THE USE OF EFFECTIVE TAX RATES IN TAX POLICY**

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A very substantial literature has emerged in recent years on effective tax rates. We have seen important theoretical developments, data developments, extensive numerical calculations, and valuable sensitivity analysis. Economists who have participated in this literature would like to think that these calculations are useful, but it is important once in a while to take a step back and consider for which purposes they are useful and for which purposes they are not. For reasons discussed in the rest of this paper, the ultimate judgment about the usefulness of effective tax rate calculations depends upon whether one views the glass as half empty or half full.

The first section of this paper summarizes very briefly the major advances made by calculations like these, but the following three sections discuss problems in their use for policymaking. One section summarizes some of the standard caveats in the academic literature on effective tax rates, and another section adds a different set of caveats about their interpretation by policymakers. It suggests that the analyst may want to switch over to a measure that provides the same information, namely the "cost of capital," when presenting results to policymakers. A final section discusses some of the many omissions from the model that limit its use for analyzing detailed provisions.

Given the large number of theoretical and policy-related caveats that surround the use of effective tax rates, as summarized in this paper, the more appropriate topic might be "How *Not* to Use Effective Tax Rates in Tax Policy." To keep these caveats in perspective, however, the next section reviews the truly major advances made possible by these calculations.

Major Advances

It has long been recognized that investment incentives are affected by changes in statutory tax rates, investment credits, depreciation allowances, and other tax provisions. Until only a few years ago, however, economists and policymakers were largely at sea when it came to comparing the net effects of even major changes in these provisions. Some analysts would compare alternative tax systems on the basis of the percentage of acquisition price recovered through depreciation allowances within some fixed period such as five years. Other more sophisticated analysts might compute the present value of depreciation allowances under different tax regimes or for different international competitors. Also, actual tax payments were frequently used to calculate "average effective tax rates" for different countries, even though some of those taxes may not relate to the expected future tax on the income from a marginal investment currently under consideration.[1]

None of these concepts quite captured the desired measure of investment incentives. Neither the speed of depreciation recovery nor the present value of allowances could capture the net effects, for example, of lengthening depreciation lives and lowering statutory rates. Actual tax burdens might be used to compute the average effective tax rates in different countries, but actual burdens are not available to compute average effective tax rates for hypothetical tax regimes within one country. Also, measures of corporate tax burden miss entirely the possibility that shifts from corporate taxation to personal taxation could leave unchanged the total tax on income from capital.

An appropriate but aggregate measure of investment incentives has been available since the pioneering work of Hall and Jorgenson (1967). Their formula for the cost of capital incorporates the net effects of statutory rates, investment tax credits, and the degree to which depreciation allowances are accelerated relative to an estimate of economic depreciation. It shows the pre-tax rate of return that must be

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earned over the life of the investment to cover all taxes plus the required after-tax yield.

It was not until disaggregate estimates of economic depreciation rates were made available by Hulten and Wykoff (1981) that researchers began to realize the usefulness of this formula for estimating effective tax rates on different assets or industries. The "marginal effective tax rate" emerged, measured as the proportional difference between the pre-tax and post-tax rates of return. Since that time, there has been a veritable flood of papers seeking to refine the methodology, disaggregate the data, extend the calculations, apply them to new problems, and test the sensitivity of results.[2]

Where the original cost of capital formula focused attention on aggregate capital formation, the availability of disaggregate effective tax rates has focused attention on its allocation. Calculations inside and outside of government have shown wide variations in effective tax rates among assets. These calculations probably have served to increase the perception that the current tax system greatly interferes with firms' decisions about the efficient mix of equipment, structures, and other types of assets. Effective tax rate calculations have played a major role in setting the stage for a tax reform effort that repeals asset-specific credits and lowers statutory rates.[3]

Further disaggregation by source of finance has focused attention on financial arbitrage, the efficiency cost of misallocated risk bearing, and distorted financial decisions. Equity-financed investments are shown to have large positive effective tax rates associated with the double taxation of corporate-source equity income, while debt-financed investments are shown to have large negative effective tax rates associated with nominal interest deductions taken at a high statutory corporate rate. This wide discrepancy has increased the perception that taxes on real investments of high-bracket taxpayers can be avoided by selling debt to low-bracket taxpayers. Thus effective tax rate calculations have also played a role in reform of tax shelters.

