tax Rates and Inflation

An ideal income tax (i.e., one based on economic, Haig–Simons, income) would fully index all items of income and expense, including interest flows, capital gains, and depreciation, for inflation (Gravelle, 1994; U.S. Treasury, 2000). In contrast to this norm, the current tax system does not index interest flows, capital gains, and depreciation deductions. Consequently, inflation can affect the level and pattern of effective tax rates. Inflation’s influence on effective tax rates is complicated, however, and does not affect all investments equally (Henderson, 1985). For example, an increase in the rate of inflation can reduce the effective tax rate on debt financed business investment (as discussed above), but can raise the effective tax rate for debt financed investment in owner-occupied housing (because of non-itemizing borrowers). Increases in inflation raise the real burden of taxes that are imposed on nominal capital gains, thereby increasing the effective tax rate on equity financed investment in the corporate sector. By increasing the nominal discount rate, inflation reduces the real value of tax depreciation allowances based on historical cost and so raises effective tax rates for depreciable assets, but not for other assets. Moreover, the tax increase caused by the erosion in the real value of depreciation is likely to be larger for short-lived equipment than for long lived structures (Gravelle, 1979; 2001; Auerbach, 1979b; 1983b; Cohen et. al., 1997).

Summary measures of effective tax rates at three different inflation rates are shown in Table 5. In these calculations, inflation tends to increase the average

---

**Table 4**

**Effective Tax Rate by Industry**

<table>
<thead>
<tr>
<th>Industry</th>
<th>Effective Tax Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without Intangibles</td>
<td>With Intangibles</td>
</tr>
<tr>
<td>1 Agriculture, Forestry, and Fisheries</td>
<td>23.0</td>
</tr>
<tr>
<td>2 Mining</td>
<td>30.2</td>
</tr>
<tr>
<td>3 Crude Petroleum and Gas</td>
<td>24.6</td>
</tr>
<tr>
<td>4 Construction</td>
<td>32.9</td>
</tr>
<tr>
<td>5 Food and Tobacco</td>
<td>36.1</td>
</tr>
<tr>
<td>6 Textile, Apparel, and Leather</td>
<td>36.0</td>
</tr>
<tr>
<td>7 Paper and Printing</td>
<td>34.1</td>
</tr>
<tr>
<td>8 Petroleum Refining</td>
<td>37.2</td>
</tr>
<tr>
<td>9 Chemicals and Rubber</td>
<td>35.1</td>
</tr>
<tr>
<td>10 Lumber, Furniture, Stone, Clay, and Glass</td>
<td>35.6</td>
</tr>
<tr>
<td>11 Metals and Machinery</td>
<td>35.8</td>
</tr>
<tr>
<td>12 Transportation Equipment</td>
<td>37.4</td>
</tr>
<tr>
<td>13 Motor Vehicles</td>
<td>34.8</td>
</tr>
<tr>
<td>14 Transportation, Communication, and Utilities</td>
<td>31.7</td>
</tr>
<tr>
<td>15 Trade</td>
<td>34.9</td>
</tr>
<tr>
<td>16 Finance and Insurance</td>
<td>28.8</td>
</tr>
<tr>
<td>17 Real Estate</td>
<td>6.9</td>
</tr>
<tr>
<td>18 Services</td>
<td>34.6</td>
</tr>
</tbody>
</table>

Source: Author’s calculations as explained in the text.
Note: The calculations include federal income taxes only and assume a 3 percent inflation rate and a 4 percent real after-tax rate of return. Investments are financed using 35 percent debt and 65 percent equity. Industry effective tax rates are capital stock weighted averages.
Inflation also affects the neutrality of the tax system. One measure of neutrality is the standard deviation\(^{41}\) of the social rate of return (Fullerton, 1987).\(^{42}\) If all investments were taxed equally, then all would have the same social rate of return, and the standard deviation would be zero. Tax differences create differences in the social return across investments, and so raise the standard deviation of the social rate of return.

In the calculations in Table 5, inflation slightly increases the capital stock weighted standard deviation of the social rate of return.\(^{43}\) Although it widens tax differences between corporate investment and investment elsewhere, and between tangible and intangible property, inflation reduces tax differences among tangible assets (equipment, structures, land, and inventory).

**Summary**

The effective tax rate calculations reviewed above illustrate several distortions caused by the present system of taxing capital income. First, tax depreciation is not closely related to economic depreciation, and any desirable tax reductions provided by current law’s accelerated depreciation system come at the cost of dispersion of effective tax rates within the business sector.\(^{44}\) Second, the current tax system imposes a heavier tax on corporate investment than it does on noncorporate investment and owner-

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\(^{40}\) This result is not necessarily general. The effect of inflation, e.g., is sensitive to financing assumptions. The more important is debt in the firm’s capital structure, the less likely is it that inflation would increase the effective tax rate. In addition, if borrowing on international markets finances investment, then inflation could reduce effective tax rates (Cohen et. al., 1997).

\(^{41}\) The standard deviation is the square root of the sum of squared deviations from the mean.

\(^{42}\) While the standard deviation is suggestive of tax induced distortions, it is not a substitute for explicit welfare cost analysis. Welfare costs, for example, depend on behavioral elasticities that are completely omitted from the standard deviation calculation.

\(^{43}\) This neutrality result is not necessarily general, since, e.g., financing assumptions as well as assumptions about the burden imposed by capital gains taxes affect inflation’s influence on the uniformity with which alternative investments are taxed.

\(^{44}\) Some have questioned, however, whether tax differences across assets, e.g., as between equipment and structures, are large enough to matter (Auerbach, 1996; Summers, 1987a).
occupied housing. This encourages too little capital in corporate businesses and in heavily corporate industries, and too much elsewhere in the economy, especially in owner-occupied housing. Third, the current tax system is not indexed for inflation. This may raise the overall level of tax on capital income as well as contribute to tax biases that favor some investments over others. It also makes the tax burden sensitive to variation in the inflation rate, and so may require offsetting adjustments on an ad hoc basis. Fourth, despite accelerated depreciation and the tax benefits of debt finance, the current tax system imposes a substantial tax on capital income that may discourage saving and investing.

**DEPRECIATION REFORM**

The U.S. tax depreciation system has remained largely unchanged since 1986 and many of its components have been in place since the early 1960s. During the intervening time period, entirely new industries have developed and manufacturing processes in traditional industries have changed dramatically. It is not surprising that tax depreciation and economic depreciation do not closely correspond.

**Fundamental Depreciation Reform**

One approach to reform would abandon the current depreciation system in favor of an entirely new system. Moving the tax system closer to an ideal income tax by adopting economic depreciation is an example of a fundamental reform. Moving the tax system closer to a consumption tax by adopting expensing also is an example of fundamental reform, albeit in a different direction.

**Economic Depreciation for Equipment and Structures**

Switching to a tax system based on economic depreciation involves adopting new tax depreciation rates and indexing tax depreciation for inflation. Based on Hulten–Wykoff depreciation rates, Table 6 shows how allowing tax deductions based on economic depreciation for equipment and structures would change investment incentives. Because on average economic depreciation is slower than current tax depreciation (at the assumed 3 percent inflation rate), switching to economic depreciation would slightly raise the effective tax rate for business investment, and thus for the economy as a whole.

Switching to economic depreciation often is justified as a way to further the goal of tax neutrality. In contrast to this expectation, the calculations in Table 6 suggest that providing economic depreciation would not appreciably change the uniformity with which alternative investments are taxed, as measured by the standard deviation of the social return. Switching to economic depreciation has a small effect on overall tax neutrality because economic depreciation simultaneously increases tax differentials between some investments while reducing tax differentials between others. By raising effective tax rates on business investment, while leaving unchanged the effective tax rate on owner-occupied housing, economic depreciation moves the tax system away from neutrality at the margin of choice between investment in business capital and investment in owner-occupied housing. Economic depreciation also moves the tax system away from neutrality at the margin of choice between corporate and noncorporate investment and between business plant and equipment and intangibles.

