1984

Which Effective Tax Rate?

Don Fullerton, *University of Illinois at Urbana-Champaign*

WHICH EFFECTIVE TAX RATE?**

DON FULLERTON*

ABSTRACT

An effective tax rate for capital income may be calculated for average or for marginal income, and it may include only corporate taxes or the total of corporate, personal, and property taxes. This paper categorizes effective tax rates into four basic types, and it discusses eleven separate reasons to expect the effective tax on marginal investment to differ from the observed tax on the past or average investment. For each type of rate, we discuss its measurement and appropriate use.

Even within one of these categories, there exist different kinds of effective tax rates with different interpretations. In particular, the effective tax on a marginal increase in the return to a given investment can be considerably greater than the effective tax on the marginal income from a new investment which receives new credits and deductions. While the former concept might be useful for measuring income flows, this paper argues that the latter concept is a better measure of the incentive to invest. This distinction is also used to reconcile part of the difference between the 37 percent effective total tax rate of King and Fullerton and the 66 percent effective total tax rate of Feldstein and Summers.

1. Introduction

ECONOMISTS have long been concerned with the incentive effects of capital income taxation. Because taxes are imposed on different kinds of income at different rates by different revenue authorities at the federal, state, and local levels, the combined effects are unlikely to correspond in a meaningful way to any single coherent plan for the maximization of social welfare. Moreover, because of the complexities involving inflation, corporate financial policy, separate personal and corporate tax systems, investment tax credits, depreciation allowances, pension savings, insurance companies, and the effects of uncertainty, an overall evaluation of capital income taxation is necessarily a difficult and ambiguous exercise.

To abstract from these many complications, policymakers frequently refer to summary statistics such as effective tax rates. Estimates are reported, for example, in the *Economic Report of the President*. Because these rates vary according to the industry or the investor, they have been used to measure the net burden or distributional effect of the tax system. They also have been used to measure efficiency losses associated with particular types of capital misallocation. Following Arnold Harberger (1966), different studies have measured efficiency effects of favoring noncorporate capital over corporate capital,[1] equipment over structures,[2] owner-occupied housing over rental housing,[3] present consumption over future consumption,[4] and even debt-finance over equity-finance.[5] A couple of studies have looked at misallocations in terms of who saves and who bears risk.[6]

Because taxes have many different effects, however, there exist different kinds of effective tax rate estimates. A wide variety of methodologies have been used to estimate effective tax rates with a wide variety of results, but these studies often do not specify the purposes for which their effective tax rate estimates are best suited. They refer to estimates of "the effective tax rate" without further defining the term. Others are left to interpret these estimates and to err in their use.

The purpose of this paper is to look at this wide variety of effective tax rates, categorize them into four basic types, and indicate the purposes for which each is best suited. Last year's tax as a percentage of last year's income may be a good summary of the burden or of redirected income flows, but this "average effective tax rate" may not be a good measure of the impact of taxes on the incentives to make

*Princeton University, National Bureau of Economic Research, and Hoover Institution, Stanford University.

new investments. These incentives might best be summarized by estimates of the required pre-tax returns, but these numbers are sometimes difficult to interpret without reference to the after-tax return received by the corporation or by the ultimate saver. We can provide policymakers with an estimate of the net tax on the expected income from a marginal investment, but this "marginal effective tax rate" is not a good measure of the current burden of the tax. Furthermore, either average or marginal effective tax rate estimates may include only corporate taxes, or they may include the total of corporate, personal, and property taxes.

The next section defines and categorizes the four basic types of effective tax rate, and it comments on some of the problems encountered in estimating each type. Section 3 considers why, in practice, average effective tax rate estimates are so different from marginal effective tax rate estimates. We suggest eleven separate reasons for such differences in the U.S., but most of these reasons apply to other countries as well.

The situation is further complicated by the existence of different procedures to estimate each basic type of effective tax rate. Section 4 discusses some of these choices and the appropriate use of each type of rate. In particular, the marginal effective tax rate depends fundamentally on the nature of the margin. One can calculate the additional tax associated with a marginal increase in the nominal interest rate, the real interest rate, or the amount of investment. A marginal increase to investment in different assets might be undertaken in proportion to existing capital stock, or in proportion to gross investment, net investment, or other annual flows.

Effective tax rates are used to measure the impact of taxes on incentives, but the proper use of such rates requires a careful answer to the question: incentives to do what? In particular, we argue that the extra tax associated with a particular marginal investment is a useful measure for the incentive to make that investment. The extra tax associated with a marginal increase in the nominal interest rate is a useful measure for some of the redistributive effects of taxation, but it has no significance for the actions of investors.

These arguments are applied to particular cases in Section 5, where we look at the different assumptions and procedures used in two studies of U.S. effective tax rates. In order to determine the importance of each difference, we start with the data and procedures of one study and make one change at a time until we have only the data and procedures of the other study. Section 6 provides concluding remarks.

2. A Suggested Taxonomy

Table 1 distinguishes four types of effective tax rate. Each of these types has been measured and used by different studies, and each has been labelled as "the effective tax rate." The first two of these types are "average" effective tax rates, generally defined by actual taxes paid as a proportion of capital income. The basic approach in this case is to look at the "cash flow," in one year, from users of capital to owners of capital and to government. These actual taxes might refer to just "corporate" taxes paid, or to the "total" of corporate, personal, and property taxes.

These average effective tax rates are relatively easy to calculate, and they are useful for measuring incomes of capital owners, revenues of government, and the size of the public sector. These ratios capture, for existing capital, the reduction in taxes associated with accelerated depreciation and the investment tax credit. They also capture the addition to taxes associated with inflation through historical cost depreciation, FIFO inventory accounting, the taxation of nominal capital gains, and fixed nominal income tax brackets. Since all investments are affected by these phenomena, the tax on previous investment *might* be a reasonable approximation of the expected tax on a marginal investment. The next section finds eleven reasons why it might not be a reasonable approximation, however. The allocation of capital is determined by the incentive of each industry to employ the marginal unit of capital. Nevertheless, average effective tax rates have been used in many studies

Table 1

Taxonomy of Effective Tax Rates

Type of Effective Tax Rate	Definition	Examples of Studies that Estimate or Use Such Rates
1. Average Effective Corporate Tax Rate	Observed corporate taxes divided by "correctly measured" corporate income. Current cash flows, ignoring future consequences.	Shoven and Bulow (1976) Sunley (1976a) Fiekowsky (1977) Pechman (1977) Tax Notes Supplements (1982) Fullerton (1982) Horst (1982)
2. Average Effective Total Tax Rate	Observed corporate taxes plus property taxes plus personal taxes on interest and dividends, divided by total capital income.	Harberger (1966) Rosenberg (1969) Shoven (1976) Fullerton, Shoven, Whalley (1978, 1983) Feldstein and Summers (1979) Feldstein, Poterba, Dicks-Mireaux (1983) Slemrod (1983)
3. Marginal Effective Corporate Tax Wedge	The expected real pre-tax rate of return on a marginal investment, minus the real after-tax return to the corporation.	Auerbach and Jorgenson (1980) Jorgenson and Sullivan (1981) Hall (1981) Bradford and Fullerton (1981) Hulten and Wykoff (1981b) Gravelle (1982) Auerbach (1982)
Marginal Effective Corporate Tax Rate	The marginal effective corporate tax wedge divided by the pre-tax return (tax-inclusive rate) or by the corporation's post-tax return (tax-exclusive rate).	Economic Report of the President (1982) Hulten and Robertson (1982) Fullerton and Henderson (1983) Oliner, Haveman, David (1983)
4. Marginal Effective Total Tax Wedge	The expected real pre-tax rate of return on a marginal investment, minus the real after-tax return to the saver who provides the finance.	Boadway, Bruce, Mintz (1982) King and Fullerton (1984)
Marginal Effective Total Tax Rate	The marginal effective total tax wedge divided by the pre-tax return (tax-inclusive rate) or by the saver's post-tax return (tax-exclusive rate).	

to measure distortions in capital allocation [see, for example, Harberger (1966), Shoven (1976), Fullerton, Shoven and Whalley (FSW, 1978, 1983), and Slemrod (1983)].

