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A NOTE ON THE EFFICIENT DESIGN OF INVESTMENT INCENTIVES

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ABSTRACT

The importance of investment, both as a component of output and a cause of business fluctuations, has led to government introduction, in many countries, of a range of tax incentives aimed at stimulating capital accumulation.

Many authors have invoked the concept of "neutrality" in evaluating different incentive schemes. One view of what constitutes a neutral tax system suggests that all projects undertaken at the margin have the same present value of gross returns, discounted at the consumption rate of discount. This note discusses the difficulties involved in a recent attempt to apply this notion of neutrality to problems of tax design.

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I. Introduction

The importance of investment both as a component of output and a cause of business fluctuations has led to government introduction, in the U.K., the U.S. and many other countries, of a range of tax incentives aimed at stimulating capital accumulation. Because investment goods are durable, and vary with respect to asset life, a critical issue which has generated much discussion in the literature on capital taxation is the relative treatment of long-lived and short-lived assets.[1] Many authors have invoked the concept of "neutrality" in evaluating different incentive schemes, and in the past two distinct notions of what constitutes a neutral scheme have been advanced. One view is that an investment incentive is neutral if it has the same proportional effect on internal rates of return of different projects.[2] The other approach requires an equiproportional impact on the "user cost" of different assets.[3] While intuitive arguments can be offered in support of each approach, the prescriptions of one contradict those of the other, and both views are of an ad hoc nature not relating directly to any calculation of a social optimum.

In a recent article in the Economic Journal,[4] Robin Boadway has argued that the appropriate requirement for neutrality is that the present value of the returns from an initial investment of £1, using the social discount rate, should be equal for all projects undertaken at the margin. We have few qualifications about this approach itself; although discounting with the social rate of time preference (STP) may be inappropriate in the current context. However, we would take issue with two aspects of Boadway's application of his view of neutrality. The first problem concerns the appropriate definition of the constraint on firm leverage which would arise from the existence of limited liability. We believe Boadway's assumption to be inappropriate, and find that

applies in the current context, one might criticize Boadway for his approach.

There are cases in which Boadway's criterion does turn out to be appropriate. As Kay (1972), drawing upon the work of Arrow (1966), has demonstrated, if one assumes that a constant fraction s of all project returns are reinvested at the given SOC, denoted p (> sr), the present value of a project in terms of eventual consumption is:

$$PV_i^* = PV_i \cdot \frac{p(1-s)}{p-rs} \qquad (2)$$

where PV_i is as defined in equation (1). Thus, equality of PV* among projects is achieved if and only if equality amont the basic PV's is satisfied. However, the assumption that s is independent of project choice, while perhaps accurate for smaller problems of expenditure evaluation, is less appealing when we consider corporate investment as a whole, for it implies that the aggregate time stream of consumption is dependent on the durability of capital.

While we consider this an important issue in itself, further treatment lies beyond the scope of this note. We therefore accept Boadway's criterion for the remainder of our discussion.

III. Interest Deductibility and the Borrowing Constraint

In the absence of uncertainty and personal taxes, the ability of corporations to deduct interest payments from taxable income makes debt strictly preferable over equity as a financing method. Clearly, some constraint is required to prevent firms from engaging in infinite borrowing. Boadway assumes that firms are constrained to keep the amount of their outstanding debt A at or below the size of their capital stock:

$$A \leq K \qquad (3)$$

$$v_t = \int_t^{\infty} e^{-\rho(s-t)} E_s ds \tag{4}$$

The value to the firm from undertaking a project at time zero, denoted w_o, is the increment to equity value deriving from future receipts, v_o, plus the receipts from the initial flotation of debt, A_o. To derive an expression for this sum, we first differentiate (4) with respect to time, getting:

$$\rho v_t = E_t + \dot{v}_t \tag{5}$$

Letting x_t be the rate of cash flow at time t ignoring increments in the stock of debt, A_t, and interest payments net of tax, (5) becomes:

$$\rho v_t = x_t + \dot{A}_t - r^G(1-u)A_t + \dot{v}_t \tag{6}$$

where r^G is the gross nominal interest rate (equal to r when there are no personal taxes or inflation associated with the project). Letting b be the ratio of the value of debt at time t to the value of debt + equity,[9] we may rewrite (6) as:

$$i(v_t + A_t) = x_t + (\dot{v}_t + \dot{A}_t) \tag{7}$$

where

$$i = br^G(1-u) + (1-b)\rho \tag{8}$$

is a weighted average cost of capital. Under the usual convergence assumption, (7) yields:

$$w_o = \int_o^{\infty} e^{-it} x_t dt \tag{9}$$

Since x_t does not depend on the fraction b, we may easily derive the "user cost" of capital for the firm as a function of b by maximizing w_o less the initial cost of investment goods, for i given, and then evaluate the expression we obtain for different assumptions about b, and hence i.

investments. Investment Allowances and the gross ITC without basis adjustment favor short-lived investment using our calculations, contrary to Boadway's certification of neutrality.

IV. Personal Taxes

All of the above discussion is really beside the point, in a way, since few would argue that a realistic analysis can be conducted while ignoring potentially high rates of inflation and personal taxation. Even maintaining Boadway's assumptions that b=1 and π=0, economic depreciation is not neutral with personal taxes present. We get the following expression for the cost of capital from the last entry in Column 3 of Table 1:

$$c = r^G + \delta \tag{11}$$

Letting t_p be the personal tax rate on interest income, so that

$$r = r^G(1-t_p) \tag{12}$$

(11) becomes

$$c = r\left(\frac{1}{1-t_p}\right) + \delta \tag{13}$$

which implies that economic depreciation is neutral if and only if $t_p = 0$.

If we were to consider the more general problem of a firm using mixed finance, we would first need to explain the existence of an interior solution to the choice between debt and equity. One solution would be to assume the existence of some constraint that b not exceed some value b* between 0 and 1. In such a case, if we still maintain the assumption that π=0, the cost of capital would be:

of neutral incentives becomes much more complicated once realistic allowance is made for the presence of inflation and personal taxes.

Footnotes

*I am grateful to John Flemming , Robin Boadway and Julian Alworth for comments on earlier drafts.

[1]While discussion has tended to focus on the corporate sector, most incentives, at least in the U.S. (including the investment tax credit and accelerated depreciation) apply to the unincorporated sector as well. We shall follow the usual approach since most nonresidential investment is done by corporations.

[2]This is the criterion used by Musgrave (1959) and Harberger (1979), among others.

[3]See, for example, Sunley (1973) or Sandmo (1974).

[4]Boadway (1978).

[5]Known as "expensing" in the U.S.

[6]Alworth (1979), in criticizing Boadway's approach, has suggested as a third alternative for the constraint on debt the amount the firm would realize by selling its assets, taking account of deferred capital gains taxes on such a sale. This value would be lower than the firm's market value unless the firm actually would choose to sell its assets, which does not appear to be the usual case. Thus, Alworth's restriction will normally result in the firm's equity having a positive value. Such a constraint is therefore not related to the limited liability of the firm as such, but might represent the convention of lending institutions who look at balance sheets rather than market value.

[7]Boadway (1978), page 473, footnote 3.

[8]A complete version of the analysis which follows appears in Auerbach (1979 b).

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