The literature extended the effective tax rate concept to encompass not only federal corporate taxes, but also state corporate taxes, state and local property taxes, and all levels of personal taxes on interest income, dividends, and accruing capital gains. The model was expanded to include not only the corporate sector, but also taxes on investment in the noncorporate sector and in owner-occupied housing. The model was expanded also to include not just different types of equipment and structures, but inventories, land, and even intangible assets. Elaborate weights were developed to take averages across these marginal investments. Also, several methods and considerable arguments were generated on how to incorporate both debt and equity into the firm's decision about the optimal source of finance and in the individual's decision about the optimal portfolio mix.

The elaboration of this type of model has been extremely useful, for example, in sorting out the net effects of large, complex, and controversial tax changes such as those proposed successively by the Treasury, the President, the House, and the Senate. The newly-available detail in these models allowed them to capture not only the major changes in statutory corporate and personal tax rates, investment tax credit rates, and depreciation schedules, but also to capture a partial deduction for dividends paid and partial or full indexation of depreciation allowances, capital gains, and even interest.

While this type of model represents a considerable improvement over previously available economic tools, it still omits aspects of the tax code that are important to policymakers, even aspects that directly affect marginal investments. It is therefore important that these calculations not be oversold, or even allowed to be over-bought. For this reason, the next sections review some caveats to keep in mind.

Theoretical Problems

Much of the academic literature recognizes important conceptual caveats in the calculation of effective tax rates. In particular, these rates are sensitive to

choices about the after-tax rate of return, the assumed rate of inflation, the derivation of personal tax rate parameters, and the nature of expectations. It is typical in this literature to assume static expectations, in the sense that a single inflation rate and profit rate are expected for all future time. Also, as pointed out in Bradford and Stuart (1986), individual investors are assumed to believe that the tax regime remains fixed, in spite of the increasing frequency of tax law changes in recent years. While purely static expectations are clearly not the "right" assumption, no single other expectational assumption is clearly better or more tractable.

Many of the calculations also assume that firms minimize taxes. For example, in order to calculate the present value of depreciation allowances, the model may assume that firms use the minimum available depreciation lives. Similarly, firms might use LIFO rather than FIFO inventory accounting. At the same time, however, the model may not assume that firms minimize taxes in other respects, such as by using only debt finance or even by avoiding all dividend payments.

It is particularly difficult in this kind of model to determine what proportion of marginal investment is undertaken by firms that expect adequate tax liability to use all of their credits and deductions, and what proportion of marginal investment is undertaken by firms that do not expect to have sufficient tax liability until some uncertain future date. For this reason, the standard effective tax rate calculation assumes that firms receive full use of credits and deductions associated with the marginal investment.[4] Negative effective tax rates in this context may appear to contradict the fact that corporate tax credits are not refundable, but the firm can receive its net subsidies on new investment in the form of a reduction in the tax it otherwise would have to pay on income from its existing investments. Nevertheless, negative effective tax rates might contradict assumptions of equilibrium in a steady state with a growing number of new assets and no abnormal profits.

Another theoretical stumbling block involves assumptions about risk. Consensus has not emerged on a completely satisfactory treatment of risk, and so a reasonable and simple alternative might be to ignore it all together. Other inconsistencies arise in this case, however, such as in the determination of debt/equity ratios. For example, the model may assume that firms arbitrage between debt and real capital with the result that the required after-tax rate of return to the firm on its equity is matched by the after-tax rate of return of retiring a unit of debt. Then the cost of funds is always the after-tax interest rate. In this case, however, the double taxation of equity means that any individual can earn a higher net rate of return by holding debt. Alternatively, the model can assume that individuals arbitrage away differences in the net rates of return on debt and equity, but then the extra corporate taxes imply that the firm must earn more on its equity-financed investments than on its debt-financed investments. This alternative violates arbitrage conditions at the level of the firm. The choice between individual arbitrage and firm arbitrage has been shown to make some difference in results.

These theoretical problems are only noted briefly here, because they are fairly well explained in the academic literature. In fact, however, they are of little concern to policymakers. Remaining sections concentrate on the particular problems with these concepts that are encountered in trying to use them to help make policy.

Communicating to Policymakers

Various calculations of marginal and average effective tax rates can be useful to measure incentives. They provide considerable information about the effect of taxes on the total stock of capital and its allocation. They can be used to measure intertemporal distortions, intersectoral distortions, and interasset distortions. An aggregate effective tax rate might even provide information about the aggregate burden on capital. However, no industry-specific or asset-specific effective tax rate is useful to provide any information about

effects on horizontal equity, vertical equity, or any other kind of equity. In particular, there is no relevance to any analysis of the "fair" treatment of different assets or industries, only of individuals.

