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Income derived from corporate equity that is used to pay dividends is taxed more heavily than are corporate interest payments or income derived from investment in the noncorporate sector.[1] Similarly, if retentions of corporate earnings result in long-term capital gains, dividends carry an aggregate tax burden greater than that on retained earnings.[2] The differential taxation of dividends and retained earnings can be expected to influence the dividend payout ratios of corporations. Beyond that, if firms have relatively high payout ratios or if combined (personal and corporate tax) rates on capital gains are high, earnings on corporate equity will be taxed more heavily than interest on corporate debt. If this occurs, we can expect debt-equity ratios to be skewed toward the issuance of more debt. Finally, depending upon several conditions—the relative reliance upon debt and equity finance in the corporate sector, retention rates, and the combined marginal tax rates on corporate debt, distributed earnings, and retentions—capital income originating in the corporate sector can be taxed

[1] Under present law the marginal rates applied to ordinary income range from 0 to 70 percent. Thus the combined rate on distributed earnings ranges from 48 to 84.4 percent.

[2] The combined rates under the corporate income tax and the capital gains tax range from 48 percent to 73.5 percent. If we ignore gains and losses attributable to other causes, retentions theoretically should be reflected in capital gains. See Bailey (1969) for evidence that this has indeed happened historically.

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either more or less heavily than that originating in the noncorporate sector, with consequent effects on resource allocation and outputs of the two sectors.

In 1962 Harberger presented a general equilibrium model of incidence intended to capture the reallocation of capital that occurs in response to the differential taxation of capital in the corporate and noncorporate sectors. In designing the model he assumed that investors are indifferent between investments in the corporate and noncorporate sectors (though they may require a risk premium to reflect relative risks in the two sectors) and thus earn the same net return in the two sectors (again allowing for risk). Employing this model Harberger found that the corporate income tax reduces the total return to capital by approximately the amount of the tax, i.e., that capital bears the burden of the tax. Particularly noteworthy is Harberger's conclusion that the corporate income tax is born by the owners of *all* capital, not just owners of corporate shares.

Harberger's model makes no distinction between debt and equity capital in the corporate sector and barely refers to the preferential treatment of retained earnings under the capital gains tax. Thus, it can at best deal only with the intersectoral reallocation of capital; it can give no clues as to how the differential taxation of corporate debt, dividends, and retentions affects the financial structures of firms or how tax-induced readjustments of financial structures can affect the cost of corporate capital—questions that are important not only in their own right, but also as intermediate problems to be addressed in the process of answering such traditional questions as the incidence and resource-allocation effects of taxation. Finally, the traditional Harberger model can shed little light on the effects of various schemes for integration of the corporate and personal income taxes.

This paper adds to the Harberger model a more realistic description of the corporate financial decision.[3] We retain the two-sector model developed by Harberger, but allow for two distinct types of corporate securities—debt and equity. The return to the latter is composed of two components, dividends and retained earnings. As in the real world, gross corporate income is subject to the corporate income tax, and dividends are subject to the personal tax rate. Retentions are assumed to be taxed at some fraction of the personal rate. Capital in the noncorporate sector is

[3] After this paper was essentially completed, a paper by Feldstein, Green, and Sheshinski (1977) that discusses similar issues came to our attention. While we employ a static two-sector model, they employ a one-sector growth model.

financed solely through the issuance of a financial asset, the income from which is subject to the personal income tax. For simplicity, we assume that the personal income tax is proportionate to income.

The key theoretical conclusion of this paper is that because investors do not see corporate debt, corporate equity, and investment in the noncorporate sector as perfect substitutes, the net rates of return on all these uses of capital need be neither equal nor affected equally by the corporate tax. Indeed, *owners of corporate shares bear proportionately less of the long-run burden of the corporation income tax than do investors in the noncorporate sector*. That is, the burden of the corporation income tax is overshifted to noncorporate investors rather than shared equally by all capitalists, as in Harberger's analysis.[4] Investors in corporate debt, like corporate shareholders, bear less of the tax burden than Harberger suggested. The practical significance of these conclusions is, of course, that the corporation income tax is even less progressive than the Harberger analysis suggests, and the Harberger analysis itself is less progressive than if the tax were merely borne by shareholders.[5] [6]

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[4] This result is suggested by the following quotation from Barzel (1976):

> The corporate income tax is fundamentally an ad valorem tax. When such a tax is imposed or raised it can be evaded in part by switching to corporate financing based more on debt and less on equity. The risk borne by equity holders will then increase. The measured rate of return to equity, reflecting this risk, might exceed the change in the tax rate, giving the impression of more than 100 percent shifting. (p. 1185)

It seems unlikely that the return to equity would rise by enough to suggest more than complete shifting. (Our reference to overshifting should be interpreted as being relative to the Harberger result of diffusion to all capitalists.) Moreover, Barzel does not mention the increase in risk premiums paid to debtholders induced by the rise in the debt-equity ratio.

[5] Harberger (1962) explicitly recognized the possibility that risk premiums might be affected by differential taxation, but he dismissed the problem as unimportant:

> . . . we must make clear that the "equalization" which our theory postulates is equalization net of such risk premiums. So long as the pattern of risk differentials is not itself significantly altered by the presence of the corporation income tax, our theoretical results will be applicable without modification. And even if the pattern of risk premiums applying to different types of activities and obligations has changed substantially as a result of the tax, it is highly likely that the consequent modification of our results would be of the second order of importance. (p. 137)

Our analysis could be interpreted as an attempt to determine whether this dismissal was ill-advised.

[6] The increase in risk premiums may help to explain Krzyzaniak and Musgrave's (1963) extremely high estimate of shifting of the corporate tax. Whereas they regressed the profit rate on the tax rate (and other variables), it might have been preferable to employ two-stage least squares to determine the influence of taxation on the corporate debt-equity ratio and then to regress the profit rate on the tax rate and the debt-equity ratio resulting from

We initially explain our addition of a corporate financial sector in the context of Harberger's standard differential equation model. But we estimate the effects of the present differential taxation of corporate-source income using a formulation of that model that allows us to simulate the exact effects of finite changes in taxes. Whereas Shoven (1976) has shown that linear approximations based on Harberger's model are reasonably accurate, there is no a priori reason to believe that the accuracy of the analogous linear approximations of the effects on financial structure and various return to capital are equally acceptable.

The next section of this paper contains a review of the literature on corporate financial structure and its response to taxation that is particularly relevant to our problem; it also gives a description of a model of corporate financial policy in the presence of taxes and the risk of bankruptcy (especially the firm's choice of an optimal debt-equity ratio) that is consistent with the main threads of that literature. A third section describes how the model of corporate financial policy can be integrated with the standard Harberger model; an important attribute of the model presented here is that the parts of the model describing input and output choices and those describing financial structure can be separated. This separability does not imply that input and output decisions are independent of financial decisions; because the firm's financial structure determines its cost of capital, input combinations and output decisions depend on financial decisions. But the influence runs in only one direction. Optimal debt-equity *ratios* (and dividend-payout ratios) depend upon differentials in taxation but not upon levels of inputs or outputs.

In a fourth section of this paper we discuss the interpretation of the analytical results obtained using our augmented Harberger model. In a fifth section we employ our model to examine the effects of several schemes that have been suggested to eliminate the double taxation of dividends, including full integration of the corporate and personal income taxes. In order to analyze integration we must add a description of the corporate choice of a dividend-payout ratio. In the final sections of this paper we describe the technique used to simulate the effects of the present tax system and integration and present and interpret the results of that simulation.

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the first stage (plus other variables). Of course, the speed of adjustment of risk premiums needed to make this a reasonable explanation may be unrealistically high.

Financial Policy and Taxes

A substantial amount of literature is devoted to the proposition that under certain conditions the value of a firm is independent of that firm's financial structure, i.e., that there is no optimal debt-equity ratio.[7] An important corollary of that proposition is that the firm will finance its operations entirely from the source of funds that bears the lowest rate of taxation, i.e., that firms will be financed 100 percent from debt, given present patterns of taxation.[8] A further implication of this line of reasoning is that the corporation income tax does not exert the distortionary influences described earlier, because it does not affect the marginal cost of capital.[9]

Crucial to all demonstrations of the so-called Modigliani-Miller (1958) hypothesis of the irrelevance of corporate financial structure is the assumption that bankruptcy is impossible. As Stiglitz (1972) has shown, if there is a positive probability of bankruptcy, corporate financial structure is not irrelevant for the valuation of the firm, and there is an optimal debt-equity ratio. Of more immediate relevance for present purposes, if bankruptcy is possible, as Stiglitz has noted, ". . . the tax advantages of debt would increase the debt-equity ratio from what it would have been otherwise, but would not result in the firm going to an 'all debt' position" (Stiglitz, 1973, p. 23). The corporation income tax is not, therefore, irrelevant in a world in which bankruptcy is possible. Scott (1976) has attempted to model both the firm's choice of an optimal debt-equity ratio and the response of that optimal ratio to the differential taxation of debt and equity in a world in which bankruptcy is possible. He found that the optimal debt-equity ratio is an increasing function of the corporate tax rate.

Our description of the optimal debt-equity ratio is in the spirit of the analyses by Stiglitz and Scott. But it abstracts from many complexities in order to simplify the analysis and focus attention on our key purpose—integrating the corporate financial decision into a general equilibrium model of incidence. In particular, Stiglitz and Scott use partial equilibirum analysis to consider the implications of taxes and/or the risk of bankruptcy on the firm's optimal debt-equity ratio; but because of the complexity of the problems, they have difficulty obtaining comparative-statics re-

[7] See Modigliani and Miller (1958) for the initial statement of this theorem and Stiglitz (1974) for a restatement under less restrictive conditions.

[8] See Stiglitz (1973) for an elegant demonstration of these conclusions.