On a third score, however, economic depreciation improves neutrality by reducing or eliminating tax differences among tangible assets within the corporate sector and within the noncorporate sector. Taken together, these three effects roughly cancel, leaving the overall neutrality of the
### TABLE 6
EFFECT OF ALTERNATIVE CAPITAL COST RECOVERY REFORMS ON EFFECTIVE TAX RATES

<table>
<thead>
<tr>
<th>Section</th>
<th>Effective Tax Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current Law</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Corporate Sector</td>
<td></td>
</tr>
<tr>
<td>Equipment (%)</td>
<td>30.5</td>
</tr>
<tr>
<td>Structures (%)</td>
<td>38.8</td>
</tr>
<tr>
<td>Public Utilities (%)</td>
<td>29.9</td>
</tr>
<tr>
<td>Inventories (%)</td>
<td>37.9</td>
</tr>
<tr>
<td>Land (%)</td>
<td>37.9</td>
</tr>
<tr>
<td>Intangibles (%)</td>
<td>4.4</td>
</tr>
<tr>
<td>Total (%)</td>
<td>32.2</td>
</tr>
<tr>
<td>Noncorporate Sector (%)</td>
<td></td>
</tr>
<tr>
<td>Owner–Occupied Housing (%)</td>
<td>20.0</td>
</tr>
<tr>
<td>Economy Wide Average (%)</td>
<td>3.9</td>
</tr>
<tr>
<td>Standard Deviation of the Social Return</td>
<td>0.0093</td>
</tr>
</tbody>
</table>

Source: Author’s calculations as described in the text.
Note: The calculations include federal income taxes only and assume a 3 percent inflation rate and a 4 percent real after-tax rate of return. Investments are financed using 35 percent debt and 65 percent equity.
10-5-3-1 depreciation is modeled by moving assets with tax lives of 15, 20, and 25 years into the 10 year class, assets with tax lives of 7 years and 10 years into the 5 year class, assets with tax lives of 5 year class into the 3 year class, and by depreciating computers over a one year period.
Effective tax rates shown are capital stock weighted averages.
tax system about the same as under current law.\textsuperscript{45}

To the extent that tax allowances would be characterized by depreciation rates similar to those estimated by Hulten and Wykoff, a switch to economic depreciation could increase, rather than reduce, tax revenue at the current rate of inflation. This is because on average current depreciation allowances seem to be somewhat accelerated relative to economic depreciation.\textsuperscript{46}

Switching to economic depreciation, nonetheless, raises a number of concerns. It might involve substantial new data work to get better estimates of economic depreciation. In addition, economic depreciation allowances must be indexed for inflation, and indexing may contribute to the complexity of the tax code and create possibilities for tax arbitrage (U.S. Treasury, 2000). However, (indexed) economic depreciation does not cause negative effective tax rates at modest inflation rates and so probably would not significantly encourage tax shelters.

Expensing

Rather than modify depreciation by attempting to move towards an ideal income tax, one might abandon the attempt to measure and tax capital income by allowing the cost of all business investments to be deducted in the year the investment is placed in service. This would move the tax system towards a consumption type tax (Aaron and Gale, 1996).

Table 6 shows that expensing for business investments would reduce to near zero the overall economy-wide average effective tax rate and so virtually eliminate the tax disincentive to save and invest. Expensing also seems to improve tax neutrality. It eliminates tax differences across assets within the corporate sector and within the noncorporate sector.\textsuperscript{47} It also reduces the size (and reverses the sign) of the tax difference between business investment and investment in owner-occupied housing.

Expensing nonetheless raises a number of concerns. It is likely to have a large revenue cost, which must be paid for by raising other taxes or reducing government spending. Its large tax deductions raise tax administrative concerns. Anti-shelter and anti-fraud rules might need to be developed and strengthened. In addition, it may create undesirable incentives, e.g., through negative effective tax rates on some investments. Negative effective tax rates are the hallmarks of tax shelters. Negative tax rates also imply economic inefficiencies since an investment with a negative effective tax rate would be profitable on an after-tax basis even though it earned a negative marginal product on a pre-tax basis (i.e., even though it reduced the value of output). Further, expensing may inappropriately favor taxpayers with sufficient tax capacity to absorb deductions. Expensing could also substantially reduce the value of the stock of existing tangible assets, since

\textsuperscript{45} The calculations in Table 6 are based on a 3 percent rate of inflation. At higher inflation rates, economic depreciation compares more favorably to current law because economic depreciation is indexed for inflation, while current law’s depreciation deductions are not. At a sufficiently high rate of inflation, switching to economic depreciation would reduce the economy-wide average effective tax rate and improve tax neutrality.

\textsuperscript{46} Because economic depreciation would be indexed for inflation while the current tax system is not, this conclusion could change at a sufficiently high rate of inflation.

\textsuperscript{47} Contrary to the simple intuition discussed above, expensing does not reduce to zero the effective tax rate on all qualifying investments. The simple intuition is based on a model that assumes equity financing and a single layer of tax, whereas the calculations in Table 6 assume a mix of debt and equity financing and account for the double taxation of corporate profits. When combined with expensing, the tax subsidy on debt financed investment (discussed above) gives a negative effective tax rate to noncorporate investment. In the corporate sector, shareholder level taxes on corporate income offset the subsidy to debt, leaving an effective tax rate that is just slightly greater than zero.
the price of existing (old) capital, which does not benefit from expensing, would have to fall in order to give the same rate of return earned on new capital, which benefits from expensing (Auerbach and Kotlikff, 1987; Gravelle, 1995b; Lyon and Merrill, 2001). This reduction in the value of old capital may inappropriately shift the distribution of taxes onto older taxpayers. Finally, expensing may reduce the progressivity of the tax system, since capital tends to be concentrated among high-income taxpayers.

Economic Depreciation and Partial Expensing

Combining economic depreciation with partial expensing may be a desirable way to provide a limited tax incentive for investment. Partial expensing would be neutral across investments of different durabilities. This gives it an advantage over the current nonneutral accelerated depreciation system as well as over a single rate investment tax credit, which also would be nonneutral across investments (see, e.g., Bradford, 1980). Partial expensing also separates the tax break from the measurement of income. This gives it an additional advantage over accelerated depreciation, which mixes up incentives with income measurement. Separating the incentive from income measurement rules makes it clear that a tax break is being provided and may make it easier to modify the size of the tax break as conditions dictate.

The fourth column in Table 6 shows effective tax rates for a policy that combines economic depreciation with 50 percent expensing. That policy would reduce the economy-wide average effective tax rate by about one-third while reducing the variation with which alternative investments are taxed. Note also that this policy creates no negative effective tax rates.

**Incremental Reform**

Rather than abandoning the current depreciation system, an alternative type of reform would seek to improve the operation of the current depreciation system by making more limited changes. Three such reforms that have received substantial attention relate respectively to new economy/high technology assets, to equipment generally, and to real property.

**Modify the Cost Recovery of New Economy Assets**

Some commentators (e.g., Neubig and Rhody, 2000) have argued that high technology equipment currently receives insufficiently rapid depreciation allowances and consequently is taxed at effective rates that are too high. The excess of the effective tax rate on computers above that on equipment as a whole (Table 3) is an example of the type of problem these commentators have in mind. In response to these problems, a number of bills have been introduced that would dramatically shorten the life of new economy, high-tech assets.