The measurement of average effective tax rates is not unambiguous. Fiekowsky (1977), for example, points out that a.) U.S. tax as a proportion of corporate income could omit foreign taxes already paid, b.) profits measured for tax purposes invariably differ from profits measured for fi-

nancial reporting, c.) a correct measure of profits requires actual depreciation, a cost which is difficult to establish by market transactions or by arbitrary schedule, and d.) actual taxes in any year may not be related to profits in that year, due to carryforwards of previous credits or losses, and carrybacks of current credits or losses. The profit measures necessary for average effective tax rates are broken down by industry rather than by asset, so researchers must use estimates of annual economic depreciation amounts such as those in Coen (1980) rather than rates for each asset such as those in Hulten and Wykoff (1981a). These four problems also have encouraged researchers to take the average over several years for taxes in the numerator and for profits in the denominator [see Rosenberg (1969) and FSW (1978, 1983)].

There are additional problems measuring the average effective total tax rate. Property tax data often are not sufficiently disaggregated by asset or industry. Moreover, it is impossible to specify separately the personal taxes that are paid on capital income, because of the graduated rate structure. Most studies assume that labor income is received "first," in that each type of capital income is multiplied by the appropriate *marginal* rate to get the tax paid on it. Thus many studies mix aspects of average and marginal effective tax rates. Next, the denominator requires information on real corporate profits, interest paid, rents paid, and any real capital gains. Finally, for an effective tax rate in the noncorporate sector, entrepreneurial income must be divided into labor and capital components. When Harberger and FSW attribute a normal wage to National Accounts' estimates of proprietors' hours worked in each industry, the estimated labor component often comes to more than the proprietors' total observed income.

More recent studies have employed a cost of capital approach based on Hall and Jorgenson (1967) to estimate a marginal effective tax rate, on new investment. In this approach, the net cost of a hypothetical investment project is defined as the purchase price minus the present value of tax savings from depreciation allowances and investment tax credit. Compare this net cost to the present value of after-tax returns on the asset. If the two were not equal, profit-seeking investors would drive up the cost of the asset or drive down the return until they become equal. Given an interest rate for the opportunity cost of funds, this equilibrium equality can be used to estimate the pre-tax real rate of return that the asset would earn, net of depreciation. The marginal effective corporate tax wedge is defined as this pre-tax return minus the corporation's real post-tax return. Division by the pre-tax return provides the usual notion of a tax-inclusive rate, or division by the post-tax return provides a tax-exclusive rate.

This model assumes perfect information, competition, and zero excess profits on the marginal investment. It usually abstracts from all considerations of risk, and it usually assumes that the firm has sufficient taxable profits to use all credits and deductions at the earliest opportunity. These choices are not automatic, however, and studies differ in these respects.[7]

Marginal effective tax rate measures can account for expected inflation, statutory tax rates, credit rates, and depreciation allowances, and they can be designed to include corporate, personal, and property taxes in the analysis. As a practical matter, however, the algebraic expressions cannot be designed to account for all complexities of the way in which actual taxes are affected by myriad provisions such as graduated rate schedules, locational choices, depletion allowances, export subsidies and the like. (Such complexities *are* included in the average effective tax rate measure, but they might not affect taxes on the marginal investment.)

Data requirements for each investment include its rate of investment tax credit, depreciation lifetime and allowances, actual depreciation rate, the statutory tax rate, the expected inflation rate, and the opportunity cost of funds (the interest rate used for discounting). Credits and allowances can be obtained from the tax law and are explained in any of the papers listed under number 3 of Table 1. Economic depreciation rates are often ob-

tained from Hulten and Wykoff (1981a). This careful study finds that economic depreciation can be approximated by exponential rates for 32 different assets. It satisfies our immediate data problem but does not, of course, "solve" the ultimate problem of measuring depreciation.

For the statutory tax rate, only very small firms never reach the top corporate bracket. The typical marginal investment is thus taxed at the top federal rate of 46 percent, and at an average state rate. King and Fullerton (1984) average over fifty states to get a statutory rate of 6.55 percent. Accounting for deductibility of state taxes at the federal level, the statutory rate is thus [.46 + .0655(1 − .46)], or 49.5 percent.

Finally, the inflation rate and interest rate are usually chosen by assumption.[8] Bradford and Fullerton (1981) point out three major problems in these choices. First, the present value of delayed depreciation allowances depends in a nonlinear fashion on the net interest rate used for discounting. Since the required pre-tax return depends on this present value, the marginal effective tax rate can be very sensitive to the assumed interest rate. That paper provides an example where the effective tax rate falls from 100 to 40 percent as the assumed real net return is varied from zero to 6 percent.

Secondly, credits and accelerated deductions might imply negative effective taxes. As the subsidy increases in the numerator of the effective tax rate formula, the required pre-tax return approaches zero in the denominator. The subsidy can thus be an arbitrarily high fraction of the pre-tax return. Moreover, if the subsidy is large enough that the required pre-tax return turns negative, the negative tax in the numerator is divided by a negative pre-tax return. The resulting positive number is difficult to interpret at best. This problem can be solved by using only the numerator or "effective tax wedge," interpreted as the percentage of asset value paid in tax each year.

Thirdly, a comparison of different inflation rates requires an assumption about how inflation affects nominal interest. Two candidates are "Strict Fisher's Law," under which inflation adds point-for-point to the nominal interest rate, and "Modified Fisher's Law" under which inflation adds more than point-for-point. Empirical studies conflict on which law actually holds,[9] but they may not be relevant. To measure the effects of inflation alone, we may wish to make the ceteris paribus assumption that all else is held equal. A fixed real after-tax return logically implies Modified Fisher's Law.[10]

Very few studies have extended this marginal effective tax rate methodology to include personal taxes. In fact, it may not be necessary to do so, depending on the purpose of the study. As discussed in later sections, if one is interested in the allocation of capital among competing uses, one can assume that the firm makes decisions based on the interest rate it must pay in a general bond market. If the market is large and risk is ignored, this opportunity cost does not depend on the particular characteristics of those who buy the bonds. In other words, the cost of capital does not depend on personal taxes. With a noncorporate sector, the cost of capital might depend on property taxes and the entrepreneur's personal tax rate, however, and some studies have included these costs.

Many other phenomena do depend on personal taxes, including the allocation of risk taking among households, the allocation of savings among households, and the allocation of one household's savings among vehicles. Moreover, if one is interested in the effect of taxes on the intertemporal allocation of resources, one must include all taxes on income from investments. King and Fullerton (1984) have measured marginal effective total tax rates for three different assets, three different industries, three different sources of finance, and three ownership categories.

So far in this section, marginal effective tax rates refer to taxes on an increase in capital that receives new credits and deductions. Other studies have measured higher effective tax rates associated with a marginal increase in the rate of return, given a stock of capital. Later sections discuss the usefulness of this distinction for analyzing the decision to in-

vest, but the next section continues to limit itself to the marginal effective tax on income from new investment.

3. Average vs. Marginal Rates

The distinction between average effective tax rates and marginal effective tax rates would be inconsequential if tax systems were proportional or if the two measures turned out to have similar results. Unfortunately this is not the case. Fullerton and Henderson (1983) measure average effective corporate tax rates for each of 18 U.S. industries and marginal effective corporate tax rates for the same 18 industries, but there is almost no resemblance between the two sets of rates. Both sets of effective tax rates were then recalculated using different years, different data sources, different assumptions about expected inflation, and different expected returns. Each vector of 18 average effective tax rates was paired with each vector of marginal effective tax rates. The correlation coefficients varied around zero but never exceeded 0.3.

There are eleven possible explanations for the differences. The relative importance of each explanation is likely to differ according to the asset, industry, or other breakdown used for measuring different effective tax rates. Also, most of these differences apply to effective total tax rates as well as to effective corporate tax rates.

