Taxation and Corporate Financial Policy

Alan J. Auerbach
University of California, Berkeley and NBER

February 2001

This paper has been prepared for a forthcoming volume of the Handbook of Public Economics, edited by Alan Auerbach and Martin Feldstein. I am grateful to Kevin Cole for research assistance, to the Burch Center for Tax Policy and Public Finance for research support, and to Doug Bernheim, John Graham, Jim Hines, Vesa Kanniainen, Hans-Werner Sinn and Jan Södersten for comments on an earlier draft.

Taxation and Corporate Financial Policy

ABSTRACT

This paper reviews the theory and evidence regarding the impact of taxation on corporate financial policy. Starting from a basic characterization of the classical corporate income tax and its effects, the analysis focuses on three areas of research: equity policy, debt-equity decisions, and choices regarding ownership structure and organizational form. The discussion stresses the distinction between nominal and more fundamental financial differences – for example, in the relationship between borrowing and leasing – and that financial policy involves choices not only among different underlying policies but also among characterizations of a given policy. The final section offers some brief reflections on the implications of continuing financial innovation.

JEL Classification: H32, G30

Alan J. Auerbach
Department of Economics
549 Evans Hall
University of California
Berkeley, CA 94720-3880
auerbach@econ.berkeley.edu

1. Introduction

Like other countries that rely on the income tax as a source of revenue, the United States distinguishes between corporations and individuals. U.S. corporations and individuals face separate tax schedules and different rules regarding income and deductions. Under this *classical* system of corporate taxation, there is limited coordination, or *integration*, of the two tax systems: taxes on shareholders are assessed independently of the taxes on the corporations they own. By contrast, many other countries have attempted to effect some form of integration of corporate and individual income taxes. However, even in these countries, adjustments have taken the form of partial measures, leaving the corporation income tax with independent effects.

Through the years, economists have devoted considerable effort to understanding the incidence of a distinct corporation income tax and its impact on the investment and financial decisions of firms. This chapter reviews the portion of this literature that has focused on corporate financial policy, including choices about firm ownership structure. Other chapters in this Handbook, by Fullerton and Metcalf and by Hassett and Hubbard, consider more fully the issues of incidence and investment, respectively. Poterba's chapter focuses on the effects of taxation on the financial decisions of households, rather than firms, and Gordon and Hines deal with the considerable complications introduced by open-economy capital movements. However, the discussion below must, of necessity, touch on the issues covered more fully in these other chapters. The incidence of the corporation income tax depends, in part, on the nature of financial equilibrium; the real and financial decisions of firms are independent only under restrictive assumptions; corporate financial decisions should be sensitive to the taxes faced by the owners and potential owners of their securities; and the domestic financial equilibrium will depend on tax rules that influence foreign capital flows.

1.1. What is financial policy?

In the simplest terms, financial policy relates to two key choices that firms make: (1) how much of their capital structure to support by debt, rather than equity; and (2) how much of their earnings to retain for use as internal equity finance, rather than distributing dividends and raising new equity in the market. In two landmark papers, Modigliani and Miller (1958) and Miller and Modigliani (1961) demonstrated, under certain assumptions, that neither of these decisions mattered, having no effect on firm value and shareholder wealth. These papers launched the modern literature on corporate financial policy, establishing a benchmark against which deviations from the M-M assumptions – such as the existence of taxes – could be evaluated.

The key insight of the M-M analysis is that market valuations should relate to underlying claims to income streams, rather than to how assets are labeled. A portfolio consisting of a little risky equity and a lot of safe debt should have the same value as a second portfolio with a lot of less risky equity and a little safe debt if the underlying risk of the two portfolios is comparable. We should go beyond terms like "debt" and "equity" to consider the characteristics of the claims themselves.

Over the years, this lesson has been emphasized by the evolution of financial instruments such as leases, which may act as substitutes for debt, and options, the valuation of which can, once again, be understood by constructing comparable portfolios with and without options and requiring that they have the same value (Black and Scholes 1973). A challenge to analyzing the impact of taxation on firm decisions, though, is that the tax system is based in large part on formal labels, and only indirectly on underlying asset characteristics. Thus, equity faces one set of tax rules and debt another, often more favorable, so special rules are needed regarding the treatment of the risky debt that more closely resembles equity. Equity repurchases are treated

more favorably than are dividends but, again, restrictions exclude from this favorable treatment share redemptions that too closely resemble dividends.

Evaluating the impact of taxes on firm behavior requires that we understand the rules that apply in distinguishing among different types of assets. Financial policy decisions often amount to choosing the optimal trade-off between distortions to financial policy and the tax benefits such distortions generate. Indeed, a major tax avoidance activity consists of trying to improve this trade-off, constructing assets and transactions to permit corporations to characterize their financial decisions in a manner most favorable from the tax standpoint. The impact of taxation, then, depends not only on the tax system itself, but also on where the tax system's definitional lines are drawn and how well they can be "moved" through tax avoidance activity.

1.2. Outline of the chapter

Each of the three sections that follow deals with an important aspect of corporate financial policy, respectively equity policy, debt-equity decisions, and choices regarding ownership structure and organizational form. The final section offers some brief reflections on the implications of continuing financial innovation. The discussion below relies heavily on my previous survey paper (Auerbach 1983a) with respect to developments in the literature up to that paper's writing, and on the section in Auerbach and Slemrod (1997) concerning the impact of the Tax Reform Act of 1986 on financial policy.

2. Corporate equity policy

While risk is an essential component of the theory of corporate financial decisions, a useful starting place to analyze the effects of taxation is a model without risk. Also eschewing for the moment the important question of investor heterogeneity, we consider the behavior of a

representative firm whose securities are owned by a representative individual, with firm and individual each facing its own, distinct tax system, and no provisions that integrate the two. The basic approach follows that laid out in King (1974, 1977), Auerbach (1979b), Edwards and Keen (1984) and, for the continuous time analogue used here, Sinn (1987).

Corporations face a single income tax rate, τ, which will enter the analysis later, while individuals face distinct tax rates θ on dividends and c ($\leq \theta$) on accrued capital gains. In reality, capital gains are generally taxed on realization rather than on accrual, a distinction that is important from the perspective of household portfolio reallocation decisions. However, incorporating a realization-based capital gains tax would complicate the present analysis greatly, and is not as important in this context. The accrual-equivalent alternative, c, should be thought of as being considerably less than the actual capital gains tax rate, because it takes into account the fact that not all gains are realized in every year, and that gains realized in the future benefit from a deferral advantage.[1]

Let V_t be the value of the firm at time t. It is also useful to introduce the measure S_t to represent the value of new shares issued at date t. If $S_t < 0$, then the firm is a net repurchaser of its own shares. Let D_t be the firm's total dividend payment at date t, and let ρ be the discount rate that the representative investor applies to the cash flows and capital gains generated by the firm. Capital market equilibrium requires that the after-tax rate of return equal ρ:

$$\rho = \frac{D_t}{V_t}(1-\theta) + \frac{\dot{V}_t - S_t}{V_t}(1-c), \tag{2.1}$$

[1] King (1977) discusses the construction of accrual equivalent measures. Poterba's chapter in this Handbook discusses capital gains taxes and their effects.

where the second term on the right-hand side of (2.1) reflects the fact that increases in share values due to *extensive* growth through share issuance are not taxable.

Rewriting (2.1) as a simple first-order differential equation in V:

$$\frac{\rho}{1-c}V_t = \dot{V}_t + D_t\left(\frac{1-\theta}{1-c}\right) - S_t \tag{2.2}$$

(where $\dot{V}_t$ is the rate of change of V_t with respect to time, t) and solving forward using the terminal condition that discounted firm value converge to zero, we obtain the following expression for firm value at date t:

$$V_t = \int_t^{\infty} e^{-\frac{\rho}{1-c}(s-t)}\left[D_s\left(\frac{1-\theta}{1-c}\right) - S_s\right]ds \tag{2.3}$$

Expression (2.3) is valid for any path of dividends and share issues, and so can serve as a basis for determining the optimal choices of these two variables to maximize firm value. These choices are not independent, and are further constrained by technological and legal constraints on the firm. The most obvious constraint is that imposed by the firm's net cash flow: net cash leaving the firm equals dividends less net new share issues. If we define G_t as the net proceeds from the firm's operations before the determination of dividends and new share issues, then this constraint is:

$$G_t \equiv D_t - S_t \tag{2.4}$$

In addition, dividends cannot be negative ($D_t \geq 0$). However, there may be further constraints on the payment of dividends. For example, one might imagine firms finding it necessary to pay out

a certain share of their earnings as dividends. As discussed further below, the motivation for such behavior requires a richer model than the current one, notably some combination of asymmetric information and a divergence of interests between shareholder and corporate manager. However, for the moment, we can simply consider the implications of imposing such a constraint, as in:

$$D_t \geq p(D_t + \dot{V}_t - S_t) \tag{2.5}$$

which requires that dividends equal at least a fraction p of the firm's total returns.[2]

There may also be effective restrictions on share repurchases, which have the attraction over dividends of facing capital gains tax rates. Although there have been legal restrictions on repurchases elsewhere, impediments in the United States are limited to taxation, treating repurchases as dividends if they are distributed in proportion to share ownership. While other methods of repurchasing (via the open market or through tender offers) are unlikely to result in proportional sales by different investors, repurchases have, except during certain periods, been uncommon relative to new share issues and dividends. This suggests that there may be factors beyond those explicit in the model that limit a firm's ability to repurchase its shares, by making it costly to do so.