It is plausible that the somewhat dated current tax depreciation system misclassifies new economy assets. Treasury’s lack of authority to create or redefine asset classes contributes to the problem. Even if Treasury had more discretion, however, a serious problem would remain because existing tax law does not provide a clear standard for assigning assets to depreciation categories.

A fully satisfactory solution to this problem may require a wide-ranging review of the current system for assigning assets to depreciation classes. In the absence of such a review, the case for giving shorter recovery periods to certain new assets is less compelling, since these new assets may not be depreciated inappropriately relative to many other assets. Nonetheless,
if based on sound research showing a short economic life or demonstrating external benefits, a narrower reform focusing on computers and other high-tech assets conceivably could help to improve the tax system.

However this may be, arguments offered in support of a shorter recovery period for computers and other high-tech assets sometimes are oversold. For example, some arguments rely on evidence that in their initial application computers seldom last as long as the five–year period over which they currently are depreciated (U.S. Treasury, 2000). This evidence is intended to suggest that the economic life of a computer is shorter than its tax recovery period. But the suggestion has at least four flaws. First, a computer’s economic life may exceed the period for which its initial purchaser uses it. Second, because of differences in the pattern of depreciation (e.g., double declining balance vs. straight line), it is possible that recovery over a shorter period has a smaller present value than does recovery over a longer period, and it is present value that matters. Third, the ability to deduct remaining basis when an asset is scrapped or sold effectively accelerates the recovery of the asset’s cost, and so can reduce the over–taxation that would otherwise occur when tax depreciation allowances are too slow. Fourth, even if the economic life for high–tech assets has been very short in the recent past, it may not stay short forever. It seems likely that technological obsolescence, not physical deterioration, has been the primary factor contributing to a relatively short economic life for computers and other new economy assets. To the extent that the pace of technological advance slows, economic lives will rise, thereby obviating the need for more accelerated tax deductions (Gravelle, 2001).

A number of controversies surround the recovery of the cost of computer software (Nellen, 2000; Hardesty, 1999; 2000; and IOMA, 2001). These concern the period over which costs associated with computer software can be recovered and the extent to which software costs qualify for the R&E tax credit.

In general, the costs of developing computer software may be deducted currently or amortized (using the straight–line method) over up to a 60 month period. Purchased software (if not amortizable under section 197) may be depreciated using the straight–line method over three years. If the cost of software is bundled with the purchase of computer hardware, software is depreciated as part of the hardware (e.g., over a five–year period using the 200 percent declining balance method). If purchased software has a useful life of less than one year it is currently deductible.

These recovery periods are consistent with proper income measurement to the extent that computer software has a short economic life. For example, assuming a 7 percent nominal discount rate and 3 percent inflation, recovering software costs over a three–year period using the straight–line method is consistent with an economic depreciation rate of 0.37.49 Deducting the cost of software currently is consistent with income tax principles to the extent that the software fully depreciates over the course of the first year.

One potential problem in the taxation of software is created because current law allows the costs of self–created software to be recovered more rapidly than the costs of purchased software. This may inefficiently discourage the use of purchased software.50

Substantial controversy surrounds the classification of costs associated with Enterprise Resource Planning Systems

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49 Unindexed straight–line depreciation over three years has the same present value as does economic depreciation based on a 0.37 rate.

50 Another potential problem is that current law treats purchased software differently depending on whether the software is separately purchased or is bundled with the purchase of computer hardware. The differential
(ERPS), Customer Relationship Management Software (CRMS), and web sites. ERPS are large company based computer information systems that use a large continually updated database. These systems typically are implemented using a purchased software package that is customized by the taxpayer. The development of ERPS tends to be accompanied by large-scale internal reorganizations intended to improve and integrate the management of the business. Taxpayers seek to have as many of the ERPS costs as possible classified as software development costs, which can be expensed. In contrast, the IRS has suggested that many of these costs are the costs of purchased software, recovered over three years, or the costs of integrated business management systems, which may be recovered only to the extent that the business management system has a determinable useful life.

CRMS is an integrated package that lets a company manage its web site, e-mail, call center, field service, sales, and marketing operations. The IRS argues for capitalization of the costs of CRMS and recovery over 36 months, following the rules for purchased software. Taxpayers would prefer more rapid cost recovery.

Web sites are generally constructed using purchased software packages, modified by the company. It is unclear whether developing a web site constitutes software development, or instead creates some other asset, the costs of which should be capitalized and amortized over its useful life. The IRS argues for the recovery of web site costs over 36 months, while taxpayers would prefer expensing.

The actual expected economic life of these software applications probably varies from case to case. Nonetheless, how software costs are recovered is important in determining the effective tax rate. For example, if the costs are expensed, but the software has an economic life of greater than one year, then the effective tax rate would be zero (approximately). On the other hand, if the costs are never deducted, yet the software depreciates, then the effective tax rate could be very high. If, for example, the statutory tax rate is 35 percent and software has an economic depreciation rate of 0.37, then allowing no recovery for the costs gives an effective tax rate of 85 percent, well over twice the statutory rate.\textsuperscript{51}

The extent to which software costs qualify for the incremental R&E tax credit also is mired in controversy. To qualify for the R&E credit, the software costs must represent research in the experimental or laboratory sense for activities intended to discover information that would eliminate uncertainty about the development or improvement of a product.

The economic rationale for the R&E credit is to address a potential under-supply of research (e.g., Arrow, 1962; Hall, 1993). For example, some users may be able to benefit from an invention without having to compensate the inventor. Because of these external benefits, the inventor does not receive the full social return generated by his invention and his incentive to invest in R&E is too low. The tax credit attempts to address this problem by raising the inventor’s rate of return.

To the extent that the statutory definition of credit qualifying R&E accurately identifies investment that yields external benefits, the current R&E credit may promote economic efficiency. Regardless of tax treatment may favor separately purchased software. Yet economic inefficiencies on this score will not be large to the extent that the cost of software purchased with a computer can be unbundled easily and separately stated on the sales receipt.

\textsuperscript{51} If costs were recovered (using the straight-line method) over three years, the effective tax rate would be 35 percent, while if costs were recovered over five years the effective tax rate would be 46 percent, and if costs were recovered over seven years the effective tax rate would be 55 percent. These calculations assume a 7 percent nominal discount rate and 3 percent inflation.
whether the credit promotes efficiency, however, qualifying for it can dramatically reduce effective tax rates. Suppose that the statutory tax rate is 35 percent, the nominal discount rate 7 percent, the inflation rate 3 percent, and the R&E depreciation rate is 15 percent.\(^{52}\) Without a tax credit, but with expensing, R&E is essentially untaxed; it faces a 0 percent effective tax rate. With a tax credit at the full statutory rate of 20 percent, R&E faces an effective tax rate\(^{53}\) of –1900 percent.\(^{54}\) The effective credit rate, however, may be substantially less than the maximum statutory rate.\(^{55}\) If the effective credit rate were 10 percent, then the effective tax rate would be –91 percent.