[9] See Stiglitz (1973).

sults, and they make no pretense at general equilibrium analysis. By comparison, our description of the risk of bankruptcy is deliberately vague and somewhat ad hoc, and it is based ultimately upon the availability of empirical estimates of key parameters. But we are able to employ it in a general equilibrium analysis from which we obtain comparative-statics conclusions about the incidence and financial effects of taxation. We assume (a) that investors are not indifferent to the corporation's debt-equity ratio, but demand increasing risk premiums on both debt and equity as the debt-equity ratio rises, and (b) that the firm minimizes the cost of obtaining the amount of capital it needs by adjusting its debt-equity ratio. Shareholders require larger returns as the debt-equity ratio rises because the increased fixed charges for interest inherent in increased leverage implies an increased coefficient of variation of equity earnings. Bondholders require a higher interest rate in the same circumstances because the increased coefficient of variation in earnings implies a greater likelihood of suspension of payments—and, ultimately, bankruptcy.[10] With this background we can describe our model of corporate financial behavior.[11]

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[10] Tambini (1969) has stated this well, noting that risk premiums rise with the debt-equity ratio:

The main problems are whether, why, and by how much the marginal cost of debt and equity differ from their average costs. These are different stages of the same question. The basic point is that a change in financial structure affects the riskiness of corporate capital, that is, of debt and of equity, and so it affects their required rates of return and their cost to corporations. In particular, an increase in debt financing, or leverage, increases the riskiness of the firm (and vice versa for a decrease in leverage), and therefore the risk for debt-holders (lender's risk) and the risk for stockholders (borrower's risk). The main reason for the change in the lender's and borrower's risk is that, given the probability distribution of expected income from capital, the payment of fixed charges, like interest, leaves the dispersion of the distribution of corporate profits unaffected, but with a smaller mean. The ratio of the standard deviation to the mean of profits—the coefficient of variation—provides us with one measure of risk. On the assumption that stockholders have an aversion to risk and prefer a more certain to a less certain income stream, an increase in debt, by increasing the coefficient of variation of earnings of equity-holders, would cause an increase in borrower's risk. Similarly, an increase in the coefficient of variation of earnings increases the probability of negative profits, of a suspension in interest payments, and therefore of lender's risk. Of more weight still is the fact that the increase in the coefficient of variation increases the probability of gambler's ruin, i.e., of bankruptcy on the assumption that bankruptcy is a function of the total "loss" accumulated over one or more years.

A second (possibly alternative) measure of risk for debtholders and stockholders is the ratio of debt to the market value of equity, D/E. The meaning of the ratio is intuitive for debtholders, as the market value of equity can be viewed as an estimate of what is left after having paid all other claimants: it is therefore a cushion or a measure of security. Since equity is the present value of expected profits, an increase in the D/E ratio increases the probability of bankruptcy, and hence borrower's risk. (p. 196)

The Model

Corporate capital (K_x) can be financed from either debt or equity. Let E be that portion of the capital stock in the corporate sector that is financed by equity and B, the portion financed by debt. Thus

$$K_x = B + E. \tag{1}$$

The cost of debt capital in the corporate sector (P_{bx}) is given by the following simple expression:

$$P_{bx} = i_b(1 + t_b), \tag{2}$$

where i_b is the net of tax return and t_b is the personal tax rate applied to interest payments, there being no corporate tax on interest.[12] [13] At this point we do not distinguish between retentions and dividends and differences in their taxation. Thus, the analogous expression for the cost of corporate equity capital (P_{ex}), to be elaborated further in a later section, is:

$$P_{ex} = i_e(1 + t_e), \tag{3}$$

where i_e is the net of tax return on corporate equities and t_e is the aggregate (corporate and personal) tax rate applicable to the return to equity capital.

Combining equations (1), (2), and (3), we can write the following expression for the cost of a given corporate capital stock:

$$K_x P_{kx} = i_b(1 + t_b)B + i_e(1 + t_e)E. \tag{4}$$

The net return to corporate equity (i_e) and the net interest rate on corporate debt (i_b) depend (positively) upon the corporate debt-equity ratio (B/E), reflecting the risk of bankruptcy associated with leverage. That is, taking the net return to capital in the noncorporate sector (i_n) as a benchmark, we express the

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[11] Tideman and Weber (1977) employ a similar description of the corporate financial decision, but utilize it to examine the effects of integration on saving rather than incidence.

[12] In describing the financial sector it will be convenient to use i, properly subscripted, to indicate *net returns* to various forms of investments and to build up *costs* of capital from the net returns and relevant taxes.

Besides allowing us to avoid extremely messy notation, this convention helps to highlight the separation of the real and financial parts of the model discussed further later.

[13] Both the return to noncorporate capital and interest on debt are presently subject to the personal income tax. Thus, we could set t_{ky} and t_b equal to each other and the (constant) marginal personal tax rate t_p. We do not do so at this point because maintaining separate notation will allow us better to identify the roles played by various differentials in taxation.

ratios of i_e to i_n and i_b to i_n as increasing functions (f and g) of B/E:[14]

$$i_e = f(B/E)\, i_n, \tag{5}$$

and

$$i_b = g(B/E)\, i_n. \tag{6}$$

Given this state of affairs, the firm attempts to minimize the cost of financing its capital stock by choosing the optimal debt-equity ratio. Substituting from equations (1), (5), and (6) into equation (4) and differentiating with respect to B (which is equivalent to differentiating with respect to B/E, since B+E is constant), we obtain the following first-order condition:

$$i_b(1+t_b) - i_e(1+t_e) + i_n\left(1+\frac{B}{E}\right)\left[g'\frac{B}{E}(1+t_b) + f'\ (1+t_e)\right] = 0. \tag{7}$$

This expression has a ready explanation. A change in the amount of capital financed by debt, given the total corporate capital stock, raises the cost of capital by an amount equal to the cost of debt (the first term), but reduces it by an amount equal to the cost of equity (the second term). But the rise in the debt-equity ratio also induces a rise in both the returns that must be paid on corporate securities. Thus, in total, the cost of capital rises by the difference in the first two terms *plus* the third term, which indicates how the total cost is affected when both debt and equity become more expensive because of investor reluctance to invest with the higher debt-equity ratio.

Figure 1 may assist in understanding our analysis of the firm's choice of optimal financial structure. In it we measure the fraction of the firm's capital stock that is debt-financed $\left(\frac{B}{B+E}\right)$ along the horizontal axis from the left; the fraction financed by equity is measured from the right. The curves labeled i_b and i_e indicate the ratios of the returns that must be paid on corporate debt and equity at various debt-equity ratios (ratios of B to $B+E$, to be more precise) to i_n in the absence of taxes. Though we have drawn the left-hand intercepts of both i_b and i_e to exceed unity, indicating

[14] These functions may take on a form such as the following:

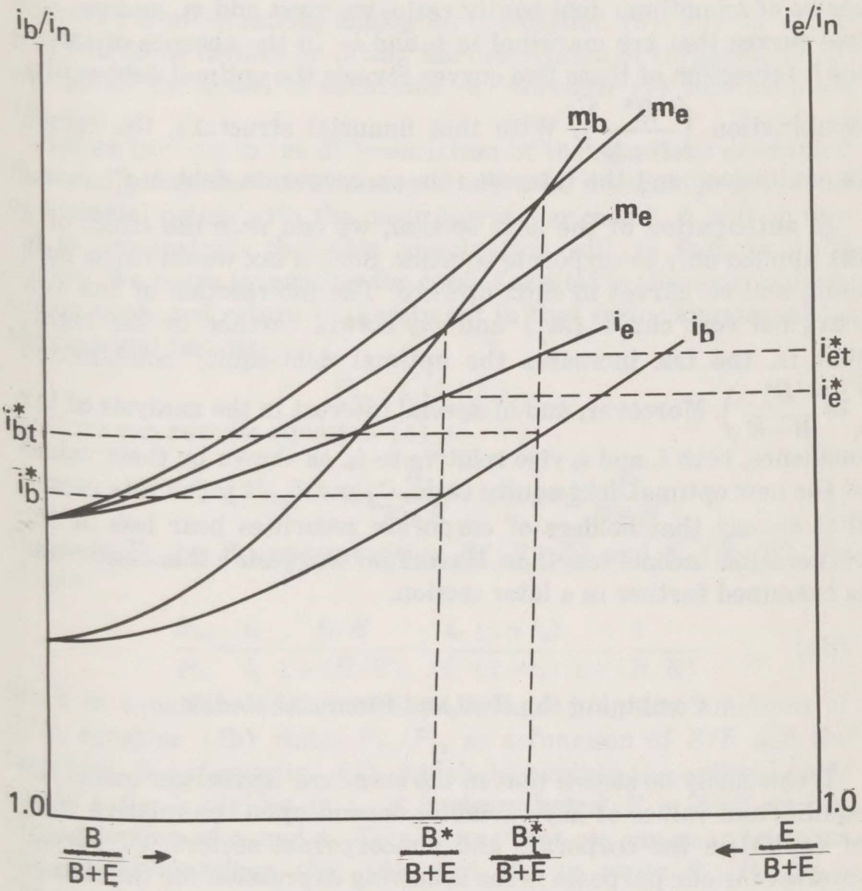
$$i_e/i_n = C(B/E)^a + V \tag{5'}$$

and

$$i_b/i_n = G(B/E)^\phi + W. \tag{6'}$$

The constants are required because the equations cannot take on a zero value when $B=0$. But whether V and W are greater or less than unity cannot be known.

FIGURE 1.—*The choice of an optimal debt-equity ratio*



a positive risk premium on both corporate securities at a zero debt-equity ratio, this has been done primarily to avoid confusing the diagram; this placement has no other significance. On the other hand, it is necessary for an interior solution that the left-hand intercept of i_e be above the left-hand intercept of i_b. Otherwise, the optimal debt-equity ratio would be zero.[15]

[15] Similarly, m_e must intercept the right-hand axis below the right-hand intercept of m_b if 100 percent debt financing is not to be optimal. Of course, as 100 percent debt financing is approached it can be expected that both risk premiums approach infinity. For our purposes all that is required is that m_e and m_b intersect.

While i_e and i_b indicate the average cost of corporate equity capital and borrowing, they do not show the corporate sector's marginal costs of the two sources of finance. Thus, to illustrate the choice of an optimal debt-equity ratio, we must add m_e and m_b, the two curves that are marginal to i_e and i_b. In the absence of taxes, the intersection of these two curves reveals the optimal debt-equity combination $\left(\frac{B^*}{B+E}\right)$. With that financial structure, the return to equity is i^*_e and the interest rate on corporate debt is i^*_b.