Perhaps most importantly, repurchases from investors who voluntarily tender their shares may also be subject to the non-tax costs associated with asymmetric information. When firms have the potential to take advantage of tendering shareholders, and an incentive to do so (perhaps

[2] While this is a particularly simple constraint, imposing a more general cost relating to the dividend payout ratio leads to a similar outcome. See Poterba and Summers (1985). The key is that an increase in earnings leads to an increase in dividends. The same conclusion also applies to the constraint on share repurchases given below in (2.6); the results when that constraint binds are similar to those derived from a more general cost of entering the external equity market.

in the interest of remaining shareholders) their decision to repurchase equity may attach a premium to the shares they seek to acquire. Barclay and Smith (1988) provide empirical evidence in support of this claim. As suggested by Brennan and Thakor (1990), these costs can lead to a situation in which firms use repurchases only for large distributions, when the advantages of a repurchase overcome the costs of acquiring information about the true value of the firm. As argued by Myers and Majluf (1984), such costs may be associated with entering the external equity market and hence applicable to new share issues as well, causing share prices to fall upon the announcement of a new issues (Asquith and Mullins 1986). But firms impelled to issue new shares have no other source of external equity funds, while those contemplating a repurchase do have the option of paying dividends. Thus, in a richer model in which utilizing the external equity market is costly, we might observe firms issuing equity but not repurchasing equity. We return to this question below but, again, begin simply by considering the impact of such an effective constraint,

$$S_t \geq 0 \tag{2.6}$$

To consider the policy that maximizes firm value (2.3) subject to the constraints (2.4)—(2.6), we use (2.4) to substitute for S_t in (2.3), (2.5) and (2.6) and form a Lagrangean:

$$V_t = \int_t^{\infty} e^{-\frac{\rho}{1-c}(s-t)} \left[G_s + D_s \left(\frac{1-\theta}{1-c} - 1 \right) + \lambda_s (D_s - p\dot{V}_s - pG_s) + \mu_s (D_s - G_s) \right] ds \tag{2.7}$$

where the multipliers λ_s and μ_s are associated with the constraints (2.5) and (2.6), at least one of which will be binding at any given date.

Expression (2.7) is complicated by the presence of the term $\dot{V}_s$ on the right-hand side. To simplify, we take the derivative of (2.7) with respect to time to obtain a first-order differential equation analogous to (2.2) and solve using the same approach used to reach (2.3). The result is:

$$V_t = \int_t^{\infty} e^{-\int_t^s \frac{\rho}{(1-c)(1-\lambda_v p)} dv} \frac{1}{1-\lambda_s p}\left[G_s\left(1-\lambda_s p-\mu_s\right)+D_s\left(\frac{1-\theta}{1-c}-1+\lambda_s+\mu_s\right)\right] ds \tag{2.8}$$

The first-order condition with respect to dividends, D_s, is:

$$\lambda_s+\mu_s = 1-\frac{1-\theta}{1-c} \tag{2.9}$$

so that the second term in brackets on the right-hand side of (2.8) vanishes. Thus, the firm's value, at an optimum, is:

$$V_t = \int_t^{\infty} e^{-\int_t^s \frac{\rho}{(1-c)(1-\lambda_v p)} dv}\left(1-\frac{\mu_s}{1-\lambda_s p}\right) G_s ds \tag{2.10}$$

Assuming that $\theta > c$, at least one of the multipliers in (2.9) must be nonzero. At the margin, issuing new shares to pay dividends increases taxes (the increase in dividend taxes exceeding the reduction in capital gains taxes) and reduces the value of shares. This cost is reflected by the negative term $\left(\frac{1-\theta}{1-c}-1\right)$ in expression (2.8). To maximize value, firms will wish to decrease both new shares and dividends until at least one of the constraints binds. We many distinguish three regimes, according to whether λ, μ, or both are positive. Though firms might switch among regimes over time, it is helpful to consider first the implications for firms permanently in one regime or another.

2.1. The "traditional" view ($\mu = 0$)

When only the minimum-dividend constraint binds, expression (2.10) reduces to:

$$V_t = \int_t^{\infty} e^{-\frac{\rho}{[1-(1-p)c-p\theta]}(s-t)} G_s ds \tag{2.11}$$

According to this expression, the value of the firm equals the present value of its cash flows net of new share issues and dividends, discounted with a before-personal-tax discount rate reflecting an individual tax rate on equity income that is a weighted average of the tax rates on dividends and capital gains. In this regime, a fixed share p of the cash flows from any marginal investment are paid out as dividends and taxed at rate θ, with the remainder being retained and taxed at rate c. This regime has been said to reflect the "traditional" view (see, e.g., Poterba and Summers 1985), because it includes two "standard" conclusions. The first conclusion is that both dividend and capital gains taxes raise the corporate discount rate, which equals $\frac{\rho}{[1-(1-p)c-p\theta]}$. The second is that, at the margin, firms will increase value by investing to the point at which the marginal valuation of a dollar of new investment is one dollar. This last point may be seen by noting that reducing a shareholder's wealth by one dollar and increasing the present discounted value of future cash flows G_s by one dollar leaves the representative shareholder indifferent to the outcome.

2.2. The "new" view ($\lambda = 0$)

When only the share-repurchase constraint binds, expression (2.10) reduces to:

$$V_t = \int_t^{\infty} e^{-\frac{\rho}{1-c}(s-t)} \left(\frac{1-\theta}{1-c}\right) G_s ds\,, \tag{2.12}$$

a valuation expression that has two striking implications. First, the appropriate discount rate, $\frac{\rho}{(1-c)}$, is unaffected by the tax rate on dividends, regardless of the dividend yield. Second, the net cash flows of the firm are multiplied by the ratio $\left(\frac{1-\theta}{1-c}\right) \leq 1$. This result was called the "new" view of dividend taxation (e.g., Auerbach 1981), which, of course, it was at the time it first received serious analysis as an alternative to the view laid out above, in analyses by King (1974), Auerbach (1979a) and Bradford (1981).

The intuition underlying the new view is that, with the share-repurchase constraint binding, the firm will neither issue nor repurchase shares. Thus, its marginal source of equity funds will be retained earnings. Likewise, any subsequent cash flows generated by a marginal investment will be paid out fully as dividends – they cannot be used to reduce share issues, which are already zero. Hence, the tax consequences of both current investment and future cash flows differ from the previous case. The tax benefit of avoiding current dividend taxes upon investment reduces both the discount rate and the equilibrium valuation of marginal investment.

Consider, for example, a discrete-time example of a firm's decision whether to invest an additional dollar at date t that yields a gross payoff (after all corporate taxes) of $1+r$ dollars at date $t+1$. The cost of retaining a dollar is reduced by the dividend taxes saved, and increased by the capital gains taxes on induced share appreciation, q. Because the value of new investment per dollar equals its cost to the shareholder, in equilibrium, $q = 1-\theta+cq$, or $q = \left(\frac{1-\theta}{1-c}\right)$. One period later, this investment plus its return is worth $\frac{q[1+r(1-c)]}{q}$ per initial net dollar forgone, if all earnings are retained. If all earnings in the subsequent period are paid out, then the

shareholder receives $1+r(1-c)$ from the firm, a distribution that forces the shareholder to pay $[1+r(1-c)]\theta$ in dividend taxes, which will be partially offset by the capital gains tax avoided through the payment of the dividend, $q[1+r(1-c)]c$. On net, the benefit of the entire transaction is $\frac{[1+r(1-c)](1-\theta+cq)}{q}$. In either case, as long as tax rates are constant over time, the value per initial dollar invested is $1+r(1-c)$. Thus, the dividend tax rate plays a role in valuing the firm, but does not influence its investment.