Accelerate Depreciation of Equipment

Gravelle (2001) discusses a recent proposal\(^{56}\) that would accelerate the depreciation of equipment generally while paying special attention to high-tech equipment. The 10–5–3–1 proposal would allow businesses to write-off high-tech equipment over one year and would shorten the lives of remaining assets to recovery periods of 10, 5, or 3 years. Table 6 contains calculations based on a simplified interpretation of this proposal.\(^{57}\)

The 10–5–3–1 depreciation proposal (as implemented in these calculations) would dramatically lower the tax cost of investment in equipment and public utility property while leaving unchanged the tax cost of investment in most types of buildings, inventories, land, and owner-occupied housing. This would slightly reduce the tax cost of a typical investment in the U.S. economy, and, as a result, would help to raise investment incentives overall. Its effect on the uniformity of taxation across investments, however, is less certain. As emphasized by Gravelle (2001), the proposal would widen tax differences between types of equipment. It also would widen tax differences between equipment on the one hand, and most business structures, land, and inventories on the other hand. In contrast, however, it would narrow tax differences at other margins, e.g., between equipment and intangibles, between equipment intensive corporate industries and less equipment intensive noncorporate industries, and between business capital and owner-occupied housing. In the calculations reported in Table 6, the proposal would leave overall tax neutrality largely unaffected, when measured using the standard deviation of the social return.

This proposal raises a set of concerns that are similar to those raised by expensing. For example, 10–5–3–1 depreciation is likely to have a large revenue cost and may lead to tax shelter activities.

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\(^{52}\) As reported by Fullerton and Lyon (1988). With a 4 percent real discount rate, economic depreciation at a 15 percent rate suggests a useful economic life of about 12 years in the sense that economic depreciation at this rate has the same present value as does indexed straight-line depreciation over 12 years.

\(^{53}\) Calculations assume a full basis adjustment.

\(^{54}\) This very negative effective tax rate may overstate the incentive effects of the tax credit. To put the matter in a different perspective, note that going from expensing to expensing plus a 20 percent tax credit reduces the depreciation inclusive cost of capital by 20 percent: assuming a 4 percent real rate of return and a 15 percent depreciation rate, the credit would reduce the depreciation inclusive cost of capital from 18 percent to 14 percent.

\(^{55}\) For example, only a fraction of the project’s expenditures may meet the statutory definition of qualifying R&E. Alternatively, total R&E spending by the firm may be insufficient to support a marginal credit at the allowed maximum rate. Hall (1993) estimates that in the early 1990s the average effective credit rate was about 11 percent and about 40 percent of firms had R&E below their base level and so received no credit.

\(^{56}\) The proposal has not been fully specified, but is described in more detail in Cost Recovery Action Group, Inc. (2000).

\(^{57}\) The calculation in the table assigns assets currently in the 15, 20 and 25 year recovery classes to the current 10 year recovery class, assets currently in the 10 year and 7 year recovery classes to the current 5 year recovery class, assets in the current 5 year recovery class to the current three year recovery class, and allows computers to be depreciated over one year.
Investment Tax Credit for Equipment

Giving an investment tax credit (ITC) to equipment would reduce effective tax rates, and is an alternative to accelerated depreciation. The final column of Table 6 shows effective tax rates when equipment and public utility property is given a 10 percent ITC, a policy similar to that in place prior to the 1986 Tax Reform Act. These effective tax rates clearly illustrate both the strengths and weaknesses of a generous selective investment incentive.

The effects of the ITC considered here on investment incentives are similar in direction, but larger in size, than those that would be caused by 10–5–3–1 depreciation. The ITC’s large reduction in effective tax rates for qualified assets has the desirable feature of offering a strong stimulus to business investment and hence to total investment in the U.S. economy. Reducing the tax cost of business investment in equipment and public utility property also helps to promote tax neutrality at some margins, e.g., by reducing the tax penalty on depreciable business property relative to intangibles as well as by reducing the current tax penalty on business investment relative to investment in owner-occupied housing.

At the same time, however, an ITC of 10 percent creates a number of problems. It can give a negative effective tax rate to qualifying investment in equipment and so can encourage unproductive investment and tax shelters. Because only certain business assets qualify, the ITC increases tax differences between qualifying investments in equipment and public utility property on one hand, and investments in structures, land, and inventories on the other hand. At these margins, the ITC hinders tax neutrality. Overall, as illustrated by its increase in the standard deviation of the social return, the ITC slightly reduces tax neutrality, relative to current law. An ITC also is likely to have a large revenue cost and to shift the tax burden onto old capital.

Accelerate Depreciation of Nonresidential Real Property

Taxpayers frequently object that the recovery period for nonresidential real estate is too long. Some empirical evidence supports this view. The present value calculations in Table 2, e.g., suggest that tax depreciation is slower than economic depreciation for industrial buildings and for commercial buildings. A recent study of the depreciation of structures (Deloitte and Touche, 2000) obtains results that are roughly consistent with the Hulten–Wykoff depreciation rates, and further supports a shorter recovery period for nonresidential real estate.

Relatively slow tax depreciation raises the effective tax rate on nonresidential structures above that associated with economic depreciation and above that imposed on equipment. Assuming straight-line depreciation, shortening structure’s recovery period to 30 years would give them about the same effective tax rate as implied by economic depreciation, while a 20–year recovery period would give them about the same effective tax rate as currently faced by equipment.58

One potential tax reform would slow the depreciation of equipment to meet the revenue cost of a shorter recovery period for real estate. In addition to having the virtue of a self-financed reform, this proposal also could improve the neutrality of the tax system for business property. The prospects for improved overall tax neutrality would rise if the reform did not increase the effective tax rate on business capital relative to that on owner-occupied housing.

Some factors, however, may argue against shortening real estate’s recovery period. One is that some buildings may appreciate in value over time. Giving

58 Gravelle (1999) obtains a similar conclusion.
more generous depreciation deductions, while continuing to allow gain on the building and associated land to benefit from deferral and from a reduced rate of tax, may be inappropriate. Another is that current tax depreciation may reflect economic depreciation: the empirical evidence cited above may be wrong. The Committee Report on the 1993 bill that lengthened the life of structures to 39 years justified the increase as a way to match tax depreciation more closely to economic depreciation, although no supporting data or studies were cited (U.S. Congress, 1993). Finally, buildings might enjoy a tax benefit from an ability to support relatively high leverage, and so may not be heavily taxed. If commercial structures used in the corporate sector were financed with 70 percent debt, they would face about the same effective tax rate as faced by a typical corporate sector investment in equipment financed with 35 percent debt. The argument that buildings are more heavily debt financed than is equipment is controversial, however, as discussed above.

According to newspaper reports (Eilperin, 2001), there is interest in shortening the period over which the costs of leasehold improvements may be recovered. One bill (H.R. 1030) would allow the costs of leasehold improvements to be recovered over ten years, as opposed to the 39–year recovery period allowed under current law.59

The problem of depreciating improvements is not limited to leasehold improvements (U.S. Treasury, 2000). Current tax rules require that taxpayers generally depreciate improvements and structural components as if they were separate assets recovered using the same period as would apply to the underlying property. For example, under current law, a replacement roof installed on a commercial structure would be depreciated over 39 years, even though the roof may need to be replaced every 10 years. The potential problem is aggravated by current law’s apparent denial of a deduction of remaining basis when a structural component is replaced. Consequently, there can be a cascading effect in which several roofs are being depreciated at the same time, even though only one is physically present. The cascading effect is mitigated somewhat for lessees and lessors, who can recover undepreciated basis upon termination of the lease. This differential treatment may give a tax advantage to leasing over owning.

Current law’s treatment of improvements, however, does not necessarily mismeasure income with respect to the entire project. It is an empirical question whether the depreciation of the entire flow of costs over the investment’s life is too slow or too fast. Simply pointing out that some components of an investment depreciate faster than others is insufficient to prove that the depreciation of the total investment is too slow.

Limiting tax relief to leasehold improvements may exacerbate present law’s preferential tax treatment of leased property. For example, under the House proposal a lessee operating a restaurant would obtain an even more favorable cost recovery than a restaurant operator who owns his own building and must treat the costs of remodeling every six or seven years as additions to the building.