In anticipation of the next section, we can note the effect of a tax applied only to corporate equities. Such a tax would cause both the i_e and m_e curves to shift upward. The intersection of the new marginal cost curve (m'_e) and m_b occurs farther to the right; that is, the tax increases the optimal debt-equity combination $\left(\text{to } \frac{B^*_t}{B+E}\right)$. Moreover, and of special interest in the analysis of tax incidence, both i_e and i_b rise relative to i_n, as shown by their values at the new optimal debt-equity ratio, i^*_{et} and i^*_{bt}. It is for this reason that we say that holders of corporate securities bear less of the corporation income tax than Harberger suggests; this contention is examined further in a later section.

Combining the Real and Financial Models

It can easily be shown that in the standard Harberger model the equilibrium values of key variables depend upon the relative costs of capital in the corporate and noncorporate sectors. Of special interest for our purposes is the following expression for the change in the cost of capital in the noncorporate sector resulting from a change in the relative costs of capital in the two sectors:

$$\hat{P}_{ky} = H(\hat{P}_{kx} - \hat{P}_{ky}), \tag{8}$$

where $\wedge$ over a variable indicates percentage change and H is as indicated by Ballentine and Eris (1975, p. 635, equation 3).

Given that capital is assumed to earn the same rate of return in both sectors, we know that

$$\hat{P}_{kx} = \hat{P}_k + (1 \hat{+} t_{kx}), \tag{9}$$

$$\hat{P}_{ky} = \hat{P}_k + (1 \hat{+} t_{ky}), \tag{10}$$

and

$$\hat{P}_{kx} - \hat{P}_{ky} = (1 \hat{+} t_{kx}) - (1 \hat{+} t_{ky}). \tag{8a}$$

Thus, once we know $\hat{P}_{ky}$ from equation (8), we can use equation (10) to solve for $\hat{P}_k$, which is vital for incidence analysis. We could also determine the changes in such variables as K_x, L_x, X, Y, P_x and P_y from equations analogous to equation (8), but our attention will focus instead on fitting the description of corporate financial policy contained in equations (1) through (7) into equation (8).

Before turning to the differentiation of the equations describing financial policy that is necessary to allow us to combine the model of financial policy with the basic Harberger model, it will be useful to demonstrate that this combination will, in fact, be quite simple. We begin by writing the cost of capital in the noncorporate sector as the net return to investment in that sector augmented by the personal tax rate:

$$P_{ky}=i_n(1+t_n). \tag{10a}$$

Next we can rewrite equation (4) as

$$P_{kx}=i_b(1+t_b)\frac{B}{B+E}+i_e(1+t_e)\frac{E}{B+E}. \tag{4a}$$

Dividing P_{kx} by P_{ky} and rewriting $B/(B+E)$ and $E/(B+E)$, we obtain

$$\frac{P_{kx}}{P_{ky}}=\frac{i_b}{i_n}\,\frac{B/E}{1+(B/E)}+\frac{i_e}{i_n}\,\frac{(1+t_e)}{(1+t_b)}\,\frac{1}{1+(B/E)}. \tag{4b}$$

Since in equations (5) and (6), i_b/i_n and i_e/i_n, are functions of B/E, equation (4b) states P_{kx}/P_{ky} as a function of B/E and the tax rates. But if equation (7), which determines the optimal debt-equity ratio, is divided by i_n, it is clear that B/E is itself an implicit function of t_b and t_e. This means that we can use the financial model equations (5), (6), and (7) to write P_{kx}/P_{ky} as a function of t_b and t_e. This in turn implies that

$$\frac{d(P_{kx}/P_{ky})}{P_{kx}/P_{ky}}=\hat{P}_{kx}-\hat{P}_{ky}$$

can be written in terms of $1\hat{+}t_b$ and $1\hat{+}t_e$. Finally, $\hat{P}_{kx}-\hat{P}_{ky}$ can be inserted into equation (8) to solve for $\hat{P}_{ky}$. With that solution, all the remaining variables can be calculated.

In order to derive the differential equation relating B/E to t_e and t_b, let us write $d(B/E)$ as follows:

$$d(B/E)=\frac{d(B/E)}{dt_e}dt_e+\frac{d(B/E)}{dt_b}dt_b. \tag{11}$$

To solve for the right-hand side, we divide equation (7) by i_n, obtaining an implicit function of the form

$$F(B/E,\ t_b,\ t_e)=0. \tag{7a}$$

By the implicit function theorem we know that

$$\frac{d(B/E)}{dt_e}=\frac{-\partial F/\partial t_e}{\partial F/\partial(B/E)} \tag{12}$$

and

$$\frac{d(B/E)}{dt_b}=\frac{-\partial F/\partial t_b}{\partial F/\partial(B/E)}. \tag{13}$$

Solving equation (7a) for these partial derivatives, we obtain:

$$-\frac{\partial F}{\partial t_e}=\frac{i_e}{i_n}-f'\left(1+\frac{B}{E}\right), \tag{14}$$

$$-\frac{\partial F}{\partial t_b}=\frac{i_b}{i_n}-g'\frac{B}{E}\left(1+\frac{B}{E}\right), \tag{15}$$

and

$$\frac{\partial F}{\partial(B/E)}=\left(1+\frac{B}{E}\right)\left[2g'(1+t_b)+g''\frac{B}{E}(1+t_b)+f''(1+t_e)\right]. \tag{16}$$

Substituting sequentially from equations (14), (15), and (16) into equations (12) and (13), and from there into equation (11), and converting to percentage changes, we obtain the following key equation:

$$\frac{B}{E}(\hat{B}-\hat{E})=$$

$$\frac{(1+t_e)\left[\frac{i_e}{i_n}-f'\left(1+\frac{B}{E}\right)\right](1\hat{+}t_e)-(1+t_b)\left[\frac{i_b}{i_n}+\left(1+\frac{B}{E}\right)\frac{B}{E}g'\right](1\hat{+}t_b)}{\left(1+\frac{B}{E}\right)\left[2(1+t_b)g'+(1+t_b)\frac{B}{E}g''+(1+t_e)f''\right]} \tag{17}$$

But we see from equation (7) that the terms premultiplying $(1\hat{+}t_e)$ and $(1\hat{+}t_b)$ in the numerator are equal to each other. Equation (17) can therefore be written as

$$\hat{B}-\hat{E}=\frac{(1+t_b)\left[\frac{i_b}{i_n}\frac{E}{B}+\left(1+\frac{B}{E}\right)g'\right]\left[(1\hat{+}t_e)-(1\hat{+}t_b)\right]}{J}, \tag{17a}$$

where J is the denominator in equation (17). For ease of future reference, we can also rewrite this equation as

$$\hat{B}-\hat{E}=Q[(1\hat{+}t_e)-(1\hat{+}t_b)]. \tag{17b}$$

Since the numerator of Q is unambiguously positive, Q will carry the sign of its denomnator. But J is simply the first derivative of equation (7) with respect to B/E, i.e., the second-order condition for minimizing the cost of capital with respect to the debt-equity ratio. Thus J—and Q—must be positive. Equation (17a) tells us that the debt-equity ratio must rise if the tax on equity rises relaive to that on debt and by how much it will rise.

The next step is to differentiate equation (4a) in the logs. The result can be written in the following two equivalent forms:

$$\hat{P}_{kx}=\theta_b[\hat{\imath}_b+(1\hat{+}t_b)]+\theta_e[\hat{\imath}_e+(1\hat{+}t_e)]+\left(\theta_b\frac{E}{B+E}-\theta_e\frac{B}{B+E}\right)(\hat{B}-\hat{E}) \tag{18a}$$

$$=\theta_b[\hat{\imath}_b+(1\hat{+}t_b)]+\theta_e[\hat{\imath}_e+(1\hat{+}t_e)] + \theta_b\frac{E}{B+E}\left[\frac{i_b(1+t_b)-i_e(1+t_e)}{i_b(1+t_e)}\right](\hat{B}-\hat{E}), \tag{18b}$$

where θ_b is $\dfrac{Bi_b(1+t_b)}{(B+E)P_{kx}}$, the fraction of the gross return to capital in the corporate sector accruing to bondholders, and θ_e is the share accruing to owners of corporate equities. If we now differentiate equations (5) and (6) in the logs, we obtain

$$\hat{\imath}_e-\hat{\imath}_n=\frac{f'}{f}\frac{B}{E}(\hat{B}-\hat{E}) \tag{5a}$$

and

$$\hat{\imath}_b-\hat{\imath}_n=\frac{g'}{g}\frac{B}{E}(\hat{B}-\hat{E}) \tag{6a}$$

These can be rewritten as follows:

$$\hat{\imath}_e=\eta_e(\hat{B}-\hat{E})+\hat{\imath}_n \tag{5b}$$

and

$$\hat{\imath}_b=\eta_b(\hat{B}-\hat{E})+\hat{\imath}_n. \tag{6b}$$

In this formulation η_e and η_b relate the percentage changes in i_e/i_n and i_b/i_n to the percentage change in the debt-equity ratio, and are therefore elasticities.

Substitution from equations (5b) and (6b) into equation (18b) yields the following:

$$\hat{P}_{kx}=\hat{\imath}_n+[\theta_b(1\hat{+}t_b)\,\theta_e(1\hat{+}t_e)]+(\theta_b\eta_b+\theta_e\eta_e)(\hat{B}-\hat{E}) + \theta_b\frac{E}{E+B}\left[\frac{i_b(1+t_b)-i_e(1+t_e)}{i_b(1+t_b)}\right](\hat{B}-\hat{E}). \tag{19}$$

This equation has a simple explanation, based on the meaning of each of its terms. The cost of corporate capital rises, all else equal, by the same percentage amount that the net return to noncorporate capital rises ($\hat{\imath}_n$). But the costs of corporate and noncorporate capital differ because of the risk premiums and taxes on the two forms of return to corporate capital; the remaining three terms capture these influences. The divergence between $\hat{P}_{kx}$ and $\hat{i}_n$ is widened to the extent that the two taxes on the return to corporate capital increase; as indicated in the second term, $(1\hat{+}t_b)$ and $(1\hat{+}t_e)$ are weighted by the shares θ_b and θ_e.