This view may be obvious to economists, but it is not widely understood or accepted among non-economist policymakers. For this reason alone, it is worth repeated clarification and elaboration. To the degree these effective rate concepts are useful, they are embedded in an economic model with assumptions about equilibrium. After adjustments to any particular tax regime, the investor earns the same risk-corrected after-tax rate of return, regardless of the asset or industry. Every individual receives the same net rate of return, and so no individual is treated inequitably or unfairly in equilibrium no matter how divergent the estimates of effective tax rates.

The point to stress is that differences in effective tax rates lead to differences in pre-tax rates of return, not to differences in post-tax rates of return. They are therefore related to issues of efficiency, not of equity.

Average effective tax rates are particularly prone to this kind of misinterpretation. Especially prevalent is the perception that some industries "do not pay their fair share of the tax burden." This perception is very real, and it has an important impact on the policy process, but it is not meaningful. Disparities in effective tax rates get incorporated into the market such that any investor does just as well in an "overtaxed" industry as in an "undertaxed" industry. Indeed, any change to increase the effective rate in a currently "undertaxed" industry might instead be viewed as unfair by imposing windfall losses on investors in that industry.

Average effective tax rates *might* be properly used as an alternative measure of incentives to invest. Relative to marginal effective tax rates, average rates have the advantage of including literally all aspects of the tax code. Still, however, they include taxes on past investment and taxes that are unrelated to investment, not the expected tax on a new investment. Moreover, average effective tax rates are very rarely employed for this proper purpose. Their very calculation uses the terminology of tax burdens and therefore conjures up improper conjectures about fairness. For this reason average effective tax rates are pernicious, and their broad use should be discredited.

Even marginal effective tax rates are similarly misinterpreted. A reason is that policymakers are not nearly so concerned as economists about the efficient allocation of resources, or about Harberger-type efficiency gains. Indeed, even the sum of such efficiency gains is only a few percent of aggregate income. Perhaps appropriately, policymakers are much more concerned that particular groups would gain or lose substantially larger percentages of income. Because of this concern for equity rather than efficiency, policymakers naturally use any available information to help make judgments about the relative size of tax burdens.

There is other information, however, that can appropriately be used to make judgments about the distribution of tax burdens. To help avoid the misuse of marginal effective tax rates, they can be converted to "cost of capital" figures that provide identical information. The cost of capital for these purposes is simply the annual cost of renting a unit of capital, gross of taxes but net of depreciation. It is therefore part of the "*user* cost of capital" which is defined to include depreciation costs. Because rates of depreciation differ among assets, their inclusion in a user cost concept somewhat obscures the desired emphasis on relative tax costs. For example, the higher rate of depreciation on equipment means that its user cost is higher than that of structures, even though the current investment tax credit makes its tax cost lower than that of structures. The cost of capital net of depreciation displays the more intuitive result that the current cost of equipment is less than that of structures.

Thus defined, the cost of capital covers a given after-tax rate of return that is common to all investments, and it covers any of the federal or sub-federal taxes that may differ widely among investments. It is simply the pre-tax rate of return that

is used to calculate the marginal effective tax rate. This recharacterization is not meant to fool anybody, since it is easy to subtract the after-tax rate of return and calculate one's own marginal effective tax rate. Instead, it is meant simply to move away from terms that might have pejorative implications, and to focus attention on incentives.

Economists often refer to the cost of capital as the required pre-tax rate of return. The two terms are only equivalent at the margin in equilibrium, however, because the firm will undertake projects with higher pre-tax rates of return along a falling marginal product schedule until the last investment earns a pre-tax rate of return that is exactly matched by its cost. For the sake of non-economists, it may be best to avoid referring to the pre-tax rate of return in order to help avoid the natural but incorrect inference that the favored asset is the one with the higher pre-tax return.

The cost of capital is a nicely intuitive concept. Simply put, capital investment goes up when its cost goes down. In fact, since the absolute size of any one calculation for the cost of capital has no relevance, users are forced to concentrate only on relative incentives. For example, it has no meaning to say that the cost of capital for equipment is 7.5 percent. The user needs at least two calculations in order to say that the cost of capital for equipment is lower than that of structures, or that the cost of capital for equipment in the U.S. is lower than it is in other countries, or to say how the cost of capital for equipment would be altered by any particular reform.