Another way to view this equilibrium is that individuals face a tax on capital income of c and a tax on dividend distributions of $\left(\frac{\theta-c}{1-c}\right)$. While the capital income tax affects the cost of capital, the extra tax on distributions affects only value, constituting, essentially, a capital levy that is analogous to that imposed by the cash-flow component of the consumption tax (Auerbach and Kotlikoff 1987). Even though the levy is not assessed immediately, its inevitability causes it to be capitalized into share prices, a result reflected in the theory's alternative characterization as the "trapped equity" view. Whether the equity really is trapped is, of course, a central question, to which we return below.

2.3. The intermediate case ($\lambda, \mu > 0$)

Between the two regimes just discussed is a regime in which both constraints bind. In this situation, firms pay minimum dividends and issue no new shares. In terms of the value of the firm, this regime is intermediate between the "traditional" and "new" regimes, ranging from the former for small values of μ to the latter for small values of λ. Characterizing the cost of capital is more complicated, because the multipliers may take on a range of values, and the cost of capital depends not only on the current values of these multipliers, but also on their rates of

change.[3] However, for constant values of μ and λ, the cost of capital, also, will lie between those of the two previous regimes.

Which of these regimes is most likely to occur depends upon the relationship between the firm's investment and its cash flow, as is depicted in Figure 2.1, which illustrates the equilibria corresponding to different investment demand schedules, labeled D_H, D_M, and D_L. The schedule S represents the supply of funds, and reflects the fact that external funds are more costly to the firm than internal funds.[4] For firms with high levels of investment demand relative to cash flow, as represented by demand curve D_H, the maximum level of retained earnings, F_0, is far short of investment, and the equilibrium will be at point ***T***, with new share issues needed as a supplementary source. For firms with low levels of investment relative to cash flow, as represented by demand curve D_L, the level of retained earnings available at the dividend constraint exceeds the amount needed to finance investment, so dividends will be reduced until the share repurchase constraint binds, at point ***N***. Between these two regimes, as at point ***I***, firms will finance all investment through retentions, not finding additional investment profitable enough to justify the more expensive external equity funds, but finding investment profitable enough not to increase dividends and reduce investment. For firms in this regime, a shift in the level of internal funds, say from F_0 to F_1, will increase investment, providing one of the theoretical arguments in support of the observed dependence of investment on cash flow (e.g., Fazzari *et al.* 1988).

[3] The general expression for the cost of capital is given in expression (3.3) below.

[4] As already discussed, the cost of funds for the intermediate regime will depend not only on the values of μ and λ, but also on these multipliers' rates of change. This will be true, too, for firms transiting out of one of the other two regimes, for which the multipliers will be changing. However, for given future values of the multipliers, the cost of funds will still be higher if external funds are used currently, as in the constant-multiplier cases just analyzed.

Although movement among regimes can be driven by shifts in either demand or supply schedules, it is a useful simplification to think of firms with internal funds that are adequate to finance investment as "mature" and those with stronger demand relative to existing funds as "immature." The resulting classification leads to the notion (Sinn 1991a) of a life-cycle process for firms with respect to equity tax regime, a so-called "nucleus" theory in which the firm begins in the traditional regime and eventually makes the transition to one in which internal funds suffice. This distinction highlights the fact that equity taxation may represent a barrier to entry for new firms (Judd and Petersen 1986).

2.4. Corporate tax integration

The distinction between these alternative views of the impact of shareholder-level taxes is highlighted by the issue of corporate tax integration, which encompasses a range of policies aimed at alleviating the double-taxation of corporate-source equity income. All such policies involve a reduction in taxes on dividends, either at the shareholder level, through a direct reduction in tax rates or through credits or deductions that have the same effect. The two approaches adopted most commonly in practice around the world are the *imputation* system that provides tax credits to shareholders on dividends received and the *split-rate* system that taxes corporate earnings distributed as dividends at a lower rate. Although these systems differ in their details, they are fundamentally equivalent in their incidence and incentive effects, lowering the total tax burden on dividends. Their impact can be analyzed by considering a reduction or elimination of the tax rate on dividends, θ.

The analysis depends on the size of the reduction in the effective tax rate on dividends. If θ is reduced but remains greater than c, the model as presented above applies. Under the traditional view, firms would receive a reduction in their cost of capital; under the new view,

only the capital levy would fall, with no impact on the cost of capital. If θ falls below c, then neither of the constraints (2.5) or (2.6) will bind, the associated multipliers will be zero, and the three regimes discussed above collapse to one. This is because firms will now *reduce* taxes and gain from issuing shares to pay dividends. Some additional constraint is necessary to prevent infinite tax arbitrage, and one is typically present in existing systems that restricts the tax relief to dividends attributable to previously taxed corporate earnings. Thus, once all earnings have been distributed, there is no further tax incentive to distribute. In our model, the easiest way to represent this is by a constraint that limits dividends to all earnings,

$$D_t + \dot{V}_t - S_t \geq D_t \tag{2.13}$$

Inserting this constraint in (2.7) in place of the previous two constraints yields, in place of (2.8),

$$V_t = \int_t^\infty e^{-\int_t^s \frac{\rho}{(1-c)(1+\gamma_v)}dv} \frac{1}{1+\gamma_s}\left[G_s(1+\gamma_s) + D_s\left(\frac{1-\theta}{1-c} - 1 - \gamma_s\right)\right]ds \tag{2.8'}$$

where γ is the multiplier associated with (2.13). Maximizing value with respect to D_s again makes the last term in brackets vanish, with $\gamma_s = \left(\frac{1-\theta}{1-c}\right) - 1$, allowing us to rewrite (2.8') as:

$$V_t = \int_t^\infty e^{-\frac{\rho}{1-\theta}(s-t)} G_s ds\,, \tag{2.14}$$

Thus, we can think of integration as having the same impact in all regimes, lowering the cost of capital, once equality between θ and c is reached. Up to that point, integration is less

effective at lowering the cost of capital in the traditional regime (because $p < 1$) and not effective at all in the trapped-equity regime.[5]

Is there a way to make integration schemes more effective? Because the traditional view applies only to the extent that firms use new shares as their marginal source of equity funds, a tax benefit based on new share issues, rather than dividend payments, would seem to be the answer. One proposal floated in the United States during the 1980s would have given firms a partial deduction for dividends paid (like a split-rate system), with the size of the deduction based on the share of dividends attributable to equity issued after the legislation's effective date.[6] This scheme is basically similar to the "Annell" deduction present in Sweden during the 1970s and '80s (King and Fullerton 1984, p. 95).

Why aren't such schemes more commonly used? A subsidy to new share issues raises the question of how repurchases should be treated. All firms, even those issuing new shares, would have an incentive to repurchase all outstanding shares and issue new ones to qualify for the deduction. The natural response is to impose a tax on repurchases that offsets any such potential tax benefit. However, taxes on repurchases would hit not only such "churning" transactions, but also transactions by firms engaging in net repurchases. Such activity is, of course, inconsistent with the constraint (2.6), but this constraint reflects a restrictive, simplifying assumption. Repurchases do occur, even if they are less common than tax factors alone would suggest. One important example of repurchasing is the cash-financed takeover in which one firm redeems the shares of its target company. Taxing such transactions would be a controversial policy change.

[5] In a small open economy, another reason why integration may not affect the cost of capital is that the equilibrium rate of return may not be determined by domestic shareholders. For further discussion, see Boadway and Bruce (1992) and Devereux and Freeman (1995).

[6] The proposal was first described in American Law Institute (1992). See Auerbach (1990) for further discussion.

2.5. Evaluating the models

Researchers have attempted to evaluate the alternative theories of the impact of dividend taxation by testing these theories' implications regarding financial and investment behavior and market valuation. While the predictions appear to differ sharply, testing has proved challenging due both to data limitations and the fact that theories themselves derive from a simplified model that omits certain elements of reality that complicate the interpretation of results.

For example, the first approach one might think of would be to examine the actual patterns of equity finance. We observe, for example, that most firms do not issue new shares in a given year, which would seem to support the new view. On the other hand, if firms face fixed costs of issuing new shares, they might effectively use new issues at the margin by engaging in large, periodic issues. Apparently contradicting the new view is the existence of share repurchases. Repurchases, always present to some extent in the United States, began to grow during the mid-1980s, in concert with the merger wave that occurred at the same time, as firms used cash to purchase the shares of other firms, in addition to their own (Bagwell and Shoven 1989). This growth, particularly among large firms, led to the inference that firms finally had "discovered" how to avoid dividend taxation. More recently in the United States, there has been a growth in the percentage of firms not paying dividends (Fama and French 2000).