1. The corporate tax system has four brackets of $25,000 where income is taxed at low rates; only income above $100,000 is taxed at the 46 percent top marginal rate. For this reason, the effective tax rate on the marginal investment is likely to be higher than the effective tax rate on the average investment.

2. The marginal effective tax rate gives the percentage of the expected return that is expected to be paid in tax. Any unexpected income from the investment, because it does not affect investment tax credits or depreciation allowances, will be taxed at the corporation's statutory rate. If the marginal effective corporate tax rate is less than the statutory tax rate, and if there exist unusual profits (losses) due to business cycles or structural changes in demand, then the actual taxes paid turn out to be greater than (less than) the expected taxes. The average effective tax rate would then be greater than (less than) the marginal effective tax rate.

3. If profits are so low that not all deductions and credits can be used, we have an additional reason for the two measures of effective tax rates to differ. This time, for unprofitable firms, the marginal effective tax rate is altered. It becomes very important to specify the nature of the margin under consideration, because marginal investments might be undertaken by profitable or unprofitable firms in an industry. Average effective tax rates are also affected by the number of unprofitable firms that are not paying taxes, and even in a profitable year they are affected by the carryover of losses from previous years.

4. Even if all firms are profitable, such that all credits and deductions can be used, many firms do not minimize their taxes in this way. Some firms use depreciation lifetimes that are longer than the minimum allowed by law, some firms pay additional taxes by using FIFO rather than LIFO inventory accounting, and some firms increase the total tax on capital income by simultaneously paying dividends and issuing new shares. Firms also differ in other aspects such as the charitable deductions that they take. These choices affect actual taxes paid by firms without necessarily affecting the distorting tax wedge that must be paid on the expected income from a marginal investment.

5. Any pure profits, though not unexpected, are taxed at the statutory rate without affecting credits or deductions. These pure profits may be attributed to the ownership of an "asset" such as an idea, a valuable location, or other source of monopoly power. Generally, however, these "assets" are not reproducible and hence cannot constitute a marginal investment for the firm. If the statutory rate on these profits exceeds the marginal effective rate on new investment, then it tends to raise the average effective tax rate above the marginal effective tax rate.

6. Changes in tax law affect deductions or credits for new investments without changing the deductions remaining on

previous investments. The Accelerated Cost Recovery System implies reduced marginal effective tax rates on new investments, while higher effective taxes are still being paid on investments made under the Asset Depreciation Range system or even before.

7. Even without changes in tax law, the growth rate for capital affects actual taxes when only new investment qualifies for credits or when depreciation allowances are accelerated. An increase in the average age of existing capital, through slower growth, tends to increase the average effective tax rate because less new capital is receiving credits and deductions. A decrease in the average age, through faster growth, tends to decrease the average effective tax rate. Neither of these changes in the growth rate affects the expected tax on a single hypothetical marginal investment.

8. The marginal effective tax rate depends on expected inflation, while the average effective tax rate depends on actual or past inflation. The two tax rates can differ anytime that actual and expected inflation rates differ. A temporary and unanticipated increase in the rate of inflation, for example, reduces the real value of depreciation allowances on past investments and thus increases the real taxes paid on them. If it is not expected to continue, however, it does not affect the marginal effective tax rate (and therefore has nothing to do with investment incentives).

9. Because interest is deductible at the corporate level, the effective tax on a project financed by debt can be less than that on a project financed by equity. If the marginal investment were financed by a ratio of debt to equity that is anything other than the firm's average ratio of debt to equity, then the marginal effective tax rate could again differ from the average effective tax rate. More on this later.

10. Equity may be "trapped" in the corporation, as argued by King (1977), Auerbach (1979), and Bradford (1981). If the market values of shares already reflect the fact that taxes must be paid when profits are distributed, then dividend taxes do not distort any behavior. These lump-sum taxes could raise the average effective total tax rate without affecting marginal incentives.

11. Finally, the analysis could be expanded to include consideration of risk and the taxation of the risk premium. If losses on the marginal investment can be used to offset profits on other investments, then the tax can be viewed as risk sharing by the government. The firm gives up a fraction of the return, but gives up the same fraction of the risk. Taxes on the risk-free part of the investment's return can lower the marginal incentives to invest, but taxes on the risk premium exactly reflect the value of the risk foregone. Because the latter tax payments reflect no marginal investment disincentives, the average effective tax rate can exceed the marginal effective tax rate for this reason as well [see Fullerton and Gordon (1983)].

In light of all these reasons for the two effective tax rate measures to differ, it may be surprising that the correlation coefficient was ever as high as 0.3! Yet the differences are very important for policy purposes. Some of these phenomena affect actual taxes, income flows, and government revenues, while others affect marginal behavior, new investment, growth, and factor allocations.

Figure 1, obtained from Hulten and Robertson (1982), very neatly summarizes the overall effect of these differences from 1952 to 1986. The dashed line shows the top bracket statutory corporate tax rate, the dotted line shows their average effective corporate tax rate, and the solid line shows their marginal effective corporate tax rate. This marginal rate averages over equipment and structures, a procedure to which we will return in the next section. For now, however, we merely note that the eleven reasons discussed in this section are enough to create substantial deviations between average and marginal effective tax rates over time. The lines cross frequently, indicating no general presumption about which rate is higher.

4. Uses for Effective Tax Rates

The different types of effective tax rates are very useful for the analysis of (1) inter-industry distortions, (2) inter-asset

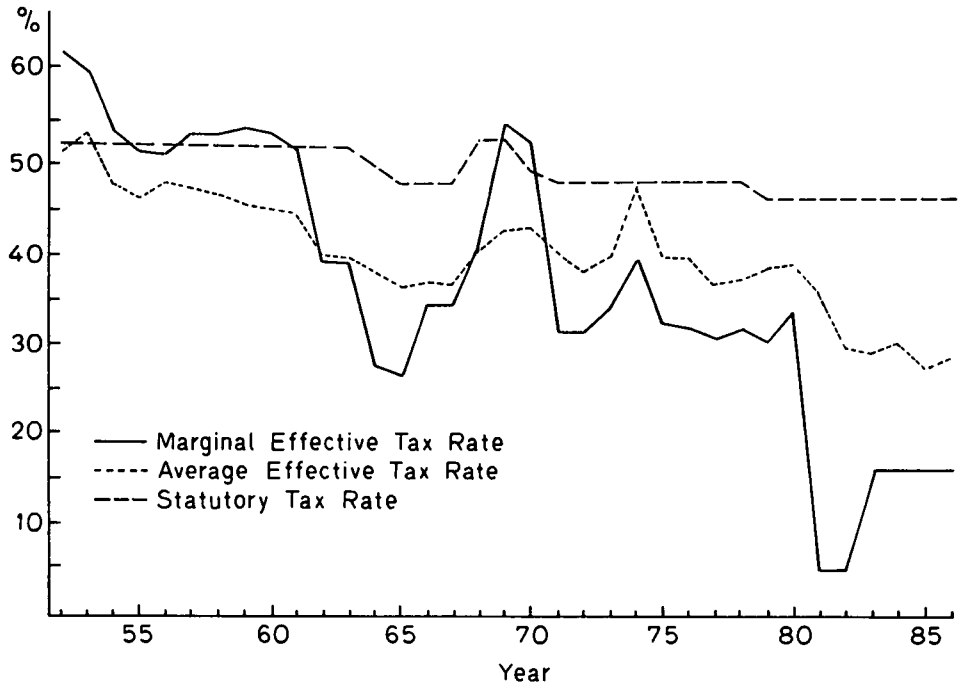

FIGURE 1. CORPORATE TAX RATES
Source: Hulten and Robertson (1982)

distortions, (3) intertemporal distortions, and (4) distributional changes in tax liabilities. Previous sections argue that average effective tax rates are appropriate for measuring cash flows and distributional burdens, while marginal effective tax rates are designed to capture incentives to use new capital. It is difficult for marginal rates to capture many legal complexities, however, so average rates have often been used as estimates of the taxes to be paid on marginal investments.