As indicated in the third term of the equation (19), an increase in the debt-equity ratio increases the risk premiums (or ratios of i_b and i_e to i_n) by η_b and η_e, weighted by debt and equity's share in the total gross return to corporate capital. However, an increase in the debt-equity ratio also shifts the financial structure of the firm toward the least expensive means of finance. Since the firm is continually choosing a debt-equity ratio that minimizes its cost of capital, these two effects must cancel out (i.e., $\partial P_{kx}/d(B/E)=0$ is the cost-minimizing condition). Collecting the third and fourth terms of equation (19) and using the first-order condition equation (7), it can be shown that these terms do indeed drop out, leaving simply

$$\hat{P}_{kx}=\hat{i}_n+\theta_b(1\hat{+}t_b)+\theta_e(1\hat{+}t_e). \tag{19a}$$

That is, the percentage change in P_{kx} is merely $\hat{i}_n$ plus the weighted average of $(1\hat{+}t_b)$ and $(1\hat{+}t_e)$.

Equation (19a) plays the same role in our analysis as does equation (9) in the standard Harberger model. The implication of this is worth emphasizing. Although the differential taxation of debt and equity induces corporations to change their relative reliance on debt finance, the change in the debt-equity ratio does not directly affect the relationship between the return to capital in the noncorporate sector and the cost of capital in the corporate sector, so long as corporations minimize the cost of capital.[16] This result occurs because the rise in the debt-equity ratio has two offsetting effects on the cost of corporate capital: the rise in the risk premium is exactly offset by the reduction in the cost of capital resulting from the shift from the expensive to the inexpensive means of finance.

Interpretation of Results

Replication of Harberger Analysis

It may be worthwhile to pause at this point to note that the essential features of the results of the original Harberger analysis

[16] Thus, if the taxes on equity and debt were changed in opposite directions by enough to keep the total tax burden on corporate capital unchanged [i.e., if $\theta_b(1\hat{+}t_b)+\theta_e(1\hat{+}t_e)=0$], P_{kx}/i_n would be unaffected, despite the induced shift in B/E.

can be replicated in the context of the present model. Suppose that $1+t_b$ and $1+t_e$ are raised by the same percentage amount (from 1, if this analysis is to be exactly comparable to Harberger's original analysis). In that case equation (19a) becomes identical to equation (9), except for the change in notation, and the Harberger solution for $\hat{P}_k$ becomes applicable for $\hat{\imath}_n$. Moreover, we can see from equation (17b) that this equal percentage change in the taxation of corporate debt and equity leaves the debt-equity ratio unchanged. Thus, from equations (5a) and (6a) we know that i_c and i_b experience the same percentage change as i_n.[17]

A more faithful description of the effects of the present tax treatment of corporate-source income would, however, involve differential taxation of debt and equity; to simplify matters, let us analyze briefly the case in which interest on corporate debt is taxed at the same rate as the return to investment in the noncorporate sector but the return to corporate equity is taxed more heavily. Since a uniform tax on all return to all capital would reduce the return to all capital by the amount of the tax without causing any distortions (as in the standard Harberger model), we need examine only the case in which $(1\hat{+}t_e)$ pertains only to the *differential* taxation of equity.

Inspection of equation (19a), together with an appreciation for its role with equations (8) and (10), reveals that this differentially heavy tax on equity capital will have exactly the same relative effect on i_n as t_{kx} has on P_k in the standard formulation, except for the scale factor θ_e, resulting from the fact that only a portion, θ_e, of the total gross return to capital in the corporate sector is being taxed. Analogous statements can, of course, be made about the effects of this tax on the values of all other real variables. In this sense we again replicate the results of the Harberger analysis. In addition, however, we obtain other results. As indicated in the discussion of figure 1 and the algebra of this section (equations 17a, 5a, and 6a), imposition of a tax on corporate equity, by inducing firms to increase their debt-equity ratios, increases the risk premium demanded by investors in both corporate debt and corporate equity. As a result, the returns to investments in these securities decline by less than they would in a riskless world in response to a given rate of tax levied on the return to corporate equity.[18]

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[17] If, in addition, $i_n=i_e=i_b$ in the initial situation, then $di_n=di_e=di_b$, and the Harberger result would be exactly replicated. We cannot, however, generally know that the first set of equalities holds, and so must be content to know that $\hat{\imath}_n=\hat{\imath}_e=\hat{\imath}_b$.

[18] Care must be taken in comparing the results presented here with those from the original Harberger model. The statements in the text make such

The Incidence Concept

In the original formulation of the Harberger model, the change in the real income of capital on the side of sources of income could be expressed as

$$d(P_kK) = P_kdK + KdP_k = KdP_k. \qquad (20)$$

Since by assumption dK is equal to zero, and since capital receives the same rate of return in both sectors, the change in income on the sources side is determined entirely by the change in the return to capital, dP_k.

In the present model the interpretation of incidence is somewhat more complex. This is because some of the change in i_b and i_e is simply a compensation for risk-taking and does not reflect a change in welfare. Nonetheless, we shall follow Musgrave's classical definition of incidence as the "change in the distribution of income available for private use" (Musgrave, 1959, p. 207). Under this interpretation, changes in capital income resulting from changes in risk premiums would be counted like any other changes in income.[19] [20] So far as changes in the functional distribution of income are concerned, this is the measure of incidence we use, i.e., we calculate the change in the total income of capitalists.

While the measure just described is useful in describing changes in the functional distribution of income, it tells us little about the

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a comparison for a given *tax rate.* Applying the scale factor θ_e makes the results of effects on the real sector directly comparable. But a given tax-rate change has less impact in our model since it applies only to a portion of capital financing.

[19] Another interpretation is also quite reasonable. In the original formulation of the Harberger model there is no risk premium; nor is there any reservation use of capital. From the economy-wide standpoint, all capital income is therefore a rent, and any increase (decrease) in that income is a dollar-for-dollar benefit (loss) to capitalists. In our model, however, part of the income of those who invest in corporate bonds and equities is a risk premium over and above the return available in the noncorporate sector, one that must be paid to compensate for the riskiness of those assets. As a result, part (or all) of a given increase in capital income may be due to an increase in risk premiums. Increases (decreases) in income reflecting higher risk premiums are not necessarily dollar-for-dollar gains (losses) to capitalists. For a similar line of reasoning applied to tax-induced changes in work effort, see Feldstein (1974). Thus, a second measure of functional incidence might be simply the change in i_n.

[20] Feldstein, Green, and Sheshinski (1977) recognize this same problem. While we choose to ignore welfare changes and concentrate on income changes, they assume that the debt-equity ratio is constant, and thus that risk premiums are constant and income changes reflect welfare changes. To avoid either our simplification or that used by Feldstein, Green, and Sheshinski would require a more complete analysis of risk and risk aversion.

changes in the distribution of income by income classes. For the latter we need to know the tax-induced changes in i_b, i_e, and i_n and the ownership of corporate debt, corporate equities, and noncorporate capital in various income classes. In a later section we present some tentative conclusions about the incidence of the corporate income tax and the various means to integrate the income tax; we then compare those results with those suggested by the standard Harberger analysis.

Integrating the Income Taxes

Thus far we have dealt entirely with equity capital and its return in quite general terms, without specifying whether the returns take the form of dividends or capital gains. If all corporate profits were distributed, if dividend payout ratios were insensitive to tax policy, or if both dividends and capital gains were taxed at the same rates (in present value terms), this specification would be adequate. In reality, however, not all profits are distributed, capital gains are taxed less heavily than dividends, and there is empirical evidence that payout ratios do indeed respond to the relative taxation of dividends and capital gains. Thus, in order to provide a realistic model of the incidence of the corporation income tax, and especially in order to be able to model the effects of integrating the income taxes, we must add to our model a description of corporate dividend policy.

Why corporations pay dividends is a more difficult question than why corporations do not finance their capital needs entirely from debt. Given perfect capital markets, retained earnings could be converted to cash, and shareholders would be more or less indifferent between dividends and retentions. Retentions would be preferred only because they are taxed more lightly than dividends; but given differential taxation, there would be no reason to pay dividends at all.

Of course, capital markets are not perfect (especially for low-income individuals), and at least some shareholders are likely to prefer dividends to retentions if tax considerations are ignored. Moreover, corporate managers may be expected to prefer financing expansion from retained earnings over paying out dividends and then having to go to capital markets with new issues. Augmenting corporate managers' preference is the tax discrimination against distribution noted earlier. On balance, then, there is likely to exist an optimal dividend-payout rate that balances the preferences of high- and low-income shareholders and corporate managers. This optimal payout rate can be expected on a priori grounds to depend upon the relative taxation of retained and distributed earnings.

Feldstein (1970) has estimated the response of British dividend-payout rates to tax-induced changes in the opportunity costs of retained earnings. He found that when this opportunity cost was raised from £0.68 per £ to £1.0 per £ (a little less than 50 percent) by the elimination of a surcharge on corporate distributions, the ratio of corporate income paid as dividends rose by somewhat more than 40 percent. (This estimated elasticity of about 0.90 has since been reestimated at about 0.50 by King, 1971.) Similarly, Brittain (1964; 1966) has found that dividend-payout ratios are also affected by the relative taxation of dividends and capital gains under the personal income tax.

The following description of the tax effects on the dividend-payout ratio, while somewhat less satisfactory than that of the debt-equity choice, seems indicative of the nature of the problem, reasonable, and generally consistent with the discussion of theoretical underpinnings and empirical results just presented.

Assume that corporate income results in a flow of dividends net of all personal and corporate taxes of D and a net flow of retained earnings of R.[21] The *gross* amounts of corporate income needed to pay these net dividends and provide these retentions are $D(1+t_d)$ and $R(1+t_r)$, respectively, where t_d and t_r include both the corporate income tax and the relevant personal taxes (to be discussed further later). Thus, the per unit cost of equity capital is

$$i_e(1+t_e)=\frac{D(1+t_d)+R(1+t_r)}{E}. \tag{21}$$

By comparison, the *net* return on equity is

$$i_e=\frac{R+D}{E}. \tag{22}$$

[21] In this case R must be net of the corporate tax and the present value equivalent of the tax eventually to be collected on capital gains resulting from retentions.