However, the implications are not so clear. Note that what is crucial for the new view is the *relative* taxation of the sources and uses of funds. For example, if firms obtain equity funds by reducing repurchases and retaining earnings, and distribute funds by increasing repurchases and dividends in the same proportion, then the new view is essentially intact. All that is needed is to apply a different value of the personal tax rate instead of θ to reflect the fact that some distributions are taxed at rate θ and others are taxed at rate 0 (Sinn 1991b). The same logic

would apply if firms retained earnings and issued equity to finance investment and used the proceeds of investment to increase dividends and reduce new share issues in the same proportion. Thus, rejection of the new view requires showing not only that dividends are an unimportant marginal source of funds, but also that reducing the issuance of new shares is an unimportant marginal *use* of funds. A piece of evidence on this particular implication is discussed below.[7]

Moving beyond simple observed patterns of finance, researchers have tested other implications of the alternative theories. In a widely cited paper seen as providing empirical evidence in favor of the traditional view, Poterba and Summers (1985) estimated equations based on Tobin's *q*-theory of investment. This theory predicts that investment by firms facing convex adjustment costs will be positively related to the relationship between the marginal value of capital, *q*, proxied by the stock market value per unit of capital, and the long-run equilibrium value of capital, q^*, i.e., $I = f\left(\frac{q}{q^*}\right)$. Under the traditional view of taxation, with marginal equity funds coming through new share issues, $q^* = 1$. Under the new view, $q^* = \left(\frac{1-\theta}{1-c}\right)$. Using postwar data from the United Kingdom, Poterba and Summers estimated investment equations of the form $I = f\left(\omega q + (1-\omega)\frac{q}{(1-\theta)/(1-c)}\right)$, accepting the hypothesis that $\omega = 1$ but rejecting the hypothesis that $\omega = 0$.

However, this result relies on certain restrictive assumptions. First, the calculation of θ and c requires that one identify the "marginal" investor whose tax rates determine valuation

[7] Even under the assumption of the traditional view that the firm relies on equity issues as a source of funds but not as a use of funds, the cost of capital may be independent of the dividend tax rate. An example is provided by

under the new view. Poterba and Summers used average marginal tax rates, a seemingly straightforward approach. Yet the marginal equity investor's identity depends on the nature of financial equilibrium. If, for example, the "Miller" equilibrium discussed below in Section 3 prevails, then the appropriate values of θ and c are instead those for investors who are just indifferent between debt and equity. Given that identification in the U.K. sample comes from frequent changes in tax rules affecting dividends, errors in measuring the change in $\left(\frac{1-\theta}{1-c}\right)$ would tend to bias the results in favor of the traditional view. Second, the test is meaningful only if the assumptions of the *q*-theory itself are satisfied, among them that firms face convex adjustment costs, capital is homogeneous and accurately measured, and returns to scale in production are constant. There has been a continuing dispute about the nature of adjustment costs, and even recent evidence in support of the *q*-theory using panel data (Cummins, Hassett and Hubbard 1994) suggests that aggregate measures of *q* contain considerable noise, and that tests based on these – such as those performed by Poterba and Summers – would be biased.

A second empirical finding often taken to favor the traditional view is that dividend payout ratios respond positively to the return to a before-tax dollar of dividends relative to a before-tax dollar of capital gains, $\left(\frac{1-\theta}{1-c}\right)$. While this evidence certainly supports the argument that taxes influence dividend policy (and therefore contradicts the so-called "tax irrelevance" view based on the hypothetical availability of offsetting tax arbitrage strategies), it is less clearly evidence in favor of the traditional view specifically.

Bernheim (1991), who develops a signaling model in which the fraction of distributions taking the form of dividends rather than repurchases responds to changes in the dividend tax rate to preserve the average tax rate on distributions.

The argument that this evidence is inconsistent with the new view is based on the new view's prediction that the level of dividend taxes has no impact on the incentive to invest or pay dividends. However, there are two distinct reasons why an increase in dividend taxes would reduce distributions under the new view.

First, a *temporary* increase in the dividend tax rate does raise the cost of paying dividends under the new view, for it reduces the opportunity cost of funds more than the ultimate burden on the returns to investment. Indeed consistent with this logic, Poterba and Summers (1985) found (based again on an analysis of UK data) that dividends fall with a current rise in dividend taxes and rise with an anticipated rise in dividend taxes, even when the *level* of dividend tax rates is held constant.

Second, an increase in the dividend tax typically does not occur in isolation. In the United States, for example, dividends and interest are taxed at the same rate for individual investors. An increase in dividend taxes also raises the tax rate on interest income, a change that makes corporate investment more attractive by raising the tax burden on alternative investments. Thus, it should spur more corporate investment and, under the new view, a reduction in dividends.

That the cost of paying dividends may increase with the dividend tax rate even under the new view helps in interpreting related evidence on dividend signaling. In a study that focused on the question of whether tax-based signaling drives dividend policy, Bernheim and Wantz (1995) reasoned that if dividends are used as a signal, their information content should relate to their cost. Hence, the increase in value in response to a unit increase in announced dividends should be higher during periods with a higher tax penalty on dividends. Looking at the period 1978-1988, Bernheim and Wantz estimated that the information content per dollar of dividends fell

along with the tax rate on dividends in 1981 and again in 1986. While their measure of the cost of dividends was based on the traditional view, their finding is not necessarily inconsistent with the cost of paying dividends based on the new view: the relevant cost under the new view might well have fallen over time as well. For example, anticipations of reductions in marginal tax rates prior to 1981 and again before 1986 should have raised the opportunity cost of paying dividends relative to the cost after rates had reached historically low values after 1986 and would not have been expected to fall further.

Other evidence, based on micro-data, suggests that neither pure regime applies to all firms, but that some firms appear to behave as predicted by the new view. For the United States, Auerbach (1984) estimated that firms issuing new shares required a higher rate of return on investment than those not issuing new shares, as would be the case if the respective costs of capital of the two groups were those of the traditional and trapped-equity regimes. Bond and Meghir (1994) found a higher sensitivity of investment to internal funds among U.K. firms with low or no dividends payouts. Auerbach and Hassett (2000) found that issuance of new share issues was just as responsive to internal cash flow as to investment among all firms that have paid dividends at some point in their observed history, contrary to a key "traditional view" assumption. With respect to dividend policy, they found that dividends responded more strongly to investment and internal cash flow among U.S. firms with characteristics associated with weaker access to external capital markets.

3. The debt-equity decision

For corporations, interest payments are tax deductible, but returns to equity investors are not. Dividends are subject to double taxation, and even returns to equity in the form of capital

gains are subject to at least one level of tax, at the corporate level. Thus, there appears to be a strong tax incentive to use debt to fund the firm's activities.

Consider again the firm's valuation under optimal equity policy, as given in (2.10). Recall that we defined G_t as the net proceeds from the firm's operations before the determination of dividends and new share issues. Let us now divide G_t into those flows before interest and debt, X_t, and those associated with debt, B_t, the latter flows equal to net borrowing less after-tax interest payments:

$$G_t \equiv X_t + \dot{B}_t - i_t(1-\tau)B_t \tag{3.1}$$

where i_t is the interest rate at date t. Inserting (3.1) into (2.10) yields:

$$V_t = \int_t^\infty e^{-\int_t^s \frac{\rho}{(1-c)(1-\lambda_v p)}dv}\left(1-\frac{\mu_s}{1-\lambda_s p}\right)\left(X_s + \dot{B}_s - i_s(1-\tau)B_s\right)ds \tag{3.2}$$

Maximizing V_t with respect to B_s yields the first-order condition $\frac{\partial V_t}{\partial B_s} - \frac{d\left(\partial V_t / \partial \dot{B}_s\right)}{ds} = 0$.

Letting $\alpha_s = \left(1-\frac{\mu_s}{1-\lambda_s p}\right)$ be the adjustment term multiplying corporate cash flows at date s, this first-order condition implies that

$$i_s(1-\tau) = \frac{\rho}{(1-c)(1-\lambda_s p)} - \frac{\dot{\alpha}_s}{\alpha_s} \tag{3.3}$$

The right-hand side of (3.3) is the firm's cost of equity capital at date s, taking account not only of the direct cost of funds but also the capital gains or losses associated with a shift in equity

policy regime.[8] The left-hand side of (3.3) is the net cost of borrowing, so (3.3) calls for the firm to equate the costs of debt and equity. If the equity regime is fixed over time and α does not change, then condition (3.3) simply requires that $i(1-\tau) = \frac{\rho}{1-\phi}$, where ϕ= [1-(1-*c*)(1-λp)] is the effective tax rate on returns to equity, ranging from a value of *c* when $\lambda = 0$ (i.e., under the new view) to (1-*p*)*c* + $p\theta$ when $\lambda = 1 - \left(\frac{1-\theta}{1-c}\right)$ (the traditional view).