Regardless of whether leasehold relief is a desirable tax policy, shortening the recovery period from 39 to 10 years would reduce the effective tax rate for the qualifying improvement. For example, suppose that the underlying improvements depreciate at a 15 percent rate. If the statutory tax rate were 35 percent, tax depreciation straight–line over 39 years, and the asset sold for scrap after seven years, the effective tax rate would be 55.3 percent. If

59 This discussion assumes that the proposals would apply to real property. H.R. 1030 is ambiguous on this point.
instead costs were recovered using the 
straight-line method over ten years, the 
effective tax rate would fall to 47.8 per-
cent. The decline in the effective tax rate 
is larger if, rather than sold after seven 
years, the asset were held forever. In this 
case, the effective tax rate would fall from 
62.8 percent with a 39–year tax life to 41.9 
percent with a 10–year tax life.  

INDEXING FOR INFLATION INTEREST, 
CAPITAL GAINS, AND DEPRECIATION

In the past, the interaction of high in-
flation with the unindexed tax system was 
commonly viewed as a serious problem 
that reduced the level of investment and 
distorted investment choices (e.g., 
Feldstein and Summers, 1979; Feldstein, 
1982). Not all authors, however, found 
results consistent with the standard 
view (Fullerton and Henderson, 1984; 
Henderson, 1985). While indexing may 
seem less urgent at today’s relatively low 
rate of inflation, some recent papers sug-
gest that it still may be a worthwhile 
policy option (Cohen et. al., 1997; and 
Feldstein, 1996). Furthermore, inflation 
may not be low forever, and it may be 
undesirable to have tax results depend 
arbitrarily on the rate of inflation. The cal-
culations in Table 5 support the idea that 
inflation may adversely affect the taxation 
of capital income.

Table 7 shows the effects of indexing for 
inflation interest, capital gains, and depre-
ciation on effective tax rates at three dif-
ferent inflation rates, 0 percent, 3 percent, 
and 6 percent. In these calculations, index-
ing does not lower the effective tax rate 
for all investments, compared to effective 
tax rates at the same inflation rate under 
present law. Assuming a positive inflation 
rate, indexing raises the effective tax rate 
on corporate investment in land, inven-
tories, and intangibles. Effective tax rates 
rise on these assets because indexing 
eliminates the current inflation induced 
subsidy on debt financed investment. Nor 
does indexing reduce all differences in ef-
fective tax rates; e.g., indexing widens the 
difference between the effective tax rate 
on corporate equipment, which benefits 
from depreciation indexing, and that on 
corporate land and inventories, which 
does not benefit from depreciation index-
ing.

Nonetheless, in these calculations in-
dexing improves somewhat the overall 
taxation of capital income. Over the range 
of positive inflation rates considered, in-
dexing lowers the weighted average total 
effective tax rate for all three sectors and 
for the economy as a whole. Indexing 
eliminates the interaction of inflation and 
taxes in the noncorporate and housing 
sectors, and lessens this interaction in the 
corporate sector.  
Perhaps surprisingly, however, indexing leaves largely un-
changed the uniformity with which alter-
native investments are taxed, as shown by 
its very small reduction in the standard 
devation of the social return. 

Tax modeling and financing assump-
tions can affect conclusions about the de-
sirability of indexing. Table 7 assumes that 
35 percent of investment is debt financed. 
Indexing could raise corporate and 
noncorporate effective tax rates to the ex-
tent that investments are assumed to be 
much more heavily debt financed. As an-
other example, because of deferral and the 
tax free step up in basis at death, the as-
sumed effective accrual equivalent tax on 
capital gains on corporate shares is very 
small, about 4 percent (see Table 1). Be-
cause of this low tax rate indexing capital 
gains offers only a small benefit to corpo-
rate shareholders. Calculations that as-
sume a larger tax rate on capital gains

---

60 Effective tax rates are lower with sale than without the sale because selling the asset allows the taxpayer to 
realize a tax loss that would go unrealized were the asset held forever.

61 Inflation continues to affect corporate investment incentives because dividend income is not indexed.
TABLE 7
EFFECT OF INDEXING CAPITAL INCOME ON THE EFFECTIVE TAX RATE

<table>
<thead>
<tr>
<th></th>
<th>0% inflation</th>
<th>3% inflation</th>
<th>6% inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current Law</td>
<td>Indexing</td>
<td>Current Law</td>
</tr>
<tr>
<td>Corporate Sector (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment (%)</td>
<td>20.9</td>
<td>20.9</td>
<td>30.5</td>
</tr>
<tr>
<td>Structures (%)</td>
<td>31.7</td>
<td>31.7</td>
<td>38.8</td>
</tr>
<tr>
<td>Public Utilities (%)</td>
<td>21.7</td>
<td>21.7</td>
<td>29.9</td>
</tr>
<tr>
<td>Inventories (%)</td>
<td>36.7</td>
<td>36.7</td>
<td>37.9</td>
</tr>
<tr>
<td>Land (%)</td>
<td>36.7</td>
<td>36.7</td>
<td>37.9</td>
</tr>
<tr>
<td>Intangibles (%)</td>
<td>2.6</td>
<td>2.6</td>
<td>4.4</td>
</tr>
<tr>
<td>Total (%)</td>
<td>25.6</td>
<td>25.6</td>
<td>32.2</td>
</tr>
<tr>
<td>Noncorporate Sector (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner–Occupied Housing (%)</td>
<td>18.6</td>
<td>18.6</td>
<td>20.0</td>
</tr>
<tr>
<td>Economy Wide Average (%)</td>
<td>3.9</td>
<td>3.9</td>
<td>2.3</td>
</tr>
<tr>
<td>Standard Deviation of the Social Return</td>
<td>0.0075</td>
<td>0.0075</td>
<td>0.0093</td>
</tr>
</tbody>
</table>

Source: Author’s calculations as described in the text.
Note: The calculations include federal income taxes only and assume a 4 percent real after-tax rate of return.
Investments are financed using 35 percent debt and 65 percent equity.
The calculations in the indexing columns modify current law by indexing for inflation interest deductions, interest income, capital gains, and depreciation deductions.
Effective tax rates shown are capital stock weighted averages.
could attribute to indexing a more important role in increasing incentives to invest in corporate equity.

Although it may offer some benefits, indexing is not a universally popular tax reform (U.S. Treasury, 2000). Indexing may impose a substantial revenue cost, would reduce tax progressivity, and would add to the complexity of the tax system. Indexing also may lead to arbitrage and tax shelter problems. Opportunities for tax shelters and arbitrage are largest when only some elements of the capital income tax system (e.g., depreciation) are indexed. Comprehensive indexing proposals presumably lessen concerns about tax arbitrage and shelters. Some also have worried that indexing could contribute to macroeconomic instability and to reduced public pressure for low inflation, with attendant reductions in national economic welfare.

PARTIAL INTEGRATION OF CORPORATE AND PERSONAL TAXES: A SHAREHOLDER DIVIDEND EXCLUSION

The current system of taxing corporate income creates a number of tax differentials, e.g., between dividends and capital gains, debt and equity, and corporate and noncorporate investment. These can contribute to an inefficient allocation of real and financial capital (e.g., U.S. Treasury, 1992; Gravelle, 1995a; Sorensen, 1995). Policies designed to address these problems are referred to as integration proposals. Integrating the corporate and personal tax systems has long been advocated by academic economists, but has been much less popular with the business community (e.g., Leonard, 1987). Nonetheless, the Secretary of the Treasury, Paul O'Neill, a former corporate CEO, recently has expressed interest in integration (Shlaes, 2001).