This suggestion may solve certain problems of communication, but it introduces others. In particular, the interpretation of the cost of capital by policymakers who see and use the calculations may differ from that of economists who did the calculations. Indeed, policymakers probably interpret the cost of capital to include anything that affects investment generally. For example, the imposition of a windfall recapture tax would collect an additional tax from business and might therefore reduce investment. Similarly, any buy-back of outstanding investment tax credits would provide a ready source of funds for firms and might therefore increase investment. These "cash flow" effects are typically omitted from economists' calculations of the cost of capital on the grounds that they do not affect the expected tax on the income from a marginal new investment. Cash flows do affect investment, however, and policymakers' interpretations of the cost of capital would incorporate these effects. Moreover, this non-economists' interpretation provides an appropriate criticism of the economists' cost of capital model, because the ready availability of cash *does* affect the marginal cost of acquiring funds in the absence of perfect capital markets.[5]

In fact, the absence of cash flow effects may be the least of potential problems associated with using cost of capital calculations to make policy, as discussed in the next section.

Omitted Provisions

Even after understanding and agreement have been reached about the cost of capital concept, there remain significant problems in using the economists' model in the policy process. In particular, once policymakers understand that the cost of capital includes only provisions that affect the expected future taxes over the life of a one dollar marginal investment currently under consideration, they might legitimately infer that the calculations include all such provisions. In fact, many such provisions are not included.

Partly because of the advantages of the model described in the first section above, economists might inadvertently lead policymakers to believe that the calculations are more sophisticated than they really are. Those policymakers may understandably be quite surprised to discover that these models do not include fundamental provisions that can or do affect the expected tax on a marginal investment. These calculations often do not include: marginal investment undertaken by corporations that are not in the top rate bracket; any consideration of minimum tax provisions; multi-period production,

cost capitalization rules, or any consideration of accounting provisions other than the choice between LIFO and FIFO; the early sale of depreciable assets and associated recapture taxes; corporate taxes on capital gains or on intercorporate dividends; the expensing of investment in many intangible assets; the effect of the complicated R&D credit; variations in the amount of depreciable investment that can be expensed each year, or the potential effect of raising the cost of capital for marginal investment by firms in the range of income over which these benefits might be phased out; the special treatment of timber, oil and gas, or resource extraction generally, especially provisions for intangible drilling costs and depletion allowances; the special treatment of banks and other financial institutions, especially the effect of allowances for bad debt reserves, tax-exempt interest, and foreign tax credits; the special treatment of insurance companies, both life insurance and property and casualty insurance; rehabilitation credits and low-income housing credits; excise taxes on investment goods; and, transition rules as they affect marginal investment in the years before the final version of a bill takes effect.

Many such calculations omit the household side altogether.[6] Those that do include personal taxes and noncorporate investment often omit: consumer interest limitations; passive loss rules; at-risk rules; special savings incentives such as individual retirement accounts and 401(k) pension provisions; and, any effect on noncorporate investment of other business provisions listed above.

Due simply to the length of this list, it is not possible to expand on every item or to predict its probable effect on a "properly measured" cost of capital. To indicate their importance, however, particular items can be further discussed.

First, an earlier section of this paper mentions that the typical cost of capital calculation assumes the firm has sufficient tax liability to use all credits and deductions associated with the marginal investment. This simplifying assumption may cause certain problems for measuring the cost of capital under current law, but it severely handicaps any effort to compare the cost of capital for current law and for a version of tax reform that would collect significant additional revenue by imposing stiffer minimum tax provisions and/or passive loss rules. These provisions not only have the effect of delaying certain credits and deductions, but they are *designed* to delay certain credits and deductions.

Second, while some cost of capital calculations apply only to equipment and structures, many include inventories as an investment good, with LIFO and FIFO accounting rules. For an equity-financed inventory using LIFO accounting, the effective corporate rate is said to equal the statutory rate. However, many of these inventories are self-constructed, and production is not instantaneous. If labor costs are deducted as incurred, then the investment in the inventory is effectively expensed. The inventory is only taxed at the statutory rate if the associated labor costs are deducted at the time the inventory is sold. In fact, current law does require that wages be deducted at the time the associated inventory is sold, but it allows the cost of fringe benefit programs to be deducted immediately. The typical calculation does not include the effect of immediate fringe benefit deductions that lower the "properly measured" cost of capital. They therefore miss the effects of tax reform proposals that would delay the deductions for that part of labor costs.

For a third example, consider federal excise taxes. Since the great bulk of these taxes apply to consumption goods, they are ignored in cost of capital calculations. Yet at least part of this revenue comes from excise taxes on trucks, an investment good in the transportation services industry. An excise tax on an investment good works exactly like a negative investment tax credit, and it would raise the "properly measured" cost of capital. Its nondeductibility would also raise the cost of that particular investment.