For a single, representative household also to be indifferent between debt and equity, it must be the case that the returns after individual taxes are equal, or $i(1-\psi) = \rho$, where ψ is the individual tax rate on interest income. This yields the following condition for firm optimization:

(3.4) $$(1-\tau)(1-\phi) = (1-\psi)$$

Expression (3.4) has a straightforward interpretation. The left-hand side is the net return to the individual investor of a dollar of corporate source income taxed as an equity return. The right-hand side is what the same dollar would yield if passed through as an interest payment. Note, though, that if all tax rates are given, there is nothing obvious that will cause the equality in (3.4) to be satisfied; firms will not achieve an interior solution, and will increase or decrease debt until some other constraint binds. In the apparently likely case that $(1-\tau)(1-\phi) < (1-\psi)$, one would obtain a corner solution with an all-debt outcome.

Some have embraced this argument. Perhaps most prominent is Stiglitz (1973), who suggested that firms should use equity to cover the capitalization of ideas, thereby avoiding immediate capital gains taxes, but that debt should support any new investment by existing

[8] This term implies that equity is more costly as the firm makes the transition from the traditional regime, due to capital losses as the valuation of capital assumes its "trapped-equity" level.

enterprises. However, this prediction seems at variance with the evidence. Though debt-equity ratios have varied across countries and time periods, equity finance has generally accounted for a larger share than debt of corporate capital structures, at least in the aggregate. This section reviews the different theories of corporate leverage, and the associated empirical evidence.

The simplest explanation for why firms don't borrow more is that, at the margin, there exist non-tax costs that offset the tax advantages of doing so. To understand these costs, it is first necessary to clarify the characteristics that distinguish debt from equity, for tax purposes.

According to tax rules in the United States and elsewhere, debt involves a fixed commitment to make payments, while equity does not. Thus, the more debt a firm issues, the greater its commitment of future cash flows to making interest payments, and the greater the probability that its cash flows will be inadequate to cover interest payments. This increases the probability of bankruptcy or other financial distress, the resource costs associated with which would be taken into account when making the initial borrowing decision. That these costs matter to some extent is supported by the efforts made by tax authorities to deny interest deductibility to "debt" for which commitments to pay interest and principal are weakened. In the United States, for example, there are limits on the deductibility of interest on "non-recourse" debt (for which creditors literally have no recourse if payments are not made) and on very long-term debt, for which principal repayment is of little concern.

A second possible non-tax cost to borrowing derives from the information asymmetry between potential lenders and borrowers. In an environment where lenders cannot distinguish between good and bad risks, adverse selection may occur, as firms that are relatively less risky will be discouraged by the large risk premium imposed by lenders, and only the bad risks will find borrowing attractive (Stiglitz and Weiss 1981).

Yet another imperfect-information explanation relates to the moral hazard problem of firms that can alter their investment choices to take advantage of debt-holders. With limited liability, firms face a one-sided bet when making risky investments: if their investments fail, the downside risk is truncated. As illustrated in Figure 3.1, which depicts two possible return distributions, any return below that labeled *A* would induce bankruptcy. Increased leverage raises the position in the return distribution at which failure occurs, as shown in the figure in the move from point *A* to point *B*. But the impact differs according to the underlying risk of the firm's assets. The riskier the firm's assets, the greater the share of the distribution that will be truncated by the shift. Hence, firms may be encouraged to undertake riskier investments, to take greater advantage of limited liability. In Figure 3.1, this might make the high-risk investment more attractive than the low-risk investment, despite its full distribution having a lower mean return. One may view the ability to walk away from losses as a put option that creditors provide as part of the lending contract. Undertaking riskier investments increases the value of this put option. Creditors, of course, would charge for this put option were the firm's investment strategy known and fixed, but such a "wealth transfer" cannot generally be avoided otherwise. The more difficult it is to monitor a firm's activities, and the easier it is for a firm to alter its asset portfolio, the more of a problem this potential moral hazard imposes and the higher a premium lenders would insist on (Myers 1977). The associated inefficiency in the choice of investment projects would thus be impounded in the cost of borrowing.

While each of the previous explanations relates to why value-maximizing firms might limit their borrowing, managers might well stop short of optimal borrowing because of a divergence between their incentives and those of their shareholders. Managers with high debt loads might well be forced to work harder, their human capital at considerable risk should the

firm be forced into bankruptcy. Though this effect increases the attractiveness of debt from the shareholder's perspective, it has quite the opposite impact on managers, who would find the prospect of considerable "free cash flow" much more enticing (Jensen 1986).

In addition to these theories of borrowing, there are others that relate more directly to the apparent tax incentives themselves. In responding to the apparent inequality in favor of debt finance – $(1-\tau)(1-\phi) < (1-\psi)$ – the theories suggest that (1) ϕ isn't as large as one might think; (2) τ may be smaller than the statutory corporate tax rate; and (3) ψ may be much larger than ϕ for the relevant individual investor. The first of these arguments follows from the new view of equity taxation discussed above. From that perspective, shareholders face only the capital gains rate on marginal equity returns, even those that flow in the form of dividends. If $\phi = c$, and c is very small, then the debt-equity decision rests roughly on the relative magnitudes of τ and ψ, which may not be far apart. The other two explanations, which we now explore in more detail, are that the ability to deduct interest payments may be limited, and that the relevant marginal investor is one for whom the corporate tax advantage for debt is offset by a personal tax advantage for equity.

3.1. Competing tax shields

The absence of a unique interior optimum in simple models of the debt-equity decision follows from the fact that tax rates are assumed not to change with the debt-equity ratio. Thus, if the inequality $(1-\tau)(1-\phi) < (1-\psi)$ holds at a low debt-equity ratio, it will hold at higher debt-equity ratios and continue to encourage borrowing. This result requires that interest payments be deductible at the corporate tax rate, τ, regardless of their magnitude. But corporate tax rules do not conform to this assumption. Instead, they limit deductions for interest and other expenses to the extent that these deductions would induce negative taxable income and tax refunds. That is,

if the corporation's earnings before interest and taxes, or *EBIT*, are *E*, and its interest deductions are *I*, then the tax system treats positive and negative values of (*E-I*) asymmetrically,

$$T = \begin{cases} \tau(E-I) & \text{if } (E-I) > 0 \\ \tau^*(E-I) & \text{if } (E-I) < 0 \end{cases} \tag{3.5}$$

with $\tau^* < \tau$.[9] The simplest such asymmetry is that $\tau^*=0$ – no deductibility for losses – but tax systems typically provide *some* tax benefit even for firms with losses through the ability to carry losses forward or backward to other tax years. We discuss below how one estimates the value of such unused current deductions.

The likelihood that a firm's interest payments exceed its *EBIT* depends not only the debt-equity ratio, but on other elements of the tax system as well. If the tax system measured a corporation's income accurately then, in a risk-less world, it would be possible to finance all investment by borrowing and just deduct all interest payments. To see this, consider the derivative of the valuation expression (3.2) with respect to time, *t*:

$$\frac{\rho}{(1-c)(1-\lambda_t p)} V_t = \left(1 - \frac{\mu_t}{1-\lambda_t p}\right)\left(X_t + \dot{B}_t - i_t(1-\tau)B_t\right) + \dot{V}_t \tag{3.6}$$

If the firm finances all of its operations by borrowing, then it keeps its equity value exactly at zero, i.e., $V_t = \dot{V}_t = 0$. In this case, the equilibrium valuation condition (3.6) becomes

$$i_t(1-\tau)B_t = X_t + \dot{B}_t, \tag{3.7}$$

[9] For a multinational corporation, additional limits may apply. In the United States, for example, only a portion of the interest on domestic borrowing may be used to offset domestic source income. See Froot and Hines (1995).

which says that the return to debt equals the firm's real net cash flows, X_t, plus the additional amount of debt the firm is able to issue without reducing its equity value, i.e., the increase in the value of the firm. But this is simply the firm's economic income, say *E'*, less taxes computed before interest deductions, τE. Thus, we may rewrite (3.7) as:

$$i_t(1-\tau)B_t = E' - \tau E \tag{3.8}$$

from which it follows that interest payments will be less than, greater than, or equal to *EBIT*, *E*, according to whether *E* is less than, greater than, or equals to economic income, *E'*. Indeed, if economic income and *EBIT* are equal, then we may cancel the corporate tax rate τ from both sides of (3.8), meaning that the path of the firm's debt, and hence its value, is independent of the corporate income tax (Samuelson 1964).

