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The Interaction of Financial and Investment Decisions When the Firm has Unused Tax Credits: Discussion

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derivative with respect to i of the product XY . This derivative is clearly negative since the sum of these elasticities has been found negative and the value of $i/(XY)$ is positive.

Finally, the negative sign of the last term in (6) reverses the negative effect of i on the product XY , causing V to increase with i .

Appendix B

The effect of n on V is confined to the last term in (6) [or (8)], and can be readily determined by recasting the second expression enclosed in brackets.

Let m be a differential rate of interest defined by $1 + m = (1 + i)/(1 + r)$, such that the second expression in brackets can be restated as

$$\left[\frac{(1 + m)^n - 1}{m} \right] \frac{1 + m}{1 + i}$$

and the entire last term of (6) as

$$-\tau(1 - P) \left[\frac{i}{(1 + i)^n - 1} \right] \left[\frac{(1 + m)^n - 1}{m} \right] \frac{1 + m}{1 + i}$$

Since $r > 0$, and therefore $i > m$, the absolute value of the product of the two symmetrical expressions in brackets is inversely related to n . With a negative sign preceding the last term, V is clearly increasing in n .

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DISCUSSION

ALAN J. AUERBACH*: As is true in most countries where there is a corporate tax, the U.S. corporate tax system treats gains and losses asymmetrically. While

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gains are taxed immediately, losses result in an immediate refund only to the extent that they can be "carried back," that is, used to offset income on which taxes were paid during the previous three years, in order to obtain a "refund" of these taxes. Otherwise losses must be carried forward, which subjects the firm to two disadvantages. First, losses cannot be carried forward indefinitely; since 1981, the maximum carryover period in the U.S. is fifteen years. Second, losses that are carried forward do not accrue interest, so there is a deferral disadvantage involved even if all such losses are eventually used to offset otherwise taxable income before they expire.

The silver lining to this dark cloud, at least from the firm's perspective, is that once created, this overhang of net operating loss (NOL) carryforwards can act as a shield against taxes otherwise due on the income from prospective new investments. As the authors show in equation (1), the effective tax rate on income in some future state of the worlds equals the statutory rate only if the firm's taxable income is positive. Otherwise, it is strictly less than this rate, and is solved for recursively by looking at the effective tax rates in the states of the world occurring in the next period, to which the current period's losses are carried over. In the most extreme case in which a firm never expects to pay taxes in any future period, this recursion leads to the expected result of a zero effective tax rate for the firm.

The implications of this result depend on how likely it is as an equilibrium outcome. In some circumstances, firms will always find it profitable to drive themselves to the point of being fully taxable. One example the authors cite is if a "Miller equilibrium" prevails. In this most extreme case, the avoidance of tax losses is costless and undistortionary as well. Each firm's cost of capital is what it would be under a symmetric corporate tax, provided that there are enough taxable firms in the aggregate to supply the debt that households desire to hold.

More generally, however, tax losses cannot be avoided costlessly, and firms will distort their behavior as they seek to offset them. (For example, firms may find it profitable to repurchase their debt to the point of being taxable only to the extent that the funds to do so are internally generated coming at the expense of taxable dividends rather than new share issues.) One common example the authors cite is the overinvestment in projects that would yield a negative present value with flows fully taxable. Such behavior will not necessarily result in sufficient additional taxable income to use up the firm's loss carryforwards. Indeed, at its optimal level and mix of investments, a firm may still face no taxation for many years to come. This poses serious problems from the perspective of economic efficiency, as corporations with loss carryforwards accept projects with a lower discount rate than some rejected by taxable firms.

This is especially true since the passage of the Economic Recovery Tax Act of 1981. There is no longer any guarantee that all firms should expect to pay taxes, at least in the future. There are two reasons for this. First, depreciation allowances are accelerated relative to economic income. Thus, if a firm grows at a sufficiently high rate (in terms of investment as a proportion of income or capital) it will not reach a taxable state until its growth slows down. It may face a positive tax rate in present value terms but taxes needn't ever actually be paid. This possibility has long been recognized. Second, and perhaps more fundamental, many invest-

ments now face a negative tax rate (see Auerbach [1]), in the sense that the required return on investment is lower than it would be were the corporate tax simply abolished. A firm investing chiefly in such assets may face a future of no taxes, ever, even under certainty. This is true even if the firm chooses to issue no debt at all. Interest deductions make this result even more probable.

It is not surprising in light of this fact that much attention has been focused recently on methods of tax loss transfer. One, leasing, has received statutory recognition, playing a special role in both the 1981 and 1982 tax acts. As the authors suggest, leasing is a way for firms in different tax brackets to trade for mutual benefit, at the expense of the IRS. However, though their analysis of financial leasing is interesting, it does not focus on the motivation for what has actually been occurring in the U.S. in the years since leasing rules were relaxed.

Cooper and Franks focus on the effects of leasing decisions on the effective tax rate a potential lessee faces. This is only one aspect of the leasing question, and probably not the one most important in the current context.

For a permanently tax-exempt firm (where there is no motive to trade resulting from a *change* in tax rates over time), the decision of whether to own or lease may be thought of as a determination of whether it has a lower cost of capital than the taxable firm. In a competitive market, the rental price of capital should equal the marginal product of capital since both are fully taxable to the lessor. Thus, the lease payment that a taxable lessor deems acceptable is what it would require if producing itself. If the tax exempt firm would require more, it is better off letting the taxable firm own the capital and limiting its own role to that of a conduit for production quasi-rents. But how can a *taxable* firm face a lower cost of capital than a tax-exempt firm? Through negative tax rates.

This result is most easily demonstrated in a two-period model without transaction costs. In this case, the condition for a tax-exempt lessee ($\tau^* = 0$) to approve a lease is that the present value of depreciation deductions must be equivalent to immediate expensing. This is the condition for the taxable firm to face a zero effective tax rate. More generally, if there *is* an advantage to debt finance in the presence of taxation, the taxable firm will face a still further advantage relative to the tax exempt firm. It is only these factors that can explain the substantial amounts of leasing that occurred between the passage of the 1981 and 1982 tax acts under "safe-harbor" leasing (see Warren and Auerbach [2]). Many of the large companies acting as lessees had such enormous tax loss carryforwards that the subtle issue on which the authors concentrate was inapplicable.

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