Integration can take a number of different forms. Wide reaching reforms include taxing corporations as partnerships (full integration) and replacing the current system of taxing capital income in favor of a single company level tax (dubbed the Comprehensive Business Income Tax by the Treasury’s 1992 integration report). More limited reforms would offer tax relief on corporate distributions to shareholders (partial integration). After reviewing several options, the Treasury’s 1992 report chose a shareholder dividend exclusion as its preferred approach because this option represents an economically desirable reform that also is simple and administrable.

The desirability of dividend tax relief, however, can depend importantly on corporate financing assumptions. Table 8 shows how a dividend exclusion would alter effective tax rates under three alternative financing assumptions. Under the standard financing assumptions used in most of this paper, which are based on the old view of dividend taxes, a dividend exclusion would dramatically lower effective tax rates on corporate investment. The dividend exclusion would greatly reduce the tax penalty on corporate investment relative to noncorporate investment and would reduce owner–occupied housing’s relative tax advantage over business investments. Thus, the dividend exclusion would promote tax neutrality, as indicated by its reduction in the standard deviation of the social return. By lowering the tax cost of corporate investment, a dividend exclusion also would lower the economy–wide average effective tax rate and improve the overall incentive to save and invest.

62 Although not captured in these calculations, a dividend exclusion also could improve corporate financial policy (U.S. Treasury, 1992). It would reduce the corporate tax incentive to finance with debt rather than with equity. While it would give a tax advantage to dividends over capital gains on retained earnings (thereby reversing current law), it would reduce the size of the tax differential between dividends and capital gains on retained earnings, thereby reducing the role of taxes in determining corporate dividend policy.
## TABLE 8
EFFECT OF A SHAREHOLDER DIVIDEND EXCLUSION ON EFFECTIVE TAX RATES

<table>
<thead>
<tr>
<th></th>
<th>Corporate Sector</th>
<th></th>
<th></th>
<th></th>
<th>Noncorporate Sector</th>
<th>Owner–Occupied Housing</th>
<th>Economy Wide Average</th>
<th>Standard Deviation of the Social Return</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current Law</td>
<td>Exclusion</td>
<td>Current Law</td>
<td>Exclusion</td>
<td>Current Law</td>
<td>Exclusion</td>
<td>Current Law</td>
<td>Exclusion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment (%)</td>
<td>30.5</td>
<td>20.2</td>
<td>23.8</td>
<td>21.9</td>
<td>17.6</td>
<td>10.2</td>
<td>20.2</td>
<td>13.6</td>
</tr>
<tr>
<td>Structures (%)</td>
<td>38.8</td>
<td>29.6</td>
<td>32.8</td>
<td>31.2</td>
<td>27.3</td>
<td>20.7</td>
<td>32.8</td>
<td>20.0</td>
</tr>
<tr>
<td>Public Utilities (%)</td>
<td>29.9</td>
<td>18.6</td>
<td>22.5</td>
<td>20.5</td>
<td>15.7</td>
<td>7.5</td>
<td>22.5</td>
<td>7.0</td>
</tr>
<tr>
<td>Inventories (%)</td>
<td>37.9</td>
<td>27.7</td>
<td>31.3</td>
<td>29.4</td>
<td>25.2</td>
<td>17.7</td>
<td>31.3</td>
<td>13.3</td>
</tr>
<tr>
<td>Land (%)</td>
<td>37.9</td>
<td>27.7</td>
<td>31.3</td>
<td>29.4</td>
<td>25.2</td>
<td>17.7</td>
<td>31.3</td>
<td>13.3</td>
</tr>
<tr>
<td>Intangibles (%)</td>
<td>4.4</td>
<td>-11.2</td>
<td>-5.8</td>
<td>-8.6</td>
<td>-15.2</td>
<td>-26.7</td>
<td>4.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Total (%)</td>
<td>32.2</td>
<td>21.7</td>
<td>25.4</td>
<td>23.5</td>
<td>19.1</td>
<td>11.5</td>
<td>32.2</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Source: Author’s calculations as described in the text.

Notes: Calculations assume a 4.0 percent real rate of return a 3.0 percent inflation rate.
With standard assumptions, investment is financed using 35 percent debt and 65 percent equity and 60 percent of corporate equity financed investment is burdened by the tax on dividends and the remaining 40 percent is burdened by the tax on capital gains (e.g., as under the old view of dividend taxes).
The new view modifies standard financing assumptions by burdening 10 percent of corporate equity financed investment with the tax on dividends and burdening 90 percent of corporate equity financed investment with the tax on capital gains.
Calculations in the heavy debt columns modify the standard financing assumptions by assuming that 65 percent of investment is debt financed and 35 percent is equity financed.
Exclusion means that stockholders may exclude dividends from taxable income.
Effective tax rates shown are capital stock weighted averages.
Table 8 also shows the effect of a dividend exclusion under the new view of dividend taxes. The new view is implemented by assuming that 10 percent of corporate equity is raised through new share issues, for which the dividend tax matters, while the remaining 90 percent of equity comes from retained earnings, for which the relatively low capital gains tax matters. Because current law’s tax penalty on corporate investment is smaller and because dividend tax relief has more limited scope to affect that tax penalty, dividend tax relief is a less attractive policy under the new view than it is under the old view. It does very little to improve overall tax uniformity and does little to stimulate aggregate saving and investing. Under the new view the primary effect of dividend tax relief is to increase the value of corporate shares, rather than to improve tax incentives for corporate investment.

The final set of calculations in Table 8 assume that 65 percent of investment is debt financed, rather than 35 percent as in the standard financing assumptions. With greater debt finance, the existing corporate tax system does less to discourage corporate investment, since a smaller share of the income from corporate investment is subject to the double tax on profits. For the same reason, the scope for improvement from a shareholder dividend exclusion is smaller than it is under the standard financing assumptions. Nonetheless, a dividend exclusion still generates a noticeable reduction in the weighted average corporate effective tax rate. It also narrows the difference between taxes on corporate investment and those on noncorporate investment and owner-occupied housing. Consequently, the dividend exclusion improves somewhat the neutrality of the tax system. By reducing corporate sector taxes, dividend tax relief also leads to a small increase in the overall incentives to save and invest, as illustrated by its small reduction in the economy wide weighted average effective tax rate.

A dividend exclusion is likely to have a fairly large revenue cost and would reduce the progressivity of the tax system. It also raises the possibility of negative effective tax rates, especially for intangibles, and for windfalls to existing shareholders. Whether the benefits of an improved allocation of capital and improved levels of saving and investment are sufficient to outweigh these costs depends importantly on whether one leans towards the new view or the old view of dividend taxes.

**CAPITAL GAINS TAX RELIEF**

The maximum individual tax rate on capital gains was reduced to 20 percent in 1997. Press reports indicate interest in further reductions in the capital gains tax rate, perhaps to as low as 10 percent (Hamburger, McKinnon, and Murray, 2001). Table 9 shows the effects

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63 This is designed to be illustrative only. Federal Reserve data suggests that new share issues were negative for each year between 1995 and 2000 (Board of Governors, 2001).

64 Although not considered in the table, a dividend exclusion also could be less attractive to the extent that international capital flows are important. If U.S. corporations raise money on a competitive world capital market, there may be little tax bias against corporate investment because taxes on U.S. shareholders would have little or no effect on the incentive to invest in the U.S. corporate sector. Whatever anti–corporate tax bias might exist, moreover, would not be addressed effectively by a cut in shareholder taxes. Reductions in shareholder taxes, however, could help promote additional saving by U.S. nationals.

65 Perhaps surprisingly, with 65 percent debt financing, a dividend exclusion actually gives many corporate investments a tax advantage over noncorporate investment and reduces the weighted average effective tax rate on corporate investment below that on noncorporate investment.