Assume further that the reduced-form relationship between retaining earnings and paying dividends can be described as follows:[22]

$$(R/D) = \psi\left(\frac{1+t_r}{1+t_d}\right). \tag{23}$$

Differentiating equation (23) in the logs, we can also write:

$$\hat{R} - \hat{D} = -\Sigma_e[(1\hat{+}t_r) - (1\hat{+}t_d)], \tag{23a}$$

where Σ_e is the reduced-form elasticity of substitution between the two kinds of net return to equity capital. Several characteristics of equations (23) and (23a) are worthy of mention. First, equation (23) is not based upon cost minimization similar to that in our description of the determination of the optimal debt-equity ratio. Rather, it is intended to describe the outcome of the interaction of the preferences of managers and investors, as determined by tax considerations; that is, it is a reduced-form expression for the dividend-payout ratio resulting from the (unknown) optimization by corporate managers and shareholders. This being the case, it is somewhat less satisfactory than our description of the optimal debt-equity ratio. Second, equation (23a) describes only the response of the dividend-payout ratio to changes in tax differences. This formulation is generally consistent with the results of Feldstein (1970), who found that while the dividend-payout ratio depended upon the tax treatment of dividends and retentions, it was independent of the magnitude of earnings available for distribution.

Third, it should be noted that R/D, the logarithmic differential of which is $\hat{R}-\hat{D}$, is not uniquely related to the corporate payout (or retention) rate, as usually defined. Net dividends D differ from gross dividends by the amount of the personal tax. Similarly,

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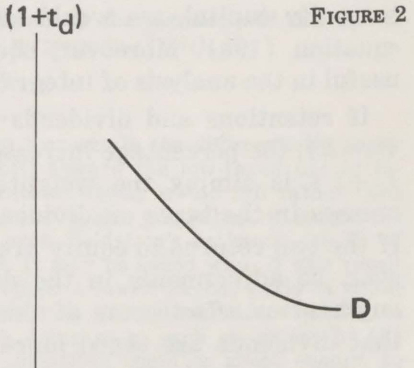
[22] Figure 2 may help to illustrate the origin of equation (23). Assume that there is a given quantity of equity capital and no tax on retained earnings. We can then use $(1+t_d)$ to stand for $(1+t_d)/(1+t_r)$ and D/Ei_e (multiplying by Ei_e/R), for D/R. It is reasonable to believe that if dividends are taxed highly, few dividends will be paid and that the quantity of dividends will depend inversely on the tax rate applied to dividends. This relationship is shown by the curve D in the diagram. The elasticity Σ_e in equation (23a) is analogous to the elasticity of curve D.

FIGURE 2



R is retentions net of the personal tax on the gains they produce. Thus D differs from the percentage change in personal taxes on dividends, and similarly for R. Changes in the payout (retention) ratio can, of course, be solved utilizing this identity. Even though corporations may not actually visualize the choice in these terms, we have chosen to employ equation (23) rather than an analogous expression in terms of gross dividends and retentions, because (a) optimal financial policy should be based on net dividends and retentions, and (b) the concepts of gross dividends and retentions become fuzzy once we admit the possibility of various schemes for integrating the income taxes. This second point can be clarified by considering alternative but equivalent methods of providing dividend relief. Suppose retained earnings are constant. If relief is provided at the shareholder level, gross dividends might appear not to be affected, even though net dividends rise. But if relief is provided at the firm's level, both gross and net dividends would rise. The formulation of equation (23) avoids this ambiguity.

If we differentiate equations (21) and (22) in the logs to obtain (unwritten) equations (21a) and (22a) and substitute from equations (22a) and (23a) into equation (21a), we obtain the following expression:

$$(1\hat{+}t_e=\theta_{dg}(1\hat{+}t_d)+\theta_{rg}\,(1\hat{+}t_r)$$
$$+\theta_r\theta_{dg}\left[\frac{t_d-t_r}{1+t_d}\right]\Sigma_e[(1\hat{+}t_r)-(1\hat{+}t_d)], \qquad (24)$$

where θ_r is net retentions as a fraction of net dividends plus net retentions $[\theta_r=R/(R+D)]$ and θ_{dg} is gross dividends as a fraction of gross dividends plus gross retentions,

$$\theta_{dg}=D(1+t_d)/[R(1+t_r)+D(1+t_d)].$$

If we were interested in changes in the taxation of dividends and retentions per se, as well as in the overall taxation of the return to equity capital, we would substitute from equation (24) into equation (19a). Moreover, equation (24), expanded further, is useful in the analysis of integration of the income taxes.

If retentions and dividends are initially taxed at equal rates $(t_d=t_r)$, the percentage increase in the tax on the return to equity $(1+t_e)$ is simply the weighted average of the percentage increases in the taxes on dividends $(1\hat{+}t_d)$ and retentions $(1\hat{+}t_r)$. If the two returns to equity are taxed differently, there will, however, be adjustments in the dividend-payout ratio that tend to augment or offset some of this primary effect. That is, suppose that dividends are taxed more heavily than retentions and that the tax on dividends is raised. In addition to the direct result measured by the first term in equation (24), the increase in t_d causes a shift toward retained earnings—the lower-taxed means of finance—which offsets some of the direct effect. Had an increase in the tax on retentions been at issue, the tax-induced shift in financial structure would have been toward the more heavily taxed source of finance, augmenting the primary effect. Finally, if $\theta_{dg}(1+t_d)$ were set equal to $-\theta_{rg}(1+t_r)$, there would still be an effect on $(1+t_e)$, because of the tax-induced shift in the payout rate.[23]

In the context of this model, integration of the income taxes involves adjusting either t_d or both t_d and t_r to make them equal to t_b and t_n, which are, in fact, equal. That is, integration for dividends only would involve setting t_d equal to the tax rate on ordinary income, without altering the tax on retained earnings. Such a policy would, of course, stimulate dividends (equation 23) and encourage less reliance on debt finance (equations 17a and 24). Full integration for retained earnings as well as dividends would have similar (but probably less extreme) effects on the dividend-payout ratio and debt-equity structure of the corporate sector. Moreover, both policies would reduce the risk premiums now being paid to owners of corporate securities. These effects are simulated in the following two sections.

Before turning to the simulation exercises, we must further define t_d and t_r. These can be written as

$$1+t_d=(1+t_c)(1+t_p) \tag{25a}$$

and

$$1+t_r=(1+t_c)(1+\beta t_p), \tag{25b}$$

where t_c is the corporate tax rate, t_p is the personal tax rate, and β is the fraction of retained earnings that are included in the personal tax base, on a present-value basis.

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[23] We must note one potentially unsatisfactory characteristic of this model. Note that $(1+t_e)$ can be negative, for an increase in $(1+t_d)$, if

$$\Sigma_e > \frac{1+t_d}{t_d-t_r} \cdot \frac{1}{\theta_r}.$$

That is, if Σ_e exceeds unity by enough, an increase in the differentially heavy tax on dividends could cause so much shift toward the low-taxed use of income (retentions) that the average tax rate on equity would fall rather than rise. While this result would appear to be a logical possibility, it is ignored in what follows since, as noted above, even Feldstein's estimate for Σ_e of 0.9 has been questioned as being too high. It may be asked why, if this result is possible, the firm had not already adopted a lower payout ratio in order to minimize its cost of capital. The answer is that shareholders prefer to receive dividends but are dissuaded from doing so to such an extent by the higher tax on dividends. The switch to retentions could be great enough to offset the higher tax on dividends.

The Simulation Model

In this section we sketch the outlines of the simulation model used to derive numerical estimates of the effects of various tax policies on financial structure and the returns to different types of capital; the model is exposited in detail elsewhere (Ballentine, 1978). In the next section, we present estimates of the results of (a) eliminating the corporate income tax, (b) integrating the income taxes, and (c) providing total relief from the double taxation of dividends. Following that is a discussion of policy implications.

Ballentine (1978) shows how one can solve the structural equations of the two-sector Harberger model in order to specify a function of the following general form:

$$F_1\left(P_{ky}, \frac{P_{kx}}{P_{ky}}\right)=0. \tag{8b}$$

Given equation (8b) and the value of P_{kx}/P_{ky}, one can, using a "canned" computer program, solve for P_{ky}. In previous two-sector incidence models P_{kx}/P_{ky} has been simply the ratio $(1+t_{kx})/(1+t_{ky})$, where t_{kx} is the (single) tax on capital in sector X and t_{ky} is the tax on capital in sector Y. In our model P_{kx}/P_{ky} is more difficult to specify. However, as shown earlier, we can use the equations that describe the financial decisions of corporations and the equation that defines the cost of capital in the noncorporate sector to solve for P_{kx}/P_{ky} in terms of the tax rates. In what follows we sketch that solution.

We first specify the precise functional form of equations (5) and (6):

$$\frac{i_e}{i_n}=C(B/E)^{\alpha}+V \tag{5'}$$

and

$$\frac{i_b}{i_n}=G(B/E)\theta+W. \tag{6'}$$

In these two equations we require that α and θ be no less than 1 in order to guarantee that the second-order condition for cost minimization be satisfied, that C and G be positive, that V and W be positive, and that $V>W$. The last two conditions ensure that if there are no taxes on debt and equity (or if the taxes are equal), then the optimal debt-equity ratio will be positive.

As discussed earlier, when equation (7), which determines the optimal debt-equity ratio, is divided by $i_n(1+t_b)$, it can be written in the following general form:

$$F_2\left(B/E, \frac{1+t_e}{1+t_b}\right)=0. \tag{7b}$$

Thus, B/E can be determined, given $(1+t_e)/(1+t_b)$. The solutions for B/E, i_e/i_n, from equation (5′), and i_b/i_n, from equation (6′), can then be used to solve equation (4b) for the value of P_{kx}/P_{ky} for given tax rates, t_b and t_e. All that remains is to specify the effective rate of tax on equity, t_e, in terms of the tax rates on dividends and retained earnings.

From equations (21) and (22) we derive:

$$1+t_e=(1+t_r)\left(1-\frac{D}{R+D}\right)+(1+t_d)\frac{D}{R+D}. \tag{21b}$$

We assumed earlier that R/D is a function of $(1+t_r)/(1+t_d)$, which implies that $D/(R+D)$ is also a function of $(1+t_r)/(1+t_d)$. We assume that the function relating $D/(R+D)$ to the tax rates is of the following form.

$$\frac{D}{R+D}=M\left(\frac{1+t_r}{1+t_d}\right)^{\rho}. \tag{23b}$$

As discussed later, we chose this functional form because it is similar to an equation estimated by Feldstein (1970). Inserting equation (23b) into equation (21b) and finally into equation (4b) results in P_{kx}/P_{ky} being stated solely in terms of the tax rates.