In general, though, the corporate tax base deviates from true economic income, as corporate tax systems treat certain types of income – such as corporate capital gains – favorably, thereby lowering the value of *E*. The same effect is provided by schemes that provide generous deductions for other corporate expenses, notably depreciation. Hence, corporations may well hit the limit of current deductibility at considerably less than an all-debt capital structure, even before account is taken of the fact that ex post returns are risky and may fall short of their certainty-equivalent value. Taking risk into account, the tax system's asymmetry described in (3.5) will impose a greater disincentive to borrow on firms with more uncertain returns.

The resulting financial equilibrium, then, will be one in which the equality (3.4) is established by the endogeneity of the corporate tax rate. The statutory tax rate τ is replaced in the equation by a function of τ and τ* that takes into account both the likelihood that the firm will not be able to deduct marginal interest payments immediately and the value of such deferred

deductions. This equilibrium, of course, will also be affected by the risk and tax characteristics of the assets in which the firm invests. The situation presents the firm with a trade-off between interest deductions and other tax deductions, as explored initially by DeAngelo and Masulis (1980) and analyzed in more detail by Sinn (1987). While, *ceteris paribus*, firms would generally seek to maximize other deductions, they may not do so if there are direct costs involved (as through a distortion of investment decisions) or if there are other advantages to borrowing, such as monitoring that debt-holders may provide (Kanniainen and Södersten 1994).[10]

3.2. The Miller equilibrium

For many tax systems, the corporate tax rate is well above the average marginal tax rate on interest income. In the United States, the corporate tax rate at the turn of the century was 35 percent, while the highest marginal tax rate (subject to small further adjustments) was 39.6 percent. With a substantial share of assets held by tax exempt institutions such as pension funds, for whom only the corporate tax on equity income applies, it seems clear that the typical investor would face a lower total tax burden on debt than on equity.

But, as elaborated by Miller (1977), how one defines the relevant marginal investor depends on the nature of financial equilibrium. In a world in which investors choose to hold only debt or only equity according to which yields a higher after-tax return, all that is necessary for an interior solution is that there exist *some* investors who prefer equity (and some who prefer debt) for tax purposes. This equilibrium is illustrated in Figure 3.2, which plots the relative

[10] Kanniainen and Södersten derive their result in the context of a model in which firms face the "one-book" accounting constraint used by some countries, in which dividends can be paid only out of taxable earnings. In this model, an increase in non-interest tax deductions requires a reduction in dividends and hence in borrowing. Further discussion of the implications of one-book accounting on financial decisions and the cost of capital may be found in

personal tax preference for debt, defined by the ratio $\frac{1-\psi(y)}{1-\phi(y)}$, as a function of income, y, along with the corporate tax preference for equity, $1-\tau$ (which is independent of an individual's income). If marginal tax rates increase with income, and the individual tax on equity, ϕ, is some fraction of the tax rate on debt, ψ, the tax preference for debt will be decreasing in y, as shown in the figure. At income level y^*, the two curves cross and expression (3.4) is satisfied.

Clearly, if all investors had income y^*, debt and equity would be equally preferred and firms indifferent in equilibrium. But even with a range of investors with incomes below and above y^*, there will still exist an equilibrium in which equity and debt coexist and firms are indifferent between them. Firm indifference alone does not require that (3.4) hold, merely that the required return to equity, ρ, equal the after-tax interest rate $i(1-\tau)$. Assuming this condition to be met, we can see that those for whom $y > y^*$ will receive a higher return from holding equity than from holding debt, and those for whom $y < y^*$ will receive a higher return from holding debt than from holding equity. Thus, if individuals may hold only positive quantities of either asset, then the market for debt and equity will clear if firms – who are indifferent with respect to their individual debt-equity choices – issue just enough debt to satisfy the demands of those with incomes below y^*. Hence, only the aggregate debt-equity ratio, and not that of any firm, will have a determinate solution.

This theory characterizes the marginal investor not as some "representative" investor, but rather as the investor who is indifferent from a tax perspective between debt and equity. Thus, if the tax system changes, the identity of the representative investor will change, too. For example, if the tax system shifts in favor of equity (as would be the case if individual tax rates rose) then,

---

Kanniainen and Södersten (1995). Also see Sørensen (1994), who provides an integrated discussion of this constraint and those underlying the equity policy regimes discussed above.

as illustrated by the dashed schedule in Figure 3.2, the marginal investor would become someone with lower income, y^{**}, and the aggregate corporate debt-equity ratio would fall.

The Miller model is easily generalized to the case of more than two types of assets, for example with the addition of completely tax exempt municipal bonds in which the very highest bracket individuals would specialize. But the model confronts a more serious limitation, namely that its prediction of investor specialization is patently false. In the real world, even non-taxable pension funds hold a substantial share of their assets in the form of equity. This contradiction arises because the Miller model presumes that assets differ with respect to tax treatment alone, so that there is no trade-off with respect to other characteristics. In a more general model in which debt and equity differ with respect to risk as well, Auerbach and King (1983) showed that the Miller result generally requires the asset space to be sufficiently complete to permit "tax spanning" that lets households choose return patterns and tax treatment separately. Otherwise, households will hold portfolios diversified with regard not only to individual equity holdings, but also with regard to debt and equity.[11] With such diversification comes a redefinition of the "marginal" investor. Now, the tax rates of all investors holding both debt and equity matter in the calculation, entering in a weighted average. The weights depend on the degree of absolute risk aversion, the less risk-averse individuals[12] in a better position to arbitrage differences in rates of return playing a more powerful role.

[11] In his chapter in this Handbook, Poterba considers the portfolio-choice implications of the Auerbach-King model in more detail.

[12] With well-behaved preferences toward risk characterized by declining absolute risk aversion, individual weights would be increasing not only with respect to risk tolerance, given wealth, but also with respect to wealth.

3.3. Evidence on the effects of taxation on corporate borrowing

One seemingly obvious approach to evaluating whether tax rules favor borrowing is to estimate the impact of changes in debt on firm value. However, a little thought reveals why such an approach is unlikely to succeed. Because the change in a firm's debt does not result from a random process, the market's response reflects not only its valuation of the change itself, but also whatever information the change conveys. As noted by Fama and French (1998), these effects are difficult to separate. Moreover, even if adequate controls for information effects did exist, valuation responses would merely reveal the presence of deviations from optimal policies, rather than the underlying influence of taxes. That is, for any model in which firms eventually settle at an interior optimum, either because marginal tax benefits decline or marginal non-tax costs increase, the marginal impact on value of a change in debt should be zero. Positive responses to increases in debt would suggest that firms had initially settled on debt-equity ratios that were too low, and negative responses would suggest that initial debt-equity ratios were too high, with neither outcome revealing anything about the size of the tax benefits at any given level of borrowing. While the pure Miller model would predict no valuation responses (controlling for information effects) because optimal firm policy is indeterminate, the lack of a measured response might also simply reflect that firms, on average, are at their respective unique optima. Such an exercise, then, might shed light on whether managers act in the interests of shareholders, rather than telling us much about the tax benefits of leverage.

Most empirical investigations of the importance of tax rules with respect to the choice of financial structure may be classified into two main categories. The first group of studies estimates the extent to which interest payments are tax deductible, shedding light on the potential importance of competing tax shields as an explanation of limited borrowing. The second

empirical approach has been to estimate models of leverage decisions using cross-section or panel data, including tax and non-tax characteristics of firms to assess the relative importance of tax factors. Except where noted below, this literature takes little account of the personal tax considerations relevant to Miller's explanation of financial policy.

3.3.1. Limits on interest deductions

As discussed above, tax systems typically provide less than full loss offset, not giving a tax refund to those investors with negative current taxable income. However, this does not imply that prospective incremental interest deductions have no value in such circumstances. First of all, firms that borrow do not necessarily know, ex ante, that they will have negative taxable income in a given year. One would wish to weight the value of interest deductions in any state by the probability of that state occurring, evaluated at the time of the borrowing decision. Second, even if interest deductions cannot be taken immediately, this does not mean that they can never be used. Rather, unused deductions typically can be carried forward for possible use in a subsequent year and, in some countries, carried back to a prior tax year. For several years in the United States, including the period considered by the research discussed below, the carry-forward period was 15 years and the carry-back period 3 years.[13]

Carrying deductions forward reduces their value, because deductions carried forward do not earn interest and may expire unused. Carrying deductions back (by recomputing a prior year's tax liability) produces an immediate deduction. However, the existence of a carry-back provision complicates calculations because it attaches an option value to taxable income,

[13] Currently in effect are the provisions of the Taxpayer Relief Act of 1997 that reduced the carry-back period to 2 years and increased the carry-forward period to 20 years.

associated with the possibility that the firm may wish to carry future losses back to the current year. This, in turn, reduces the value of an immediate deduction when the firm *is* taxable.