66 It is scheduled to fall to 18 percent on assets held for at least five years sold after December 31, 2004, but this scheduled reduction is not included in the capital gains tax rate used for current law.
### TABLE 9  
EFFECT ON EFFECTIVE TAX RATES OF A 10 PERCENT TAX RATE ON INDIVIDUAL CAPITAL GAINS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current Law</td>
<td>10% Capital Gains Rate</td>
<td>Current Law</td>
<td>10% Capital Gains Rate</td>
</tr>
<tr>
<td>Corporate Sector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment (%)</td>
<td>30.5</td>
<td>30.1</td>
<td>23.8</td>
<td>22.5</td>
</tr>
<tr>
<td>Structures (%)</td>
<td>38.8</td>
<td>38.4</td>
<td>32.8</td>
<td>31.7</td>
</tr>
<tr>
<td>Public Utilities (%)</td>
<td>29.9</td>
<td>29.4</td>
<td>22.5</td>
<td>21.1</td>
</tr>
<tr>
<td>Inventories (%)</td>
<td>37.9</td>
<td>37.4</td>
<td>31.3</td>
<td>30.0</td>
</tr>
<tr>
<td>Land (%)</td>
<td>37.9</td>
<td>37.4</td>
<td>31.3</td>
<td>30.0</td>
</tr>
<tr>
<td>Intangibles (%)</td>
<td>4.4</td>
<td>3.7</td>
<td>-5.8</td>
<td>-7.7</td>
</tr>
<tr>
<td>Total (%)</td>
<td>32.2</td>
<td>31.8</td>
<td>25.4</td>
<td>24.1</td>
</tr>
<tr>
<td>Noncorporate Sector (%)</td>
<td>20.0</td>
<td>20.0</td>
<td>20.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Owner-Occupied Housing (%)</td>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
</tr>
<tr>
<td>Economy Wide Average (%)</td>
<td>19.8</td>
<td>19.6</td>
<td>16.4</td>
<td>15.8</td>
</tr>
<tr>
<td>Standard Deviation of the Social Return</td>
<td>0.0093</td>
<td>0.0092</td>
<td>0.0073</td>
<td>0.0070</td>
</tr>
</tbody>
</table>

Source: Author's calculations as described in the text.
Notes: Calculations assume a 4.0 percent real rate of return a 3.0 percent inflation rate. With standard financing, investment is financed using 35 percent debt and 65 percent equity and 60 percent of corporate equity financed investment is burdened by the tax on dividends while 40 percent of corporate equity financed investment is burdened by the tax on capital gains. With the new view, investment is financed using 35 percent debt and 65 percent equity and 10 percent of corporate equity financed investment is burdened by the tax on dividends while 90 percent of corporate equity financed investment is burdened by the tax on capital gains. With heavy debt, investment is financed using 65 percent debt and 35 percent equity and 60 percent of corporate equity financed investment is burdened by the tax on dividends while 40 percent of corporate equity financed investment is burdened by the tax on capital gains. Eliminating the tax free step-up in basis doubles the the accrual equivalent tax rate on capital gains. Effective tax rates shown are capital stock weighted averages.
on investment incentives of a 10 percent tax rate on capital gains.

In this model, a capital gains tax rate cut can improve the allocation of capital by reducing the tax on corporate investment. It also improves the overall incentive to save and invest. The calculations in Table 9 suggest, however, that a cut in the capital gains tax rate would have at best a modest effect on investment incentives.

The table shows calculations under three alternative financing assumptions. Under the standard assumptions, cutting the capital gains tax rate leaves effective tax rates virtually unchanged. Calculations based on the new view of dividend taxes show a somewhat larger effect, because of the greater weight given to the capital gains tax rate in the computation of the corporate discount rate, but the effect remains modest. The benefits of capital gains tax cuts are reduced to the extent that investment is financed heavily with debt.

In most calculations in this paper the statutory personal tax rate on capital gains is reduced by 1/2 to account for deferral and by 1/2 again to account for the tax free step–up in basis at death. These reductions limit the burden imposed by the existing capital gains tax and water–down the benefit from reducing the statutory tax rate. Moreover, although commonly done, the reduction for basis step–up lacks a clear empirical foundation and may bias the calculations since the estate tax is ignored. To address this concern, the final two columns recalculate effective tax rates using standard financing assumptions, but without the tax–free step–up in basis at death. Even without the tax–free step–up, the capital gains tax cut continues to have only a modest effect on investment incentives, in part because about one–third of the return to corporate equity is assumed to escape tax under current law because it accrues to tax exempt institutions and pensions.

A reduction in the tax rate on capital gains also has a number of other effects. On the positive side, it would reduce the tax–disincentive for selling assets (the lock–in effect) created by a realization–based tax on capital gains. On the negative side, it may increase opportunities for tax shelters and aggressive tax planning and may provide a windfall for existing capital owners. The benefits of a capital gains rate cut are likely to accrue disproportionately to the wealthy. The revenue effects are uncertain, since increased realizations can raise revenue at least in the short run. Some of these issues are discussed in more detail in Gravelle (1994).

REPEAL THE CORPORATE ALTERNATIVE MINIMUM TAX (AMT)

In addition to the regular corporate income tax, the U.S. tax code subjects companies to the AMT (Lyon, 1997; Gravelle, 1994). The AMT is a parallel tax system intended to ensure that corporations with significant “economic” income pay some minimum level of tax on that income. One way that it accomplishes this goal is by eliminating or reducing certain tax benefits or deductions available under the regular income tax. The AMT’s broader tax base is subject to a 20 percent tax rate in computing AMT tax liability. The corporation pays the greater of its regular tax or the AMT, but receives a credit for the

67 The rate also is adjusted to account for the holdings of insurance companies (which benefit only from deferral) and of tax exempts.

68 Contrary to the model I use, some of the return to investment in the noncorporate business sector and in owner–occupied housing might be taxed as a capital gain. In that case, cutting the capital gains tax rate probably would cause a larger reduction in the weighted average economy wide effective tax rate, but do less to promote neutrality, than it does in my model.

69 This statement would be invalid if a long–holding period was required to receive the 10 percent tax rate.
excess of AMT over regular tax. The credit can be used to reduce tax payments when the company returns to the regular tax in the future.

Under the AMT, depreciation historically has been computed using a longer recovery period and a slower method of cost recovery than allowed under the regular tax. Less generous depreciation has been an important factor making firms pay the AMT and affecting investment incentives under the AMT.

Recent statutory changes, however, have reduced the importance of depreciation as a factor generating AMT liability and reducing investment incentives. The Omnibus Reconciliation Act of 1993 repealed the adjusted current earnings (ACE) adjustment for accelerated depreciation, which required firms to add to AMT income 75 percent of the difference between regular tax depreciation and AMT depreciation. In addition, the Taxpayer Relief Act of 1997 dramatically reduced the difference between regular tax depreciation and AMT depreciation by shortening AMT recovery periods to conform to recovery periods allowed under the regular tax. Under present law, for long–lived assets (e.g., buildings) there is no difference between regular tax depreciation and AMT depreciation. For short lived assets (e.g., equipment), however, a slower recovery method (150 percent declining balance) keeps AMT depreciation somewhat less generous than depreciation allowed under the regular tax (which generally allows 200 percent declining balance for these assets).

ACE adjustments affect investment incentives for a number of assets, of which inventories is an important example. The difference between the FIFO and the LIFO value of ending inventory is considered an ACE adjustment, requiring that 75 percent of the difference be added to AMT income. By taxing more heavily inflationary increases in the value of inventory, the ACE adjustment for LIFO raises the real tax cost of an investment in inventories for firms on the AMT.