In short, then, the procedure followed to simulate the impact of tax changes is as follows. First, we use equations (23b) and (21b) to solve for the effective tax on equity income, t_e, based on the tax rates t_r and t_d. Then, we use a computer to solve equation (7b) for the optimal debt-equity ratio, given $(1+t_e)/(1+t_b)$. Next, using the solution for the optimal debt-equity ratio, we first solve for i_e/i_n and i_b/i_n and, then using the value of $(1+t_e)/(1+t_b)$, solve for the relative costs of capital, P_{kx}/P_{ky}, using equation (4b). Fourth, we solve for P_{ky} based on the value of P_{kx}/P_{ky} using a computer to solve equation (8b). Finally, using the computed value for P_{ky} we can easily solve for all of the remaining variables of the model.

Before the results of our simulations are presented it may be well to discuss briefly the nature of the fiscal exercises and their relevance for policy analysis. The first issue involves the question of the fiscal change that accompanies the various tax changes being examined. Specific incidence analysis, always a dubious choice, is particularly unsatisfactory in a world that includes debt.[24]

Differential incidence, the usual choice, is quite satisfactory if our interest goes no further than the proportionate tax system being examined here. Although the calculation would be more complex, because of the adjustments in financial structure included in our model, we could certainly adjust the personal tax rate to compensate for the revenue lost in changing the taxation of corporate-source income and could compare the results of alternative changes in the taxation of corporate-source income. But in a real sense, the case being examined here—that of a flat-rate personal tax—is only the first stage in a more realistic analysis of corporate tax policy, the ultimate objective being to model integration and other corporate tax policies in a world with a progressive personal income tax. Once we allow progressive rates, the calculation of endogenous changes in tax revenues becomes extremely complicated, and with it the possibility of differential analysis. Since we are not yet prepared to incorporate progressive rates, it may be better to abandon differential incidence analysis than to employ it in the case with a flat-rate personal tax. We at least avoid an appearance of concreteness, which would be unrealistic and probably misleading.

In what follows, therefore, we employ balanced-budget incidence analysis, making the standard assumptions that allow us to abstract from the expenditure side. (In our model this requires assuming that individuals, the government, and corporations divide their expenditures between corporate and noncorporate output in the same way. We must include corporations because the expenditures that retained earnings give rise to are controlled by corporations.) Because we merely change the corporate income tax, leaving the personal income tax unchanged except as changes are required as a component of full integration, the revenue effects of the three fiscal experiments are quite different. By the same token, the revenue effects calculated are of little interest since, as just noted, they would be quite different in a world of progressive personal rates. Thus, the purpose of our reporting changes in tax revenues is primarily to show that our results are comparable to Harberger's and not to indicate that they are of interest per se.

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[24] With bonds of constant purchasing power, specific incidence analysis becomes somewhat more attractive methodologically, if not more realistic.

The Simulation Results

The simulations are based essentially on the data in Harberger (1966), as corrected by Shoven (1976) and augmented to include a description of the corporate financial sector. That data set and its derivation are described in the appendix. At this point we describe only the aspects that are necessary for an understanding of the fiscal experiments reported in the next section.

First, we employ a corporate income tax of 50 percent, a personal tax rate of 31.1 percent, and a rate of tax on retained income of 8 percent. (These are rates expressed in the manner common in the U.S.; in the terminology of the notation used here, they are 1.0, 0.4517, and 0.087, respectively.) Second, we provide alternative calculations based on varying assumptions about the elasticities of factor substitution and substitution in demand. Estimates based on alternative values of the parameters of equations (5′) and (6′) are presented in the appendix.

In order to specify more fully the exact experiments being conducted, we note in table 1 the tax rates applied to distributed and retained corporate-source income in the present situation and under each tax change and the order of magnitudes of the revenue effects involved. Of particular note is the fact that full integration is more costly than dividend relief—a result that is unlikely to prevail in the real world. This result occurs because with the flat-rate personal tax, that part of integration that applies to retentions, like that for dividends, can only reduce tax revenues, whereas we would expect that with progressive rates, we would actually recoup enough revenue from high-income shareholders to reduce the cost of full integration to less than that of dividend relief alone.

Tables 2, 3, and 4 present the results of our simulation exercises. Columns (b), (c), and (d) in table 2, and columns (a), (b),

TABLE 1.—*Tax rates and revenue changes for existing systems and three alternatives*

	Effective tax rates			Approximate fall in revenue ($ billion)
	Non-corporate income	Corporate income		
		Distributed	Retained	
Present system	31.1	65.6	54	—
No corporate tax	31.1	31.1	8	18–19
Full integration	31.1	31.1	31.1	10–12
Dividend relief	31.1	31.1	54	2–3

TABLE 2.—*Simulated values of key variables under alternative corporate tax regimes, for various parameter values* [1]

Variable	Initial values (a)	$S_x=S_y=S_d=1.0$ No corp. tax (b)	Full integ. (c)	Dividend relief (d)	$S_x=S_y=0.5$; $S_d=1.0$ No corp. tax (e)	Full integ. (f)	Dividend relief (g)
Capital income	44.21	62.64	54.59	46.54	57.71	51.81	45.92
i_b	0.71	0.78	0.74	0.72	0.72	0.71	0.71
i_e	1.40	1.82	1.64	1.46	1.68	1.56	1.44
i_n	1.00	1.42	1.24	1.06	1.31	1.18	1.04
B/E	0.818	0.396	0.538	0.740	0.396	0.538	0.740
$B/(B+E)$	0.450	0.284	0.350	0.425	0.284	0.350	0.425
B	10.61	8.22	9.50	10.45	7.79	9.14	10.33
E	12.97	20.76	17.66	14.12	19.67	16.98	13.95
$D/(R+D)$	0.150	0.150	0.174	0.211	0.150	0.174	0.211
D	2.73	5.66	5.03	4.33	4.95	4.60	4.22
R	15.43	32.02	23.93	16.21	28.03	21.89	15.81
R_g	16.77	34.81	34.74	17.62	30.47	31.78	17.19

[1] In this table $\varphi=1.4$ and $\alpha=1.2$. For values of i_b, i_e, and i_n under alternative assumptions, see tables A–1 and A–2.

TABLE 3.—*Changes in key variables under alternative corporate tax policies, for various parameter values* [1]

	$S_x=S_y=S_d=1.0$			$S_x=S_y=0.5$; $S_d=1.0$		
Variable	No corp. tax (a)	Full integ. (b)	Dividend relief (c)	No corp. tax (d)	Full integ. (e)	Dividend relief (f)
Δ tax revenues	—18.4	—10.4	—2.3	—19.2	—11.7	—2.9
Δ capital income	+18.4	+10.4	+2.3	+13.5	+7.6	+1.7
$\% \Delta i_b$	+9.3	+4.5	+0.7	+0.8	—0.6	—0.6
$\% \Delta i_e$	+29.6	+17.1	+3.9	+19.8	+11.4	+2.5
$\% \Delta i_n$	+41.5	+24.3	+5.7	+30.7	+18.1	+1.0
$\% \Delta B/(B+E)$	—36.9	—23.3	—5.6	—36.9	—23.3	—5.6
$\% \Delta D$	+107.3	+84.2	+58.6	+81.3	+68.5	+54.6
$\% \Delta R$	+107.5	+55.1	+5.1	+81.6	+41.9	+2.5
$\% \Delta R_g$	+107.6	+59.5	+5.1	+81.7	+89.5	+2.5

[1] Based on table 2

TABLE 4.—*Percentage shares of total net capital income and tax burden* [1]

	$S_x=S_y=S_d=1.0$			$S_x=S_y=0.5$; $S_d=1.0$		
	No corp. tax (a)	Full integ. (b)	Dividend relief (c)	No corp. tax (d)	Full integ. (e)	Dividend relief (f)
Percentage shares of total net capital income						
Corporate bonds	13.0	14.8	16.5	12.9	14.6	16.4
Corporate equity	52.3	47.7	42.6	50.2	46.5	42.4
Noncorporate	34.7	37.6	40.8	37.0	38.9	41.2
Percentage share in tax burden						
Corporate bonds	4.4	4.0	2.7	0.5	—0.7	—3.3
Corporate equity	49.3	45.6	40.7	45.7	43.8	39.3
Noncorporate	46.3	50.5	56.6	53.7	56.9	63.9

[1] Based on table 2. Net income accruing to each type of investment is average of income in initial situation and income with the indicated tax policy. Numerator for calculating shares in tax burden is the change in respective net rates of return multiplied by the average of amount of capital in initial situation and with the policy in question. Denominator is sum of numerators.

and (c) in tables 3 and 4 assume that the two elasticities of factor substitution and the elasticity of substitution in demand equal unity (i.e., $S_d=S_x=S_y=-1$). In columns (e), (f), and (g) in table 2 and columns (d), (e), and (f) in tables 3 and 4, $S_x=S_y=-.5$, and $S_d=-1$. In all tables $\theta=1.4$ and $\alpha=1.4$; alternative values of these parameters are employed in the appendix. Although these results seem to be fairly robust for alternative values of key variables and parameters, we must stress that the various inputs into the simulation model are not intended to be precise estimates of the actual values for the U.S. economy. Our numerical simulations are therefore probably best considered as roughly suggestive and not exact estimates of the pattern of corporate tax incidence in the United States.

Eliminating the Income Tax

Because we examine the abolition (rather than the imposition) of the corporation income tax, table 3 shows government revenues declining and the return to capital rising. The change in capital income as a proportion of the change in government revenues, which can be considered to be capital's share in the direct tax burden, is 100 percent for $S_x = S_y = S_d = -1$ and about 70 percent for $S_x = S_y = -.5$ and $S_d = -1$. For the standard Harberger model, the result in the former case is also 100 percent; in the latter case, Shoven (1976) calculates capital's share at about 67 percent. Thus, our model suggests about the same overall burden share for capitalists (owners of capital) as does the Harberger model.