The choice between effective *corporate* tax rates and effective *total* tax rates is much clearer. Assuming that all corporations operate in the same risk-free bond market, they all face the same opportunity cost of funds. The personal characteristics of the investors are unimportant, and differing effective corporate tax rates can be used to measure the efficiency costs associated with resource misallocations. Average effective corporate tax rates *can* be measured for different industries and used to study interindustry distortions. Alternatively, marginal effective corporate tax rates can be measured for different assets and used to study inter-asset distortions [see Gravelle (1982)]. In fact, the required pre-tax returns can be used directly to measure inter-asset distortions. There is no need to subtract the expected real after-tax return and calculate an effective tax rate.[11]

Measuring the cost of inter-asset distortions also requires information on how firms substitute among types of equipment, among structures, or among those and other assets. In the absence of elasticity estimates, many have assumed that firms can substitute among all assets with a unitary elasticity in a Cobb-Douglas production function. This is a powerful assumption since, for example, the extreme alternative of fixed coefficient technology would imply no misallocations among assets due to differential taxation. Even the unitary elasticities are ambig-

uous. On the one hand, firms may use one percent more of the asset in response to a one percent fall in its rental price (cost of capital gross of depreciation). On the other hand, firms may use one percent more of the asset in response to a one percent fall in its required return (net of depreciation). With non-zero and differing depreciation rates, the two assumptions about investment behavior are quite different. A given tax cut can imply that the required rate of return falls more for equipment than for structures while the gross rental price falls more for structures than for equipment.[12]

Since actual income and taxes are not attributed to individual assets, average effective tax rates are not available on that breakdown. Similarly, marginal effective tax rates are not immediately available on an industry breakdown. With information on the use of each asset by each industry, however, marginal effective tax rates for different assets can be converted into rates for different industries. Each industry's tax rate is then a weighted average of the different assets' tax rates. Though asset usages clearly differ by industry, the weighted-average industry tax rates exhibit far less variation than the asset tax rates. In any case, these rates have been used to study inter-industry distortions [see Fullerton and Henderson (1983)].

More problems arise when the marginal effective corporate tax rates for different assets are averaged for the whole economy. First, weights might be given by annual flows of gross investment or by stocks of each capital asset, depending upon the nature of the margin. The *Economic Report of the President* uses the former, placing relatively more weight on rapidly depreciating equipment. Gravelle uses the latter, however, arguing that the relevant margin is a permanent reallocation of capital. Second, such averages typically involve equipment and structures, ignoring taxes on the income from investments in land, inventories, and intangible assets (goodwill acquired through advertising or knowledge acquired through R&D). Third, such averages no longer provide information on inter-asset or inter-industry distortions. Fourth, they omit personal taxes and property taxes and thus provide incomplete information on intertemporal distortions.

Some of these problems are illustrated in Figure 1 which shows a falling marginal effective *corporate* tax rate from 1970 to 1980, averaged over equipment and structures. Because it is a marginal effective rate rather than an average effective rate, this measure cannot be used to study distributional effects or actual tax burdens. Because assets are averaged together, it cannot be used to study inter-asset or inter-industry distortions. The only remaining use is to study intertemporal distortions, but this rate omits personal taxes, property taxes, and all corporate taxes on land, inventories, and intangible assets. (All of these taxes can be added with varying degree of difficulty, but the property tax might be omitted for reasons discussed below.) In fact the marginal effective corporate tax rate in Figure 1 might be used to indicate the time pattern of changes in part of the corporate wedge between pre-tax and after-tax returns, but it does not provide all of the information required to analyze intertemporal distortions. Personal tax or other changes may offset or augment these corporate tax changes.

Intertemporal distortions require an estimate of the marginal effective total tax rate. (Average effective total tax rates have been used for this purpose, but only as a way to estimate the likely total tax on a marginal investment.) Generally, such rates pose a number of tricky problems.

First, it is not clear whether the property tax represents an investment disincentive. The Tiebout Hypothesis suggests that local jurisdictions compete for residents and for firms by offering a package of local public services. With sufficient mobility among a sufficient number of jurisdictions, no one town would be able to charge more for these services than they were worth to the firm.[13] Property taxes are thus tied directly to benefit levels and represent only voluntary payments for intermediate input of services. Even if this mechanism does not operate, however, property tax abatements for new entrants

suggest that the marginal effective tax rate could be less than the average effective tax rate.

Secondly, the effective total tax rate includes the entire wedge between the pre-tax return and the post-tax return of the ultimate owner who provides the finance. If we are interested in U.S. savings incentives, however, we might not want to include any inferences about the behavior of foreign investors or government. The rate might be designed to measure all taxes on the typical U.S. investment, or all taxes on the typical U.S. investor. These are not the same, and again the proper definition of the effective tax rate depends on the purpose to which it will be put.

Thirdly, the difference between the pre-tax return and the post-tax return does not include all of the disincentives associated with taxation. For tax-exempt bonds, since no taxes are actually paid, the pre-tax return equals the post-tax return and the "effective tax rate" is zero. Yet this tax-free return is less than it would have been in the absence of taxes on taxable bonds. An implicit tax is missed by the usual measure of effective tax rate [see Galper and Toder (1982) and page 158 of U.S. Treasury (1977)].

Fourthly, it is difficult to aggregate the effective total tax rates on different kinds of investment. Suppose, for example, that the corporation finances one marginal investment project by selling a bond to an individual retirement account (IRA). The corporation receives an investment tax credit and accelerated depreciation allowances. The entire return to the asset is then deducted by the firm, since it is paid out in interest. Ultimately, the individual is not taxed on his interest receipts. The result is a substantially negative total tax rate. For a different investment, if it is financed by selling new shares directly to the household, and if the return is paid out in taxable dividends, the total tax is substantially positive. King and Fullerton (1984) aggregate these different investments together, weighting by the amounts of actual capital that are financed in each way. There is no assurance, however, that marginal investments would be financed in the same way as past investments. For effective corporate tax rates, as mentioned above, many studies assume that firms minimize taxes by using LIFO inventory accounting, minimum lifetimes, and the earliest possible depreciation deductions. The logical extension of this assumption to total tax rates would imply that firms always use debt as the cheapest source of finance and that individuals always save through tax-free vehicles.

The resulting negative effective total tax rate can always apply to the marginal investment, as long as there are any taxable profits against which to take the credits and deductions. These taxable profits might include a.) the normal return to old investments upon which taxes were deferred, b.) normal returns to taxed investments like land and inventories, c.) unexpected returns, or d.) monopoly profits. The investing firm need not even have its own taxable profits if there is a mechanism for the transfer of tax benefits between firms. The safe harbor leasing provisions of the 1981 Tax Act provided such a mechanism.

In using this kind of analysis, we are forced to make difficult judgments. As mentioned above, even the simple cost of capital formula implies a judgment that opportunities for profits are exhausted at the margin. We might simultaneously decide, for some reason, that opportunities for investments in tax-free accounts are not exhausted. There are a number of equilibria that might be consistent with investor arbitrage, and we must choose among them. This is particularly difficult in a model with perfect certainty. In one scenario, when the firm undertakes a marginal investment, it always has the option of reducing its debt instead. In equilibrium, no matter how the investment is financed, its net of tax return should be equal to that of retiring a unit of debt. Thus the net of tax interest rate represents the opportunity cost of funds and is always used for discounting the investment's return.

Arbitrage at the firm level implies that the firm's cost of funds is independent of the source of finance. With differences in

personal taxes on interest, dividends, and capital gains, however, the individual's net of tax return is not independent of the source of finance. An alternative scenario is that arbitrage at the individual level insures equality in the net returns to an individual. In this case, since dividends are highly taxed at the personal level, new equity represents an expensive source of finance. Any equity financed investment must provide a high enough pre-tax return that the dividend recipient can pay these higher taxes and still earn the same net return that he could have earned in the bond market. In this case, the cost of funds to the firm is not independent of the source of finance.