To solve for the value of interest deductions in this environment, some assumptions are necessary. Imposing the restriction that firm transitions between taxable and non-taxable states follow a second-order Markov process, Auerbach and Poterba (1987) derived an algorithm to solve for the present value tax liability associated with a dollar of taxable income. (This calculation also measures the value of a one-dollar reduction in taxable income due to an interest deduction). Altshuler and Auerbach (1990) extended this methodology to take account of intermediate states in which firms may deduct some but not all expenses.[14] The general methodology of these two papers can be understood by considering a simplified case in which transitions follow a stationary first-order Markov process between two states (taxable and non-taxable) and losses may be carried back only one year. In this case, the "shadow" value (in terms of reduced taxes) of a dollar to be deducted (or the cost of a dollar of extra taxable income) is the statutory tax rate multiplied by:

$$
\begin{aligned}
w &= \sum_{i=1}^{L} \beta^i \pi_{NN}^{i-1} \pi_{NT} (1 - v) && \text{in state } N \\
1 - v &= 1 - \beta \pi_{TN} (1 - w) && \text{in state } T
\end{aligned}
\tag{3.9}
$$

where N is the non-taxable state, T is the taxable state, β is the one-year discount factor, L is the number of years after which loss carry-forwards expire, and π_{ij} is the transition probability from state i to state j.

[14] A related intermediate state arises in the case of the alternative minimum tax (AMT), under which a firm faces a marginal tax rate below the statutory corporate rate. See Lyon (1990) for further discussion of the effects on incentives of transitions involving the AMT

The first of the expressions in (3.9) says that the value of a dollar tax deduction for a firm not currently taxable is based on the distribution of dates when that deduction can first be used. The probability of its use one year hence is π_{NT}; the probability of its use two years hence is $\pi_{NN}\pi_{NT}$; and so on. Payments at each future date must be discounted and adjusted by the term v to account for the fact that reducing taxable income also reduces the option value of subsequent carry-backs. The second expression in (3.9) says that a dollar deduction when taxable has its value reduced by the extent to which it precludes subsequent carry-back, the value of which, in turn, is the difference between immediate use and eventual use, (1-w).

Using U.S. corporate tax returns from the period 1970-82 to estimate transition probabilities, Altshuler and Auerbach estimated 1982 shadow values of marginal interest deductions ranging from 19 percent for firms with two successive years of tax losses to 39 percent for firms with two successive years facing no tax constraints. Their asset-weighted sample average was 32 percent, well below the statutory corporate rate of 46 percent prevailing at the time. Thus, the calculations suggested that tax asymmetries were quantitatively important for the corporate sector as a whole and that there was also considerable heterogeneity with respect to the value of interest deductions.

More recently, an alternative approach has been to simulate distributions of tax payments using a large number of random draws based on the assumption that a firm's taxable income follows a random walk. Doing so, Graham (1996) estimated a slightly lower mean value (30 percent) for 1982 than Altshuler and Auerbach for an unweighted sample of COMPUSTAT firms, but a higher value (40 percent) weighting by market value. The gap between the weighted estimates of these two studies may be attributable not only to methodological differences, but also to weighting scheme (market value weights placing more weight on successful firms than

asset weights) and also perhaps to sample differences. Altshuler and Auerbach found that their estimates of the incidence of tax losses was higher in actual tax returns than in the corresponding COMPUSTAT records considered by Auerbach and Poterba. For the last year in his sample, 1992, Graham's unweighted and value-weighted estimates of the average marginal tax rate were 20 percent and 28 percent, respectively, compared to that year's statutory rate of 34 percent.[15]

3.3.2. Behavioral responses to variations in tax incentives to borrow

Evidence on the deductibility of interest payments suggests that limits on deductibility have a potential role in explaining observed borrowing decisions. But whether these limitations, or other tax considerations, actually do matter is another question, to be resolved through empirical analysis of the relationship between borrowing and tax incentives.

Implementing a model of borrowing decisions confronts several problems, with which the literature has dealt with to varying degrees. First, as just discussed, the tax rate the firm faces on its marginal interest deductions is a complicated function of the firm's current and expected future circumstances. Second, the tax rate at which interest can be deducted is endogenous; the greater a firm's debt, the lower its effective marginal tax rate on interest deductions. Thus, the relationship between borrowing and marginal tax rates based on a simple regression will be biased downward. Third, borrowing may also result from factors correlated with tax status. For example, a firm in financial distress may borrow more as a result, and may also have unused tax credits and deductions. This, too, would impart a downward bias to the relationship between borrowing and the corporate tax rate. Empirical studies typically include other explanatory variables to control for this, some more fully than others. Fourth, there are many different kinds of debt, and close substitutes for debt, such as leases. If only some elements of this category are

[15] Graham's algorithm also takes into account the AMT that applied during the later years in his sample.

considered, then the impact of taxation on borrowing as a whole may be misstated. Fifth, measurement of relevant aggregate personal tax rates is difficult, as discussed above in the context of testing theories of the effects of dividend taxation, and measuring shareholder tax rate variation across firms is even more problematic.

Early empirical work dealt implicitly with the problem of tax rate endogeneity by using variables that did not depend directly on current debt levels. For example, Bradley *et al.* (1984) used a proxy for non-debt tax shields equal to the sum of annual depreciation charges and investment tax credits divided by the sum of annual earnings before depreciation, interest and taxes[16]. In cross-section regressions of averages for the period 1962-81, they found that debt was a *positive* function of the non-debt tax shields, contrary to the theory. In a subsequent cross-section study based on debt averaged over the period 1977-79, Titman and Wessels (1988) used a factor-analytic approach to allow their model to define non-debt tax shields as a linear function of three observable measures, including depreciation deductions and investment tax credits (ITCs). They found that tax shields so defined do have the correct sign in predicting long-term debt, short-term debt, and convertible debt in separate equations. However, none of the estimated effects were statistically significant.

Though excluding interest payments themselves, these estimates of non-debt tax shields may be endogenous, as they depend on firm investment choices made simultaneously with borrowing decisions. In cross-section analysis, there is little one can do about this endogeneity, but panel data offers more options. Auerbach (1985), using a panel of firms from 1969-77, attacks the problem in two ways. First, the paper includes fixed firm effects as explanatory variables, to eliminate cross-firm variation in the tendency to borrow that may be correlated with

other explanatory variables. Second, it models the *change* in debt-assets ratios rather than their level, and uses a lagged measure of tax capacity – the firm's tax loss carry-forward – as a measure of the tax incentive to borrow. Estimates of this variable's impact are negative and statistically significant for all borrowing aggregated together, and for long-term borrowing considered separately (but insignificant for short-term borrowing).[17]

MacKie-Mason (1990) adopts a related approach, looking not at changes in debt, but at new public issues of debt relative to new equity issues. While this approach does not control for unobservable firm effects, it does take into account the simultaneous determination of contemporaneous tax and borrowing variables. MacKie-Mason measures tax status by variables used in the previous studies, the tax loss carry-forward and the investment tax credit. However, he notes that the extent to which the latter variable matters should depend on how close the firm is to tax exhaustion. Thus, he interacts the ITC with a variable meant to measure financial condition, the argument being that the ITC should matter more for firms in poorer condition. As theory would predict, he finds that both terms reduce the probability of issuing debt, with the effects both statistically significant and economically important.

Graham (1996) carries MacKie-Mason's insight about the varying importance of non-debt tax shields one step further, using the methodology discussed in the previous section to estimate each firm's marginal tax rate based on projections of taxable income using each year's initial conditions. He then considers changes in debt as a function of this and other variables and finds that the marginal tax rate exerts a significant effect in pooled data, but is not always

---

[16] This measure is unorthodox, as it adds together deductions and credits with no tax rate adjustment, which the authors defend on the basis of not knowing the tax rate to use for such an adjustment. It is hard to know the extent to which the paper's counterintuitive results with respect to this variable are due to its novel construction.

[17] In a related context, tax loss carry-forwards are significant in explaining variations in the share of tax-exempt debt in bank portfolios (Scholes et al. 1990).

significant in individual cross sections. The effect is weakest in 1986 and 1987, around the time of the comprehensive Tax Reform Act of 1986, suggesting the confounding effects of additional factors during this period.