It is in our calculations of the distribution of the burden among capitalists that we differ from previous work. Whereas the traditional Harberger analysis would find all capitalists gaining equally from the elimination of the corporation income tax, we calculate that corporate bondholders would gain relatively little. That is, i_b rises by less—and perhaps substantially less—than 10 percent. Corporate shareholders would gain by a much larger fraction (i_e rises by 20 to 30 percent, depending on the elasticity assumptions), but investors in the noncorporate sector would gain most of all (i_n rises by about 30 to 40 percent, depending on the elasticity assumptions). This result, stated from the other side, says that the corporate income tax is borne mainly by shareholders and noncorporate investors and relatively little by corporate bondholders.[25]

Table 4 presents an effort to quantify the differences in the ways the various returns to capital are affected by elimination of the tax. The top part of the table presents, for three tax changes and two elasticity assumptions, the fraction of total net capital income accruing to corporate bondholders, holders of corporate

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[25] As the results reported in the appendix show, under some circumstances debtholders may benefit more than shareholders. Thus it may be better to concentrate on the difference in the change in the return on corporate securities taken together rather than individually.

shares, and investors in the noncorporate sector.[26] The bottom part indicates the share in the tax burden experienced by investors in each type of capital.[27] We see that risk premiums on corporate bonds fall enough with the elimination of the corporate income tax that bondholders gain little (perhaps 4 to 5 percent at the most) from the elimination, though they receive some 13 percent of total net capital income. Even *corporate shareholders pay a share of the corporate income tax* (46 to 49 percent) *that is smaller than their share of net capital income* (roughly 46 to 54 percent). Finally, *investors in the noncorporate sector are the big gainers from the elimination of the corporate income tax.* Although they receive only some 35 to 37 percent of net capital income, they receive roughly 46 to 54 percent of the benefits of eliminating the tax. These results, which are markedly different from those of the standard Harberger model, suggest that the corporate income tax is somewhat less progressive than ordinarily assumed.[28]

Table 5 gives an indication of how much difference the modification presented here makes for the incidence of the corporate income tax. In columns (a) and (b) the corporate income tax is allocated among income classes in proportion to ownership of corporate shares and total capital. In column (c) half the tax is allocated in proportion to ownership of corporate securities and half, in proportion to income from noncorporate capital.[29]

While the differences in results in columns (b) and (c) are not enormous, they do suggest that the corporate income tax is somewhat less progressive at the top of the income scale—and more regressive at the bottom—than commonly assumed on the basis of the Harberger analysis.

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[26] Because the fractions depend crucially upon whether they are based on shares in net capital income in the initial (cum tax) situation or in the situation without tax, we sum the income figures in the cum-tax and no-tax situations in calculating the fraction. Simply taking the average of the fractions in the cum-tax and no-tax situations produces essentially the same results.

[27] We calculate the numerators by multiplying the average amount of a certain type of capital (with and without the tax) by the change in the relevant net rate of return. The denominator is the sum of the numerators, and is, in general, not equal to the change in the total net capital income.

[28] Under the Harberger approach the tax burdens would, of course, be allocated in strict proportion to capital income.

[29] The capital ownership series are from Projector and Weiss (1966). Because separate series are not available for corporate debt and corporate equity, the burden on these two forms of capital ownership were lumped together. "Noncorporate" is primarily housing and (agricultural and nonagricultural) businesses and professions. The 50–50 allocation is consistent with the average of results in columns (a) and (d) of table 4.

TABLE 5.—*Effective tax rates for corporate income tax by income classes, using traditional, Harberger, and simulated estimates of incidence*

Income class ($1,000)	Traditional [1] (a)	Harberger estimate [2] (b)	Simulation estimate [3] (c)
0–3	5.6	8.4	9.5
3–5	1.5	2.4	2.7
5–7.5	1.7	2.3	2.5
7.5–10	2.7	3.1	3.3
10–15	2.9	3.1	3.2
Above 15	10.6	8.6	7.8

Source: Table 3 and Projector and Weiss (1966).

[1] Corporate tax is attributed to income classes in proportion to ownership of corporate shares.

[2] Corporate tax is attributed to income classes in proportion to ownership of capital.

[3] Half the corporate tax is attributed in proportion to income from corporate securities, half in proportion to noncorporate capital income. These results are consistent with the average of the results for columns (a) and (d) of table 4.

The incidence of the corporate income tax is, of course, only part of the story. In the absence of the tax, only some 30 percent of corporate capital would be debt-financed, instead of the current 45 percent. Stated differently, the ratio $B/(B+E)$ is some 50 percent higher than in the absence of the tax. Finally, as inspection of equations (23), (25a), and (25b) reveals must be the case, elimination of the corporation income tax does not affect net dividend-payout ratios.[30] But dividends and retentions (both net and gross of personal tax) would rise by 80 to 110 percent, depending upon elasticities. This conclusion must, however, be qualified in at least two ways. First, we are ignoring completely how revenue would be recouped. Second, that part of our model dealing with dividend-payout ratios—and any estimate based upon it—is less satisfactory than other parts of the model. Thus, this result should not be overemphasized.

Full Integration

The incidence results for full integration are essentially the same as those for the reduction in the corporation income tax, except that the changes are smaller in absolute value. This might

[30] This rather anomalous result can perhaps be clarified by examination of table 1. Under the present system $46 of after-tax retentions can be exchanged for $34.4 of after-tax dividends. Thus, elimination of the corporate tax leaves unaffected the rate at which the two returns to equity can be exchanged.

have been expected since the major difference between the two cases is the higher effective tax on retained earnings in the case of full integration. That higher tax on retentions means that the effective tax reduction is less in the case of full integration. In addition, noncorporate investors gain relatively more than they might have even under elimination of the corporate tax, shareholders gain somewhat less, and corporate bondholders actually lose from integration. Of course, the original Harberger model does not deal with this case.

Effects on the debt-equity ratio are also smaller than in the case of eliminating the income tax. But, whereas elimination of the corporate income tax does not affect net dividend-payout ratios, full integration equalizes the tax treatment of dividends and retentions and causes the net dividend-payout ratio to rise. Indeed, $D/(R+D)$ rises from about 0.150 to 0.174. In spite of the rise in the dividend-payout ratio, however, net retentions actually rise by about 42 percent because of the larger amount of net-of-tax equity earnings.

Dividend Relief

As a final experiment, we have considered integration for dividends only. That is, we have abolished the corporation income tax on dividends while keeping the tax on retentions. Once again, the incidence results are basically a dampened version of the results for the abolition of the corporation income tax. But noncorporate investors are relatively larger gainers, as in the case of full integration. Noncorporate capitalists enjoy some 55 to 65 percent of the benefits of dividend relief, despite accounting for only about 41 percent of net capital. Most of the remaining benefits accrues to owners of corporate equities, and under one set of elasticity assumptions, corporate bondholders lose. Moreover, because integration is extended only to dividends, the net dividend-payout ratio rises to about 0.211. Even so, (gross and net) retentions rise slightly because of the increase in equity income net of corporate tax.

Evaluation

Overall, the results show that full integration, dividend-only integration, and abolition of the corporation income tax all lower the cost of equity capital for corporations. This tends to raise the rate of return to capital in the economy. However, such tax reductions also lower the cost of equity capital relative to debt for corporations. In response, corporations lower their debt-equity ratios. This in turn reduces the risk premium that must be paid on corporate debt and equity and thus lowers the observed rate of return on such assets. This latter effect tends to counteract the general rise in the rate of return to capital. Because the offset is almost complete for corporate debt, the interest rate on corporate debt remains virtually unchanged. It is less complete for corporate equity; thus, the equity rate of return rises by almost as much as the noncorporate rate of return. The lesson for the incidence of the corporate income tax is that owners of noncorporate capital bear the greatest relative burden, owners of equity bear the next largest burden in relative terms, and owners of debt pay very little.

While our model explicitly focuses on the functional distribution of income and on the distribution of capital income by asset type, the ultimate concern for incidence analysis is usually the impact of tax changes by income group. Prior to Harberger's work, many economists argued that the corporation income tax is paid by stockholders. Given the distribution of stock ownership by income class, this meant that the tax was likely to be progressive. Since the distribution of ownership of noncorporate capital, mainly housing and real estate, is less skewed toward the rich than is the distribution of stock ownership, Harberger's result implied that the tax is less progressive than previously thought. Our results, which indicate that the tax is "overshifted" to the noncorporate sector, imply that the tax is even less progressive than Harberger suggested and that integration reduces progressivity less than is commonly assumed.

Appendix: The Choice of Parameter Values and Some Sensitivity Analysis

Since it was Harberger's analysis (1962) that developed the now familiar result that capital bears all of the corporation income tax (and further, that all capitalists bear it equally), we use his data (as corrected by Shoven, 1976) for our estimates. These data are:

$$X = 252.265 \qquad L_x = 199.871 \qquad K_x = 23.587$$
$$Y = 44.349 \qquad L_y = 17.471 \qquad K_y = 18.515$$
$$P_{kx} = 2.2211 \qquad P_{ky} = 1.4517 \qquad P_x = P_y = P_k = i_n = 1.$$

Because our model describes the financial policy of the firm, it requires additional data. In particular, we must divide gross corporate profits, $P_{kx}K_x$, into debt payments, retained earnings, and dividend payments. From Schwartz and Aronson (1967) we shall take the proportion of the corporate capital stock financed by equity to be 55 percent.[1] This implies a value of B/E of .818. Further, since $B+E=K_x=23.589$, $B=10.615$ and $E=12.974$. Finally, from Rosenberg (1969), we take debt payments to be about 20 percent of the total return to corporate capital.

Using these figures we can state that

$$i_b(1+t_b)=1.031$$

and

$$i_e(1+t_e)=3.195.$$

Taking the tax on corporate debt to be the same as the tax on noncorporate capital (i.e., $t_b=.4517$) implies that $i_b=.71$. For the moment let $t_e=1.282$ (this value is explained later); this implies that $i_e=1.4$.[2]

To complete our basic data, we need only to obtain values for R, D, t_c, t_{rp}, and t_e. We set $t_c=1$, thus approximating a corporate income tax of 50 percent. We set the tax rate on retained earnings at .087, giving an effective tax rate of around 8 percent. (This figure is consistent with that obtained by Bailey, 1969.) Further, we take the gross of personal tax dividend-payout ratio to be about .25. From this we calculate $D=2.7288$, $R=15.434$, and $t_e=1.282$.