A reconciliation can be accomplished in either of two ways. First, constraints might prevent the kind of arbitrage discussed at either level. Firms may face limits on their borrowing and/or requirements on their dividends. Individuals may face limits on their borrowing and/or ceilings on their tax-free accounts. Financial markets may be completely specialized such that only low-bracket investors hold bonds and only high-bracket investors hold equity. No single investor would then have to earn the same net return on bonds as on equity. Secondly, the simultaneous holding of debt and equity with different net returns can be reconciled through the introduction of risk into the analysis. Either type of reconciliation, however, will affect the allocative significance of taxes. If all individuals are at their IRA ceilings, then these tax-free vehicles are irrelevant for the marginal investment. If investors self-select debt or equity, as in Miller (1977), then the tax on an additional unit of either might be represented by the tax bracket which divides the two. Lastly, if additional debt increases the risk of bankruptcy, the marginal interest rate may be higher than the rate previously paid.

5. A Specific Comparison

Feldstein and Summers (1979) find that the effective total tax on U.S. capital income is about 66 percent. King and Fullerton (1984), under one set of assumptions, find it to be 37 percent. Is it possible to reconcile these divergent estimates? The former study looks at the annual cash flow of corporate taxes and capital income. For this reason it must be classified in the above taxonomy as an *average* effective total tax rate, even though it includes personal taxes on interest and dividends at the weighted average personal marginal rates. The latter study considers new investment and measures a *marginal* effective total tax rate. As a consequence, any or all of eleven reasons in Section 3 may contribute to the divergence in results. A reconciliation of the two numbers mentioned above is virtually impossible.

This section undertakes the less ambitious task of reconciling just part of the difference between these two studies. We consider only the part of investment financed by debt, and we discuss the two studies' estimates of 1.) the appropriate corporate tax rate for interest deductions and 2.) the appropriate personal tax rate for interest receipts. These rates are important for determining the impact of inflation on effective tax rates.

Feldstein and Summers (hereafter FS) find that the appropriate rate for interest deductions is 40.4 percent and that the appropriate personal rate for taxes on interest income is 42.0 percent. As a result, when inflation increases nominal interest deductions and nominal interest receipts, the effective tax rate goes up. Inflation also increases effective taxes through historical cost depreciation, FIFO inventory accounting, and the taxation of insurance companies. In contrast, King and Fullerton (hereafter KF) find that the appropriate corporate rate for interest deductions is 49.5 percent and that the appropriate personal rate for taxes on interest income is 23.6 percent. In this case, one effect of inflation is to increase the value of nominal interest deductions by more than it increases taxes on interest recipients. This effect of inflation is to reduce the effective total tax rate.

At initial levels of inflation, the effect of historical cost depreciation is strong enough that inflation raises effective tax rates. The real value of depreciation allowances can only be reduced so far, however, so further inflation has less and less

impact through depreciation. Since additional inflation continues to augment the nominal interest rate, with the value of increased deductions exceeding the increased tax on receipts, the effective total tax rate eventually starts to fall. King and Fullerton estimate an effective tax rate curve with a peak at about a 15 percent inflation rate in the U.S.

The 1979 FS study includes years through 1977, while the 1984 KF book is able to include rates for the 1981 and 1982 tax acts as well as for the old law. For present purposes, we use KF rates from the old law for comparability to the FS study. Also, while FS try only to include federal level taxes, KF include both federal and state level taxes. Surprisingly, these two differences make very little impact. The major difference between the two studies involves their assumptions about what margin is relevant.

This difference can be explained by looking at capital income as iK, the product of a nominal rate of return i and a capital stock K. This capital income can increase at the margin either because of a higher rate of return or because of an addition to the capital stock. FS are interested in the taxes associated with an increase in the inflation rate and thus an increase in the nominal return i. KF are interested in the taxes associated with an increase in capital stock K. The difference is particularly important for marginal effective tax rates because taxes on additional nominal income are not offset by investment tax credits or accelerated depreciation allowances. The appropriate treatments of banks and insurance companies also depend heavily on this difference, as we shall see.

To obtain the appropriate total tax rate for corporate interest deductions, FS start by looking at personal taxes on equity income. Dividend receipts of households, pension funds, banks, and insurance companies are taxed at a weighted-average rate of 28.7 percent. Capital gains are taxed at an effective accrued rate of 4.7 percent. With a 46 percent average payout ratio, the average personal rate for marginal equity income is 15.7 percent. Next, FS suppose that inflation raises nominal interest payments by one dollar with no change in real income. This change in itself would save the shareholders 48 cents of corporation tax (under 1977 law), but the 48 cents of additional equity income is taxed at the 15.7 percent personal rate. The net saving to shareholders is .48(1 − .157), which equals 40.4 percent. An increase in i reduces shareholders' total taxes by 40.4 percent, so this rate is used for interest deductions.

When KF calculate the rate for interest deductions, they consider an additional unit of debt-financed capital. In this case, the income from the investment is used to make interest payments, and there is no change in shareholders' income. The interest payments are deducted at the corporation's 46 percent federal rate (under 1980 law) and at an average state rate of 6.55 percent. As mentioned in Section 2, KF find that the total federal and state statutory corporate tax rate is 49.5 percent, accounting for federal deductibility of state taxes. Thus, in summary, the difference between the margins of FS and KF explains most of the difference between the rates they use for corporate interest deductions.

For taxes on interest receipts, Table 2 outlines the calculations of each study. FS employ the tax rates in the first column, weight by the proportions found in the second column, and obtain a 42 percent average rate for marginal interest income. KF employ the tax rates in the third column, weight by the 1980 proportions in the last column, and obtain a 23.6 percent average rate for marginal interest income. Let us look at each difference in turn.

Households. Both studies use estimates from the TAXSIM model of the National Bureau of Economic Research. With tax returns from 25,000 households, this model increases all interest receipts by one percent and calculates the total additional tax as a proportion of the additional income. The resulting 25 percent federal rate is increased to 35 percent by Feldstein and Summers, because "corporate bonds are held by more affluent taxpayers than ordinary bank account time deposits" (p. 454). Without evidence on the

Table 2

Marginal Tax Rates and Weights for U.S. Corporate Interest Receipts

Owners of Net Corporate Indebtedness	Feldstein and Summers (1979)		King and Fullerton (1984)			
		Weights		Weights		
	Tax Rates	1976	Tax Rates	1960	1970	1980
Households	.350	.082	.325	.100	.095	.093
Commercial Banks	.540	.373	.249	.136	.273	.329
Savings Institutions	.240	.055	.325	.078	.095	.096
Finance Companies	.560	.038	.325	.052	.042	.090
Private Pensions	0	.057	0	.122	.086	.051
Government Pensions	not separated		0	.057	.101	.085
Life Insurance Pensions	not separated		0	.098	.071	.102
Life Insurance Business	.570	.256	.403	.345	.213	.130
Other Insurance Business	.560	.018	.460	.014	.024	.024
Government	0	.076	not included			
Miscellaneous (foreign)	0	.046	not included			
Total	.420	1.000	.236	1.000	1.000	1.000

size of this effect, KF decline to make this adjustment. They do include state taxes in the TAXSIM model, however, and obtain a 32.5 percent rate. If the 35 percent rate of FS were replaced by 32.5 percent, their average rate would only fall from 42.0 to 41.8 percent.