As emphasized by Lyon (1990), although the AMT was intended to raise taxes, it has a complicated and uncertain effect on investment incentives, compared to those offered under the regular tax system. The effect depends, e.g., on the type of asset, the type of financing, and the timing of the firm’s switches between the regular tax and the AMT. In some circumstances the AMT can reduce effective tax rates.

Consider the complications owing to the type of asset. For short lived depreciable property and inventory, there is a potential tradeoff between the AMT’s less generous cost recovery allowances and inventory accounting rules, which reduce investment incentives, and the AMT’s lower statutory tax rate, which (in some cases) increases incentives compared to those offered under the regular tax. No tradeoff exists, however, for longer–lived depreciable property and for assets (e.g., land and intangibles) that are neither depreciated nor treated as inventory. For these assets, the main effect on tax incentives comes through the AMT’s lower statutory tax rate.

The AMT’s effect on investment incentives is further complicated by the possibility that firms might not remain permanently on either the regular tax or the AMT. Instead, they might switch from the regular tax to the AMT and back again. The timing of these switches can affect investment incentives, since they affect the statutory tax rate and depreciation allowances available during different phases of an investment’s economic life. As an ex-
ample of this complexity, suppose that a firm fully depreciates an asset while on the AMT, but is off the AMT over the rest of the asset’s economic lifetime. With this pattern, the AMT’s lower statutory tax rate would apply to the depreciation deductions, while the regular tax’s higher rate would apply to much of the investment’s cash flow. Somewhat counter-intuitively, in this case the AMT’s lower statutory tax rate could reduce (rather than increase) investment incentives.

Debt finance adds additional complications. Because interest is deductible by the company, the statutory corporate tax rate may not deter debt-financed investment. Indeed, a high statutory corporate rate can subsidize debt-financed investment, owing to the deduction of nominal interest. To the extent that investment is debt financed, then, a corporation on the AMT may face a higher marginal tax cost of investment than that faced by a corporation on the regular tax.

An exhaustive treatment of the AMT is beyond the scope of this paper. Nonetheless, some of the AMT’s potential effects can be illustrated in calculations based on the simplifying assumptions that the firm is permanently on the AMT and uses the standard financing mix (35 percent debt). Compared to the regular tax, in these calculations the AMT has its largest effect on the effective tax rate for intangibles, which it raises by 9.4 percentage points. The AMT reduces effective tax rates for many assets, including structures (by 7.4 percentage points), land (6.8 percentage points), and equipment (by 2.4 percentage points). The AMT leaves the effective tax rate for inventories virtually unchanged.

These calculations suggest that for a firm permanently on the AMT, tax incentives for investment may be better than under current law. Such a firm is likely to face a somewhat lower effective tax rate than under current law. In addition, under the AMT the firm faces effective tax rates across assets that are more uniform than those imposed under the regular tax.

As indicated in the discussion above, however, these results are not robust. They depend importantly on the underlying assumptions of the analysis, e.g., that the firm is permanently on the AMT and that financing is 35 percent debt. It is not clear what debt level is appropriate for these calculations and tax return data reveals that most firms have not been on the AMT permanently. With different assumptions the AMT might not improve investment incentives relative to current law for a representative firm. Furthermore, an overall evaluation of the AMT’s effect on investment incentives must include effective tax rate differentials between corporations on the regular tax and those on the AMT.

The corporate AMT is widely viewed as a controversial feature of the current tax system. While the AMT’s stated objective has intuitive appeal, the AMT lacks a strong conceptual foundation, is potentially inequitable (since it treats otherwise similar firms and investors differently), and may add to the uncertainties and inefficiencies of the overall tax system. The concerns addressed by the AMT might be dealt with more effectively by modifying offending provisions of the regular tax system. Repealing the AMT has been suggested in the past, and recently has been proposed as a component of an economic stimulus package.

Repealing the AMT, however, would have an uncertain effect on long-term investment incentives, since in some cases the AMT taxes corporate investment less heavily and more uniformly than does the regular tax. AMT repeal could be costly in terms of foregone revenue. The revenue loss would be accelerated to the extent that repeal allowed all AMT credits to be cashed out immediately. Repeal also may provide benefits primarily to the wealthy and may concentrate those benefits on a small subset of firms in a way
that some find objectionable (Citizens for Tax Justice, 2001; McIntyre, 2001).

**BUSH TAX PROPOSALS**

A keystone of the Bush administration’s economic policy was a proposal for the largest personal tax cut in 20 years (Rosenbaum, 2001). The Bush proposal led to passage of EGTRRA in June of 2001. EGTRRA’s primary influence on effective tax rates comes through reduced statutory individual income tax rates. Treasury calculations suggest that once fully phased in, EGTRRA would reduce income weighted marginal statutory tax rates on capital income by about 1 – 2 percentage points.

Although not motivated primarily as a long–term investment stimulus, EGTRRA’s lower statutory tax rates can be expected to reduce effective tax rates, albeit only slightly. EGTRRA would lower the weighted average effective tax rate by 0.6 percentage points for an investment in the corporate sector, by 1.3 percentage points for an investment in the noncorporate business sector, by 0.4 percentage points for an investment in owner–occupied housing, and by 0.7 percentage points for an investment in the overall economy. Not surprisingly, EGTRRA would have little effect on tax neutrality.

**CONCLUSIONS**

Despite major policy changes in the 1986 Act, problems remain in the taxation of capital income. These problems include a fairly high overall level of tax and tax burdens that vary depending on the asset, sector, financing, tax regime, and rate of inflation. Effective tax rates are useful in illustrating these problems in the taxation of capital income and in understanding the effects of reform proposals. Effective tax rates are a forward–looking measure of the tax burden on saving and investment. As such, they potentially capture the incentive effects of taxes.

Effective tax rate analysis of saving and investment incentives, however, is not unambiguous in its conclusions. Effective tax rates can depend importantly on assumptions about which the economics profession lacks consensus. For example, corporate effective tax rates are higher the less important one considers debt as a marginal source of corporation finance and the more one adheres to the old view of dividend taxes. As another example of ambiguity, consider the effect of inflation on the incentive to invest. While many analysts have emphasized its tax–increasing effect, inflation also can reduce the effective tax rate on heavily debt–financed investment, creating uncertainty about the size and direction of its overall effect on the burden of capital income taxation. Measurement problems probably help explain why effective tax rates have not always performed well as independent variables in investment equations, as emphasized by Summers (1987a) and Gordon et. al. (1987).

Even if effective tax rates could be unambiguously measured, their calculation would provide only a first step in the analysis of capital income tax policy. As emphasized in Robert Chirinko’s (2002) paper in this forum, behavioral effects (e.g., elasticities) also matter in determining the size of the effects of taxes on economic activity. On some key behavioral responses (e.g., the saving elasticity) there

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72 Once fully phased in, EGTRRA would repeal the estate tax. EGTRRA also would expand tax–advantaged savings accounts. Both of these provisions may help stimulate investment, although they are not included in the effective tax rate calculations.

73 The provisions of EGTRRA generally expire on 12/31/10 at which time tax law reverts to pre–EGTRRA rules. Sunsetting creates ambiguity in the meaning of fully phased in EGTRRA tax rates. The statutory tax rates I use in the effective tax rate calculations are those that would apply in 2011 assuming no sunsetting provisions.
is little agreement as to size, while on others there is little information at all (e.g., the substitutability in production among detailed types of capital).

Although ambiguities are frustrating, they also may be edifying. They illustrate the complexity involved in tax policy analysis and counsel against accepting uncritically the results from any single analysis. As elsewhere in empirical economics, the crystal ball is cloudy, admitting no clear predictions. The policy analyst is well served to keep this ambiguity in mind.

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