We must also specify the parameters of the various functions of the model. By assuming the production function to be of the CES (constant elasticity of substitution) form, and with the knowledge of the initial equilibrium values of outputs and inputs, a choice for the value of the elasticity of factor substitution completely specifies all of the parameters of the production function. Similarly, if the utility function is homothetic, then a choice for the elasticity of substitution in demand is all that is needed to

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[1] This is based on Schwartz and Aronson's (1967) calculations for all industries in 1961 and 1928.

[2] Note that the values of i_b and i_e are implied by our choices for other values. As a check on the reasonableness of our choices, the ratio of the corporate interest rate to the corporate return on equity, both gross of personal taxes, which are implied by our data, can be compared with actual values. Shepherd (1972) has calculated the average return on equity for large corporations to be about 11 percent over the period 1960–1969. Corporate Aaa interest rates during 1962–1969 ranged from 40 percent to 64 percent of the equity rate while Baa bonds ranged from 47 percent to 71 percent. Our data imply a value of 64 percent for this ratio.

specify consumption of X and Y. In our estimates we consider alternative values for these elasticities of substitution.

Obtaining reasonable values for the functions that relate i_b/i_n and i_e/i_n to B/E is more difficult. From the text, these two functions are written as

$$\frac{\dot{i}_e}{\dot{i}_n} = f(B/E) = C(B/E)^{\alpha} + V \tag{5'}$$

and

$$\frac{\dot{i}_b}{\dot{i}_n} = g(B/E) = G(B/E)\,\theta + W. \tag{6'}$$

We know of no empirical work that estimates relationships identical to these. However, as discussed later, there is some work that can be used to suggest values for the elasticities of these functions. Fortunately, we need not rely entirely on what little econometric work is available. When the values for the tax rates, interest rates, and B/E are introduced into equation (7), we obtain a simple linear relationship between g' and f'. That relationship is:

$$f' = .5206 - .5203g'.$$

We require that f' and g' be strictly positive, which implies that $0 < f' < .5206$ and that $0 < g' < 1.0006$. Since it will be convenient later to speak of the elasticities of f and g, these values imply that the elasticity of i_e/i_n with respect to B/E is less than .30 and that the elasticity of i_b/i_n is less than 1.15.

If the functions f and g are linear or nearly linear, we can narrow the range of values for f' and g' even further. The second-order condition for optimal financial policy requires that

$$2g'(1+t_b) + g''(B/E)(1+t_b) + f''(1+t_e) > 0.$$

If the value of this expression is close to zero, large changes in the debt-equity ratio will be required to restore equilibrium if some tax change is made. Experimentation has shown that if f and g are linear (i.e., if $g'' = f'' = 0$), values of g' below .28 result in the optimal debt-equity ratio going to zero when the corporation income tax is zero.

For the linear case, then, the elasticity of i_b/i_n with respect to B/E must not only be less than 1.15, but must also be more than 0.32, which is the same as $g' = 0.28$. This implies that, for that case, the elasticity of i_e/i_n must be less than 0.22.

Baker (1973) and Hurdle (1974) report linear regressions of after-tax corporate profit rates on, among other variables, firm leverage. Since both of these are cross-section studies, we interpret them for our purposes as assuming that the noncorporate rate of return is constant. Because these studies measure profit rates in dollars per dollar of invested capital while we use wage units per physical unit of capital, we must convert their results to an elasticity measure. Since Hurdle's (1972) rates of return were from the Fortune Directory data, we used the 1956 rate of return on corporate capital from that Directory along with our value of B/E to convert her regression coefficient to an elasticity. The result gives the elasticity of i_e/i_n to B/E of 0.25, which is slightly outside the range our model will accept. (The value of 0.25 implies an elasticity of 0.20 for i_b/i_n.) A similar conversion for Baker's (1973) result gives a higher elasticity for i_b/i_n (0.34) and a very low estimate for the elasticity of i_b/i_n (0.14).

Clearly, the results of both of these studies are inconsistent with the other values of our data. However, because of the paucity of studies of this type, the relatively low explanatory value of the regression equations reported, and the relatively small number of corporations considered, we are reluctant to place great confidence in the values of the slope estimates obtained. (The studies do, however, provide good evidence of a significant positive effect of debt-equity ratios on rates of return to equity.) Instead, in table A–1 we provide some sensitivity analysis employing a wide range of values of the elasticity of i_b/i_n to B/E (and thus a corresponding wide range for the elasticity of i_e/i_n). The results refer to eliminating the corporation income tax. The figures in parentheses are the percentage changes in the relevant rates of return. Table A–1 assumes that f and g are linear. The top row shows the assumed values of the elasticity of i_b/i_n to B/E. Table A–2 assumes that f and g are nonlinear, with $\phi=\alpha=1.5$.

Both tables show that our general conclusions are fairly insensitive to the choice of elasticity values. The rise in the noncorporate rate of return is particularly insensitive, ranging from 41

TABLE A–1.—*Rates of return (RR) and percentage changes (% Δ) in rates of return resulting from elimination of corporate income tax for linear f and g functions*

	Elasticity of i_b/i_n w.r.t. B/E							
	.35		.58		.92		1.15	
	RR	% Δ	*RR*	% Δ	*RR*	% Δ	*RR*	% Δ
i_b	.74	(4)	.69	(3)	.60	(—16)	.54	(—24)
i_e	1.68	(20)	1.83	(31)	1.94	(38)	2.00	(43)
i_n	1.44	(44)	1.43	(43)	1.43	(43)	1.43	(43)

TABLE A–2.—*Rates of return (RR) and percentage changes (% Δ) in rates of return resulting from elimination of corporate income tax for nonlinear f and g (φ=α=1.5)*

	Elasticity of i_b/i_n w.r.t. B/E							
	.12		.28		.58		.92	
	RR	% Δ	*RR*	% Δ	*RR*	% Δ	*RR*	% Δ
i_b	.94	(32)	.87	(21)	.78	(10)	.69	(—3)
i_e	1.68	(20)	1.76	(25)	1.86	(33)	1.94	(38)
i_n	1.41	(41)	1.41	(41)	1.41	(41)	1.41	(41)

percent to 44 percent. In only one case, when $\alpha=\phi=1.5$ and the elasticity of i_b/i_n is only .12 (i.e., slightly below Baker's estimate), do we find that i_b rises by a greater proportion than i_e; otherwise i_e rises relative to i_b. Most importantly, in all cases i_n rises relative to both i_e and i_b, indicating that imposition of the corporate tax imposes the greatest burden on owners of noncorporate capital.

The figures that conform most closely to the results of Hurdle and Baker are the first column of table A–1 and the first and second columns of table A–2. However, those results also imply large changes in corporate debt-equity ratios. This is at variance with a rather large quantity of empirical evidence indicating that shifts in corporate debt-equity ratios have been fairly modest as corporate taxes rose. As a result, we tend to rely more on the results obtained with the elasticity of i_b/i_n around 0.58. Nonetheless, it is worth mentioning again that our basic results are fairly insensitive to the choice for the value of that elasticity.

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COMMENT

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The Ballentine-McLure paper is a valuable addition to the literature on the incidence and resource-allocation effects of the corporation income tax. It modifies existing theory to allow for the effects of this tax on debt-equity ratios and on dividend-payout ratios; these effects are large enough to imply notable new conclusions.

However, I find myself in disagreement with the two authors concerning a major point of interpretation of the results. Harberger found, broadly, that the burden of the corporation income tax is distributed evenly among all owners of capital through reduced after-tax rates of return. Ballentine and McLure say that corporate shareholders bear less of the tax, and other owners of capital more, than the Harberger findings show. The reason for this new finding is that increased debt financing induced by the tax increases the risk of both corporate debt and equity, and, to compensate for the extra risk, increases their equilibrium rates of return relative to that of other capital. Although the effect of the tax on debt financing and on yields (assuming that transactions costs negate the Modigliani-Miller theorem) is straightforward, it does not follow that the owners of corporate capital bear less of the tax.

In the paper under review the yields on corporate bonds and equity rise just enough to compensate for their extra risk due to increased debt financing; their risk-adjusted yields remain equal to those on noncorporate capital. The extra yields, merely being compensation for added risk, cannot properly be said to represent an offset to the burden of the tax, which should be measured using risk-adjusted yields. Because the extra risk-taking must be compensated, it is a real cost induced by the tax. Hence it is part of the excess burden of the tax, analogous to and an enlargement of the excess burden due to shifting of capital from the corporate sector to the noncorporate sector.

Because the new, added risk is distributed uniformly over all corporate capital (to a first approximation), it represents an added economic cost levied against all corporate capital. Therefore, its excess burden is to be measured not by a Dupuit-Harberger triangle but by the entire extra after-tax income required to compensate owners of corporate capital: the higher average corporate after-tax yield times the amount of corporate capital, compared with the yield with the tax but without the added debt financing. This extra burden should be imputed to owners of corporate capital, bringing their share of the total burden into line with Harberger's results.

REPLY

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Traditionally, incidence analysis has focused upon the change in income available for private use (see Musgrave, 1959, p. 207). When some private income is derived from risk premiums, changes in those risk premiums will not, in general, reflect changes in welfare. This is the issue Professor Bailey raises, one we also discussed briefly in our paper. Without a thorough specification of investor behavior, including attitudes toward risk, it is not clear how to go about measuring the welfare effects of taxation in our model. One tentative approach which we mentioned in footnote 19 of our paper and which seems to be consistent with Bailey's comments is to calculate incidence using only changes in capitalists' income net of all risk premiums (i.e., changes in i_nK). While we chose to follow the traditional approach in our paper, it may be interesting to mention here a result that obtains if only changes in i_nK are considered. Capital income taxes generate government revenues at the expense of all capital income, including risk premiums. As a result, even in the well-known Cobb-Douglas case, which under the traditional incidence approach implies that capitalists bear the full tax burden, the fall in capitalists' incomes net of risk premiums will be less than the rise in government revenues. The shortfall is the amount of revenues generated at the expense of risk premiums. Following such an approach it is not clear who can be said to bear the burden of that shortfall and, hence, under what circumstances capitalists can be said to bear the whole burden of the tax.