Commercial Banks. If the bank's interest receipts increase, with no new deposits, there is no reason for expenses to be affected. FS assume that the additional profits of the bank are taxed at the corporate rate of 48 percent and that the remaining 52 percent is taxed again at the average personal rate on equity, 15.7 percent. The total rate is 54 percent.[14] This assumption also requires that the banks earn monopoly profits that are not bid away by increased expenses due to competition within the banking sector. If instead, as in KF, the additional income is associated with a new deposit used to make a new investment, then much of the bank's income must be used to pay interest on the new deposit and to cover expenses of servicing it. With competition for new accounts, there is no excess profit. Some of the interest is taxed at the depositor's marginal rate of 32.5 percent, and some is received by the depositor in the form of tax-free services. In this approach, time deposits are just a conduit through which corporations borrow from individuals and pay interest to them. Demand deposits are another conduit for some corporate financing, but individuals receive check-writing services in place of pecuniary returns. *Flow of Funds* data reveal that demand deposits make up 23.5 percent of commercial bank liabilities, so KF use $.325(1 - .235) = .249$ for the personal tax on corporate interest payments to commercial banks. If just the commercial bank rate of .54 is replaced by .249, the overall tax in the FS study falls from 42 to 31.2 percent. This difference, attributable to the nature of the margin, is large because commercial bank holdings are large.[15]

Savings Institutions. For increased nominal interest income of mutual savings banks, FS again start with the 48 percent corporate rate of the bank. They assume that some of this nominal income is sheltered through holding local mortgages and that some is passed through to depositors. They use a 24 percent rate, assuming half is sheltered. For an additional corporate investment however, KF assume that the bank receives an additional deposit and lends to the corporation. Except for a small interest differential, used to cover costs, all of the corporate interest is passed on to the new depositor and taxed at his 32.5 percent personal rate. This KF assumption by itself would raise the overall FS rate from 42.0 to 42.5 percent.

Finance Companies. FS use the unsheltered rate of 56 percent, reflecting the 48 percent corporate rate plus the 15.7 percent personal rate on equity income. Again, the additional interest income is monopoly profit to the finance company which has no additional expenses. KF assume that the finance company must borrow in order to make the new corporate loan and therefore must pass all interest through to the household lender, taxed at 32.5 percent. This change by itself would reduce the FS rate from 42 to 41.2 percent.

Pensions. Both studies use zero for the marginal tax rate on interest income of pension funds. Differences in the amount of savings through pensions are discussed below.

Life Insurance. Both studies assume that the life insurance company is taxed under "Phase I," where reserve requirements are determined for each company in the "Menge Formula," with several steps. First, the "adjusted reserve rate" (arr) is found as the lesser of the company's current rate of return (i) and the average rate of return for the last five years. Next, the "average reserve interest rate" for all companies is derived from various assumptions. This average rate assumption has remained close to .03 and has not changed in response to inflation. Finally, the "adjusted life insurance reserves" are calculated by assuming that each percentage point by which the company's adjusted reserve rate (arr) exceeds the average interest rate (.03) implies a ten percent reduction in required reserves. If all assets are held only for reserves and the adjusted reserve rate (arr) equals the

actual interest rate (i), then Tax = .46 iK[10(i − .03)]. When FS calculate the extra tax for a change in i, they essentially differentiate this expression with respect to i. Evaluated at i = .07, they get a rate of 57 percent.[16] If this derivative were evaluated at the 1980 interest rates of approximately 12 percent, the tax rate would be 96.6 percent. KF, of course, are not concerned with an increase in i. From the above expression, the tax rate on interest income iK is equal to .46[10(i − .03)]. Inflation still affects this tax rate through i, but not as much as in the FS study. With i = .07, this rate is 18.4 percent. KF employ an interest rate near 12 percent and obtain a tax rate of 40.3 percent.[17] When the overall FS rate is recalculated using 40.3 for life insurance, the 42 percent rate falls to 37.8 percent.

Life Insurance Pensions. FS assume that all life insurance interest income is taxed at the 57 percent combined corporate and personal rate. KF recognize that the pension fund business of life insurance companies is not taxable. These pension reserves make up an increasing fraction of total life insurance reserves over time. In 1976, the year of the FS weights, pension reserves were 35 percent of the total. If this proportion of life insurance income were made nontaxable, keeping a 57 percent rate on the rest, then the 42 percent rate of FS falls to 36.9 percent. In 1980, the year of the KF weights, pension reserves were 44 percent of the total.

Other Insurance. For interest income, insurance companies other than life-insurance companies are basically taxed like other corporations. FS take this to mean that an increase in the interest rate would be taxed to shareholders at the combined corporate and personal tax rate of 56 percent mentioned earlier. KF effectively assume that these insurance companies make new investments out of their net earnings. Since personal tax would have to be paid on those earnings in any case, the only additional tax is the 46 percent corporate rate. This replacement reduces the overall FS rate from 42 to 41.9 percent.

Weights. FS include zero tax rates for actual corporate interest payments to government and foreign investors. Instead of looking at actual interest flows, KF consider a hypothetical marginal investment in a U.S. nonfinancial corporation, financed by selling debt to domestic private savers. They include state and local government pensions, at a zero tax rate, assuming that these are funded and actuarially fair. Finally, the KF study uses a later year. In order to show the effect of time on these relative holdings, the last three columns of Table 2 show weights for 1960, 1970, and 1980. Bank holdings of debt have increased dramatically, mostly at the expense of life insurance business. Pension holdings of debt have decreased slightly (but pension holdings of equity have increased very dramatically). If the 1976 weights from the FS study are replaced by the 1980 weights from the KF study, with no change in the FS tax rates, the 42 percent average rises to a 42.9 percent average tax rate for marginal interest income. If 44 percent of life insurance holdings in 1980 are attributable to pensions, as in the KF study, the rate falls to 37.1 percent.

Some of the KF data tend to raise the FS tax rate, but most tend to lower it.[18] The major differences, found for commercial banks and life insurance business, involve the nature of the margin. FS consider an increase in the nominal interest rate i, while KF look at additional capital K.

The two margins have very different implications for behavior. To determine desired investment, individuals want to know the extra tax associated with the marginal investment. Corporations receive investment tax credits and accelerated depreciation at historical cost on this marginal investment, and banks must pay the going rate of interest on the marginal deposit. By contrast, the extra tax associated with a marginal change in the interest rate does not involve any new credits or depreciation, or any new deposits. It is not clear, however, that individuals can do anything about the extra tax associated with a marginal change in the inflation rate and the interest rate. Rather, if the inflation and interest rates change, individuals want to know the *new* extra

tax associated with the marginal investment, including the ITC, accelerated depreciation at historical cost, and taxes on the interest of the new deposit.[19]

6. Conclusion

An effective tax rate for capital income may be calculated for average or for marginal income, and it may include only corporate taxes or the total of corporate, personal, and property taxes. This paper categorizes effective tax rates into four basic types, and it discusses eleven separate reasons to expect the effective tax on marginal investment to differ from the observed tax on the past or average investment. For each type of rate, we discuss its measurement and appropriate use.

Even within one of these categories, there exist different kinds of effective tax rates with different interpretations. In particular, the effective tax on a marginal increase in the return to a given investment can be considerably greater than the effective tax on the marginal income from a new investment which receives new credits and deductions. While the former concept might be useful for measuring income flows, this paper argues that the latter concept is a better measure of the incentive to invest. This distinction is also used to reconcile part of the difference between the 37 percent effective total tax rate of King and Fullerton and the 66 percent effective total tax rate of Feldstein and Summers.

FOOTNOTES

**I am grateful to David F. Bradford, Harvey Galper, Daniel M. Holland, Mervyn A. King, and an anonymous referee for general discussions and for help on earlier drafts. Financial assistance was provided by the National Science Foundation under Grant No. SES8025404. The research reported here is part of the NBER's research program in taxation. Any opinions expressed are those of the author and not those of the National Science Foundation or the National Bureau of Economic Research.

[1]See Harberger (1966), Shoven (1976), Hendershott and Hu (1980), and Fullerton, Shoven, Whalley (1978).

[2]See Gravelle (1982), Hulten and Wykoff (1981b), and Hendershott and Hu (1980).

[3]See Rosen (1979), Slemrod (1982a), and King (1980).

[4]See Boskin (1978), Feldstein (1978), Summers (1981a), Fullerton, Shoven, Whalley (1983).

[5]See Gordon and Malkiel (1981) and Fullerton and Gordon (1983).

[6]See Gordon and Malkiel (1981) and Slemrod (1982b).

[7]Slemrod (1983) and Fullerton and Gordon (1983) consider risk in their analyses. Fullerton and Henderson (1983) assume that the firm uses statutory investment tax credits, LIFO inventory accounting, minimum asset lifetimes, and the most accelerated depreciation method available. Jorgenson and Sullivan (1981) employ lower credits and longer lives, based on actual practices of firms.