For a final example, on the household side, consider the individual retirement account (IRA). The academic literature is very mixed about the effect of these accounts on the incentives to save at the

margin. In any case, these accounts typically do not play a role in calculations of the cost of capital. Nonetheless, policymakers are naturally incredulous that a provision with an annual revenue cost of $20 billion (in the tax expenditure budget) has no effect on economists' estimates of the overall incentive to save and invest.

In combination, this list of omissions may seem to make a strong case against any use of marginal effective tax rate or cost of capital calculations. The point of this paper, however, is that these limitations must be balanced against the advantages discussed in the first section above. And while the examples of this section are meant primarily to interject more modesty into the presentation of effective tax rates, they also serve to suggest many kinds of research topics for future work.

Conclusion

The discussion in this paper has concentrated most on the marginal effective tax rate or analogous cost of capital. After one section of positive attributes were three sections that each listed many kinds of problems. We reviewed theoretical problems prominent in the academic literature, conceptual problems with the interpretation of these calculations by noneconomist policymakers, and detailed problems in the coverage of tax provisions.

These problems are at least numerous if not weighty, but only the most severe pessimist would conclude that the concept ought to be abandoned. For one thing, the marginal effective tax rate or cost of capital provides the only forward-looking measure of incentives that captures the net effects of truly major tax provisions such as statutory tax rates, investment tax credits, and depreciation allowances. For another thing, abandonment would leave the field open for even more problematic concepts such as the average effective tax rate. Calculations of actual tax burdens include effects of prior tax rules that may not apply to new investment, the effects of prior inflation or profit rates that might not be expected on new investment, the effects of firms' decisions about charitable contributions and other matters that do not bear on capital taxation, and the effect of windfall events not expected to recur.

Moreover, average effective tax rates cannot be used to compare hypothetical tax regimes currently being discussed. In order to estimate the actual tax burden under a proposed system, one would have to employ a very large micro data set not generally available, and to make assumptions about rates of return and rates of inflation. Such forward-looking calculations would essentially *be* marginal effective tax rates. Finally, average effective tax rates are especially prone to incorrect interpretations about the fair share of tax burdens among industries. Since individuals can earn the same post-tax rate of return in all industries, differences in effective tax rates generate differences in pre-tax rates of return. They thus involve only efficiency considerations and not equity considerations. The same kinds of misinterpretations about marginal effective tax rates lead to the recommendation that the same information be conveyed in the form of a calculation for the "cost of capital."

The only real conclusion is that there is no substitute for good judgment. Cost of capital calculations need to be performed in order to provide some kind of summary measure for purposes of comparison. They are not statistical concepts with confidence intervals, however, so they appear more precise than they really are. Indeed, observers should ignore at least the third digit, if not the second. The numbers are extremely useful in coming to a summary judgment about tax reform, but any decision about tax reform should be based not on whether it increases or decreases the cost of capital as measured in one of these models, but on whether it's a good reform.

FOOTNOTES

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[1]See Fullerton (1984) for a review of some literature on average effective tax rates and marginal effective tax rates, and for a discussion of some of the distinctions between these two concepts.

[2]See, for example, Auerbach, (1983), Auerbach, and Jorgenson (1980), Bradford and Fullerton (1981), Bradford and Stuart (1986), Feldstein, Dicks-Mireaux, and Poterba (1983), Feldstein and Summers (1979), Fullerton (1985), Fullerton and Henderson (1984), Gravelle (1981, 1982), Hendershott (1985), Henderson (1985), Hulten and Robertson (1984), King and Fullerton (1984), Marovelli (1986), Spooner (1986).

[3]Variations in effective tax rates do indicate something about resource misallocation, but it takes an additional large step to try to measure the dollar value of the associated cost in efficiency. These costs depend heavily on behavioral elasticities and other modeling choices. In fact, wide variations in effective tax rates may appear to create more efficiency costs than they really do. Also, effective tax rate calculations by themselves do not point out that efficiency costs vary with the square of the effective tax rate discrepancy. Thus the first steps toward equalization (such as repeal of the ITC) may be much more important than the last few steps (such as placing every asset in a depreciation class that exactly matches its economic life).

[4]See, however, Auerbach and Poterba (1986).

[5]Note that this reason for concern about the windfall recapture tax differs from that in Bradford and Stuart (1986). They point out that a windfall recapture tax might raise expectations that the government could in the future change the tax on the income from the marginal investment now under consideration. The point here is that a current windfall recapture tax could reduce the availability of funds and therefore raise the financial cost of making new investments.

[6]Such a model may be quite appropriate in the context of open international capital markets and a fixed worldwide rate of return.

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