[8]Some studies have used the actual inflation rate and actual return in each year to estimate marginal effective corporate tax rates for each year. This procedure is essentially wrong, in that the expected future inflation rate and interest rate are the important variables affecting the decision to undertake a new investment. The only implicit assumption under which this procedure makes sense is that investors are very myopic and always expect the current inflation and interest rates to hold in all future periods. While most studies choose these input parameters by assumption, more thorough procedures would make explicit assumptions about expectations based on past values and then, for each year's investment, generate expected future inflation and interest rates.

[9]Fraumeni and Jorgenson (1980) find a constant real after-tax return to corporations. Summers (1981b) finds that inflation adds at most point-for-point to interest rates, so the real after-tax interest rate must be falling as inflation rises. These results can be compatible if returns to debt and equity differ systemmatically with the inflation rate, but they are not compatible if corporations arbitrage between bonds and real capital as discussed below.

[10]A fixed real after-tax return for a corporation taxed at rate u implies that nominal interest increases by the inflation rate over $(1 - u)$. If personal tax rates differ, we could assume a constant real return after the average tax rate $\bar{m}$. Or, if the relevant investor is tax-exempt, a constant real return implies Strict Fisher's Law.

[11]Assets with different tax rules have different required pre-tax returns, but they all have the same cost of funds. Because the firm could retire a unit of debt instead, any marginal investment faces an opportunity cost given by the net of tax interest rate. As a result, the different pre-tax returns and resulting costs of distortions do not depend on whether debt or equity finance is actually used. While the pre-tax returns are correct for any type of finance, subtraction of the post-corporate-tax return provides a marginal effective corporate tax rate for only equity finance. The assumption about arbitrage is discussed more below.

[12]This ambiguity reflects recent debate in the literature about what constitutes a neutral tax incentive. Assuming that a tax cut is intended to affect all assets similarly, it is not clear whether there should be equal percentage reductions in the rental prices (gross of depreciation) or in the required returns (net of depreciation). Since Emil Sunley (1973, 1976b) has argued for each view in turn, the issue has come to be known as the Sunley vs. Sunley controversy. Bradford (1980) concurs with Sunley (1976b) that maximization of net output requires equalized social returns net of depreciation.

[13]Clarification and discussion of the necessary as-

sumptions are provided in Tiebout (1956), McGuire (1974), Hamilton (1976), Fischel (1975), and White (1975).

[14]The 48 percent corporate rate and 15.7 percent personal rate combine to 56 percent, but FS assume that the increase in the interest rate is partially passed on to depositors. Interest rate ceilings constrain the depositors' increase to 0.3 percent for each one percent increase in the inflation rate. The total marginal tax rate on banks and their depositors is then 54 percent.

[15]In a comment on the Feldstein-Summers study, Gravelle (1980) concentrates on "(1) the questionable assumption that no other tax policies would have changed in the absence of inflation, (2) the use of NIPA depreciation, and (3) the inappropriateness of attempting to measure the effect of tax policy on investment behavior over time using the accounting measures of effective tax rates derived from the NIPA" (p. 474), that is, the use of average rather than marginal effective corporate tax rates. On the 54 percent rate of banks, Gravelle calls into question the assumption that all additional nominal interest income would be profits for the bank. She uses data indicating that 37.9 percent of bank income goes to operating costs, 49.3 percent goes to interest payments, and only 12.8 percent to profits. For increases in the nominal interest rates paid to banks, she finds much lower marginal tax rates. KF make similar points about the FS study, but differ in that they look at additions to investment rather than additions to interest rates.

[16]This expression uses the .46 federal corporate tax rate rather than the .495 combined corporate tax rate, because state governments typically impose premium taxes (on the consumer's purchase of life insurance services) rather than income taxes (on the investment income of the life insurance corporation). Feldstein and Summers use a 48 percent federal rate, and they take the difference between the tax at i = .07 and the tax at i = .08, rather than actually differentiating.

[17]We also note that insurance companies reacted to high inflation and interest rates after 1979 by increasing their use of "modified coinsurance." See King and Fullerton, page 232.

[18]We can also measure the net impact of all of these considerations on the difference between the total effective tax rates of the two studies, including both debt and equity finance. This rate is 66 percent in FS and 37 percent in KF. If we follow all of the FS procedures but replace only their rate for interest receipts (42 percent) with the KF rate for interest receipts (23.6 percent), then their 66.3 percent total effective tax rate falls to 61.8 percent.

[19]The difference between the two margins is recognized by Feldstein, Poterba, and Dicks-Mireaux (1983). They measure an average effective total tax rate by including actual corporate taxes in the numerator, plus the taxes on marginal interest (and dividend) receipts that would be associated with additional savings from households, pensions, and life insurance companies.

REFERENCES

Auerbach, Alan J. (1979), "Wealth Maximization and the Cost of Capital," *Quarterly Journal of Economics* 93, August, pp. 433–446.

Auerbach, Alan J. (1982), "The New Economics of Accelerated Depreciation," *Boston College Law Review* 23, September, pp. 1327–1355.

Auerbach, Alan J. and Dale W. Jorgenson (1980), "Inflation-Proof Depreciation of Assets," *Harvard Business Review* 58, September/October, pp. 113–118.

Boadway, Robin, Neil Bruce, and Jack Mintz (1982), "Taxation, Inflation and the User Cost of Capital in Canada," working paper, Queen's University, Kingston, Ontario.

Boskin, Michael J. (1978), "Taxation, Saving, and the Rate of Interest," *Journal of Political Economy* 86, April, pp. S3–S27.

Bradford, David F. (1980), "Tax Neutrality and the Investment Tax Credit," in Henry J. Aaron and Michael J. Boskin, eds., *The Economics of Taxation*, Washington, D.C.: The Brookings Institution.

Bradford, David F. (1981), "The Incidence and Allocation Effects of a Tax on Corporate Distributions," *Journal of Public Economics* 15, February, pp. 1–22.

Bradford, David F. and Don Fullerton (1981), "Pitfalls in the Construction and Use of Effective Tax Rates," in Charles Hulten, ed., *Depreciation, Inflation, and the Taxation of Income from Capital*, Washington, D.C.: The Urban Institute Press.

Coen, Robert M. (1980), "Alternative Measures of Capital and Its Rate of Return in U.S. Manufacturing," in Dan Usher, ed., *The Measurement of Capital*, Chicago: The University of Chicago Press, pp. 121–152.

Economic Report of the President (1982), U.S. Council of Economic Advisers, Washington, D.C.: Government Printing Office.

Feldstein, Martin (1978), "The Welfare Cost of Capital Income Taxation," *Journal of Political Economy* 86, April, pp. S29–S51.

Feldstein, Martin, James Poterba, and Louis Dicks-Mireaux (1983), "The Effective Tax Rate and the Pretax Rate of Return," *Journal of Public Economics* 21, July, pp. 129–158.

Feldstein, Martin and Lawrence H. Summers (1979), "Inflation and the Taxation of Capital Income in the Corporate Sector," *National Tax Journal* 32, December, pp. 445–470.

Fiekowsky, Seymour (1977), "Pitfalls in the Computation of 'Effective Tax Rates' Paid by Corporations," OTA Paper 23, Department of the Treasury, Washington, D.C.

Fischel, W. A. (1975), "Fiscal and Environmental Considerations in the Location of Firms in Suburban Communities," in E. S. Mills and W. E. Oates, eds., *Fiscal Zoning and Land Use Controls*, Lexington, Massachusetts: Lexington Books.

Fraumeni, Barbara M. and Dale W. Jorgenson (1980), "The Role of Capital in U.S. Economic Growth, 1948–1976," in George M. von Furstenberg, ed., *Capital Efficiency and Growth*, Cambridge: Ballinger, pp. 9–250.

Fullerton, Don (1982), "Why Do Varying Effective Corporate Tax Rates Matter," *Tax Notes* 1980 Effective Tax Rate Supplement (March 1982) and 1981 Supplement (August 1982).

Fullerton, Don and Roger H. Gordon (1983), "A Reexamination of Tax Distortions in General Equilibrium Models," in Martin Feldstein, ed., *Behavioral*

Simulation Methods in Tax Policy Analysis, Chicago: University of Chicago Press.

Fullerton, Don and Yolanda K. Henderson (1983), "Long Run Effects of the Accelerated Cost Recovery System," National Bureau of Economic Research Working Paper No. 828, Cambridge, Mass.

Fullerton, Don, John B. Shoven, and John Whalley (1978) "General Equilibrium Analysis of U.S. Taxation Policy," in U.S. Treasury Department, *1978 Compendium of Tax Research*, Washington, D.C.: Government Printing Office.

Fullerton, Don, John B. Shoven, and John Whalley (1983), "Replacing the U.S. Income Tax with a Progressive Consumption Tax: A Sequenced General Equilibrium Approach," *Journal of Public Economics* 20, February, pp. 3–23.

Galper, Harvey, and Eric Toder (1982), "Transfer Elements in the Taxation of Income from Capital," working paper.

Gordon, Roger, H. and Burton Malkiel (1981), "Corporation Finance," in Henry Aaron and Joseph Pechman, eds., *How Taxes Affect Economic Behavior*, Washington, D.C.: The Brookings Institution.

Gravelle, Jane G. (1980), "Inflation and the Taxation of Capital Income in the Corporate Sector: A Comment," *National Tax Journal* 33, December, pp. 473–483.

Gravelle, Jane G. (1982), "Effects of the 1981 Depreciation Revisions on the Taxation of Income from Business Capital," *National Tax Journal* 35, March, pp. 1–20.

Hall, Robert E. (1981), "Tax Treatment of Depreciation, Capital Gains, and Interest in an Inflationary Economy," in Charles R. Hulten, ed., *Depreciation, Inflation, and the Taxation of Income from Capital*, Washington, D.C.: The Urban Institute Press.

Hall, Robert E. and Dale W. Jorgenson (1967), "Tax Policy and Investment Behavior," *American Economic Review* 57, June, pp. 391–414.

Hamilton, Bruce W. (1976), "Capitalization of Intrajurisdictional Differences in Local Tax Prices," *American Economic Review* 66, December, pp. 747–53.

Harberger, Arnold C. (1966), "Efficiency Effects of Taxes on Income from Capital," in M. Krzyzaniak, ed., *Effects of Corporation Income Tax*, Detroit: Wayne State University Press.

Hendershott, Patric H. and Sheng-Cheng Hu (1980), "Government-Induced Biases in the Allocation of the Stock of Fixed Capital in the United States," in George von Furstenberg, ed., *Capital, Efficiency and Growth*, Cambridge, Mass.: Ballinger, pp. 323–360.

Horst, Thomas (1982), "Some Issues in the Calculation and Uses of Effective Corporate Income Tax Rates," *Tax Notes*, November 1.

Hulten, Charles R. and James W. Robertson (1982), "Corporate Tax Policy and Economic Growth: An Analysis of the 1981 and 1982 Tax Acts," discussion paper, Washington, D.C.: The Urban Institute.

Hulten, Charles R. and Frank C. Wykoff (1981a), "The Measurement of Economic Depreciation," in Charles R. Hulten, ed., *Depreciation, Inflation, and the Taxation of Income from Capital*, Washington, D.C.: The Urban Institute Press.

Hulten, Charles R. and Frank C. Wykoff (1981b), "Economic Depreciation and Accelerated Depreciation: An Evaluation of the Conable-Jones 10-5-3 Proposal," *National Tax Journal* 34, March, pp. 45–60.

Jorgenson, Dale W. and Martin A. Sullivan (1981), "Inflation and Capital Recovery in the United States," in Charles R. Hulten, ed., *Depreciation, Inflation, and the Taxation of Income from Capital*, Washington, D.C.: The Urban Institute Press.

King, Mervyn A. (1977), *Public Policy and the Corporation*, London: Chapman and Hall.

King, Mervyn A. (1980), "An Econometric Model of Tenure Choice and Demand for Housing as a Joint Decision," *Journal of Public Economics* 14, pp. 137–159.

King, Mervyn A. and Don Fullerton, eds. (1984), *The Taxation of Income from Capital: A Comparative Study of the U.S., U.K., Sweden, and West Germany*, Chicago: The University of Chicago Press (forthcoming).

McGuire, Martin (1974), "Group Segregation and Optimal Jurisdictions," *Journal of Political Economy* 82, January/February, pp. 112–32.

Miller, Merton H. (1977), "Debt and Taxes," *The Journal of Finance* 32, May, pp. 261–75.

Oliner, Stephen, Robert Haveman, and Martin David (1983), "Investment in Equipment, Structures, and Research Capital Under the Reagan Tax Acts," University of Wisconsin, Madison.

Pechman, Joseph (1977), *Federal Tax Policy*, Washington, D.C.: The Brookings Institution.

Rosen, Harvey S. (1979), "Housing Decisions and the U.S. Income Tax: An Econometric Analysis," *Journal of Public Economics* 11, February, pp. 1–23.

Rosenberg, Leonard G. (1969), "Taxation of Income From Capital, By Industry Group," in A. C. Harberger and M. J. Bailey, eds., *The Taxation of Income From Capital*, Washington, D.C.: The Brookings Institution.

Shoven, John B. (1976), "The Incidence and Efficiency Effects of Taxes on Income From Capital," *Journal of Political Economy* 84, December, pp. 1261–1283.

Shoven, John B. and Jeremy Bulow (1976), "Inflation Accounting and Nonfinancial Corporate Profits: Financial Assets and Liabilities," *Brookings Papers on Economic Activity 1*, pp. 15–57.

Slemrod, Joel (1982a), "Down Payment Constraints: Tax Policy Effects in a Growing Economy with Rental and Owner-Occupied Housing," *Public Finance Quarterly* 10, April, pp. 193–217.

Slemrod, Joel (1982b), "Tax Effects on the Allocation of Capital Among Sectors and Among Individuals: A Portfolio Approach," National Bureau of Economic Research Working Paper No. 951, Cambridge, Mass.

Slemrod, Joel (1983), "A General Equilibrium Model of Taxation With Endogenous Financial Behavior," in Martin Feldstein, ed., *Behavioral Simulation Methods in Tax Policy Analysis*, Chicago: University of Chicago Press.

Summers, Lawrence H. (1981a), "Capital Taxation and Accumulation in a Life Cycle Growth Model," *American Economic Review* 71, September, pp. 533–544.

Summers, Lawrence (1981b), "The Non-Adjustment of Nominal Interest Rates: A Study of the Fisher Effect," National Bureau of Economic Research Working Paper No. 836, Cambridge, Mass.

Sunley, Emil M. (1973), "Towards a More Neutral Investment Tax Credit," *National Tax Journal*, June, pp. 209–20.

Sunley, Emil M. (1976a), "Effective Corporate Tax Rates: Toward a More Precise Figure," *Tax Notes*, vol. 4 (March 1), pp. 15–24.

Sunley, Emil M. (1976b), "Tax Neutrality Between Capital Services Provided by Long-Lived and Short-Lived Assets," OTA Paper No. 10, Office of Tax Analysis, U.S. Treasury Department, Washington, D.C.

Tax Notes (1982), Special Supplements "Effective Corporate Tax Rates in 1980" (March 1982) and "Effective Corporate Tax Rates in 1981" (August 1982), Arlington, Va.

Tiebout, Charles (1956), "A Pure Theory of Local Expenditures," *Journal of Political Economy* 64, October, pp. 416–24.

U.S. Treasury Department (1977), *Blueprints for Basic Tax Reform*, Washington, D.C.: Government Printing Office.

White, Michelle (1975), "Firm Location in a Zoned Metropolitan Area," in E. S. Mills and W. E. Oates, eds., *Fiscal Zoning and Land Use Controls*, Lexington, Massachusetts: Lexington Books.