All of the papers discussed thus far limited their attention to firm-level tax incentives, ignoring variations in individual taxes over time and across firms. More recently, Graham (1999) extended the analysis of his earlier paper to include inter-firm variation in personal tax rates, as well as time series variation associated with changes in the tax law. In a decomposition of his regression results, he found that only the cross-section ("within") variation, and not the time series ("between") variation in tax rates exerted a significant impact on his results. Measuring the net tax advantage to debt, in terms of the notation used above at (3.4), as

$$(1-\psi) - (1-\tau)(1-\phi), \tag{3.10}$$

where ψ is the investor tax rate on debt, τ is the corporate tax rate, and ϕ is the investor tax rate on equity, he assumed identical underlying investor tax rates and achieved cross-section identification through variation dividend payout rates, basing ϕ based on its "traditional" view measure as a weighted average of dividend and capital gains tax rates. The results support the inclusion of this variable and the implication that personal tax rates do matter, and generally hold up when account is taken of investor clienteles using Auerbach's (1983b) estimates based on ex dividend day share price behavior.

Thus, at least in cross-section analysis, firms do seem to respond to differences in tax incentives to borrow. But aggregate responses in time series are less evident. One problem, as identified above in discussing the Miller equilibrium, is that it is not clear how one should aggregate tax rates of different investors. When personal tax rates change, changes in the net tax

advantage of debt over equity given in (3.10) will differ across investors in size and even, perhaps, in sign. One method of teasing out the effects of time series tax rate variation is to focus on the relative impacts of particularly large tax law changes on different types of firms, adopting the so-called "natural experiment" approach. An ideal such tax change was the Tax Reform Act of 1986 (TRA86), which lowered tax rates on dividends, interest, and corporate income, raised tax rates on capital gains, and eliminated non-debt corporate shields by repealing the investment tax credit and reducing the acceleration of depreciation allowances on real estate. While the aggregate response of debt to these changes appeared rather small (Gordon and MacKie-Mason 1990), the changes in debt across firms between 1986 and 1987 do vary as predicted with respect to dividend yield and changes in corporate tax shields (Givoly *et al.* 1992).

Another potential source of variation that an investigator might utilize, across countries, has thus far proved difficult to use in isolating the effects of tax factors from other differences. For some initial thoughts in this area, see Rajan and Zingales (1995). In the international context, though, there are other financial margins on which a multinational firm operates. Beyond the choice between domestic issuance of debt and equity, such firms also may decide whether and how to finance abroad. There is considerable evidence that these choices do respond to tax incentives, as discussed by Gordon and Hines in their paper in this Handbook.

3.4. Leasing as a form of borrowing

As discussed in the introduction, debt and equity are useful simplifications, but financial decisions relate to the allocation of claims to underlying income streams, rather than to how these claims are packaged and what the packages are called. There may be alternative ways

effectively to increase debt without an explicit increase in borrowing. The firm's choice between leasing and purchasing capital provides an illustration of this distinction.

Imagine a firm that plans initially to purchase a unit of capital and finance it entirely with debt, perhaps using the capital as security for the debt. An alternative would be for the firm to lease the capital from another firm, its lease payments to the lessor substituting for its payments of interest and principal. As there appears to be little real distinction between these two situations, this suggests that one might wish to include leases along with explicit debt in assessing the firm's overall leverage. Indeed, as the tax treatment of leases provides one of the key distinctions between borrowing and leasing, we should expect leasing to substitute for borrowing in response to tax considerations.

Consider the decision of whether to lease or purchase a unit of capital that, for simplicity, depreciates exponentially over time. According to the standard Hall-Jorgenson user cost of capital expression (see Auerbach 1983a), the zero-profits condition for the owner of this capital is that it deliver a gross (before depreciation and taxes) marginal product equal to:

$$C = \frac{(r - \pi + \delta)(1 - k - \tau z)}{(1 - \tau)} \tag{3.11}$$

per dollar of capital, where r is the firm's cost of funds, π is the inflation rate, δ is the rate of economic depreciation, k is the investment tax credit, z is the present value of depreciation allowances per dollar of initial purchase, and, as before, τ is the corporate tax rate. This derivation assumes that the capital owner is always taxable at rate τ and makes use of all available deductions.

In a competitive spot market for capital rental, (3.11) also defines the equilibrium lease payment that such capital should command. For the lessee, then, the lease itself should have no

tax consequences, as the lease payment is deductible from the return to capital, leaving a net tax liability of zero. The issue of whether to lease, therefore, hinges simply on the tax consequences of direct ownership. By the assumptions used in constructing the user cost in (3.11), a fully taxable firm facing the tax rate τ will be indifferent between leasing and owning. Thus, a preference for leasing or owning must result from one of these two conditions being violated. In this event, the decision will also depend on the other parameters in (3.11). To see how, we may consider an illustrative example, drawing on the insights of several papers on the subject, including Myers et al. (1976), Brealey and Young (1980), and Edwards and Mayer (1991).

As a benchmark, consider the case in which the inflation rate is zero, there are no investment tax credits, and depreciation allowances are based on economic depreciation. Then (3.11) simplifies to:

$$C = \frac{r}{(1-\tau)} + \delta \tag{3.12}$$

In this case, depreciation deductions equal δ (the actual rate of decay per dollar of capital), so the tax base after deducting depreciation is simply $\frac{r}{(1-\tau)}$. If the investment is entirely debt-financed, then the cost of funds r equals the after-tax interest rate, $i(1-\tau)$, and interest deductions equal i per dollar of capital. Thus, net taxable income is $\frac{i(1-\tau)}{(1-\tau)} - i = 0$. This outcome corresponds to the "Samuelson" case discussed above, for which deductions for depreciation and interest exactly equal the user cost and there is no tax difference between leasing and owning, regardless of the firm's tax status or tax rate. It is illustrated in the panel *A* of Figure 3.3, which shows the stream of depreciation deductions, interest deductions, and marginal products of

capital – user costs – over time, as the asset depreciates. The sum of depreciation deductions and interest deductions equals the user cost at each date.

Note, however, that if the firm chose not to finance capital entirely with debt, this would reduce interest deductions, leaving the firm with net taxable income at each instant, as shown by the gap between the user cost and the dotted line in the figure.[18] Thus, with economic depreciation and no inflation, leasing rather than buying would not serve to reduce a firm's tax deductions, as it might wish if such deductions could not be utilized. Indeed, with anything short of full debt finance, leasing would appeal only to companies with adequate taxable income.

In reality, depreciation allowances generally are accelerated relative to economic depreciation, and this changes the result just derived. As shown in panel *B* of Figure 3.3, accelerated depreciation has two effects. First, it lowers the user cost of capital by increasing the present value of depreciation allowances, z, in expression (3.11). Second, it increases depreciation deductions early in the period of capital use. Together, these effects make it more likely that the sum of interest deductions and depreciation allowances will exceed the user cost, particularly in early years of the asset's life. As unused tax deductions from these years carry forward without interest, this change makes ownership generally less attractive for a company facing tax "exhaustion". The result is even stronger for assets also receiving an initial investment tax credit on top of the large initial depreciation deductions, which also are typically the short-lived assets for which depreciation deductions themselves – and hence the benefits of acceleration – are more important. Thus, with realistic depreciation provisions, firms facing tax limitations are more likely to lease, particularly assets that are short-lived.

[18] This shift in the source of funds may also have an impact of the cost of funds and hence the user cost, depending on the specification of financial policy equilibrium. However, this additional complication does not affect the main conclusion that reduced borrowing increases taxable income.

Finally, consider the impact of inflation, which has two additional effects. First, because depreciation allowances are not indexed for price-level changes, they fall in real terms over an asset's lifetime. Panel *C* of Figure 3.3 illustrates this effect. This reduction in the present value of depreciation deductions, z, also increases the user cost and hence the equilibrium marginal product of capital, so both the direct impact on deductions and the indirect impact on the user cost increase taxable income, making direct ownership more attractive to the tax-constrained firm. On the other hand, because nominal interest payments are tax deductible, inflation-induced higher nominal interest rates increase the real value of interest deductions and reduce the required marginal product of capital, pushing the lease-versus-own decision in precisely the opposite direction. The net impact is ambiguous, but clearly depends on the relative importance of depreciation and interest. Inflation is most likely to encourage leasing by tax-constrained firms of assets that are financed largely by debt and assets that are long-lived. The second of these effects counteracts the impact of accelerated depreciation that makes short-lived assets the better candidates for leasing.

In summary, then, the only clear result is that leases will be most attractive for tax-constrained firms – rather than for fully taxable firms – for assets capable of being financed by high proportions of debt. But, as the asset characteristics that facilitate borrowing are likely to be similar to those that make leasing feasible (e.g., homogeneity, adequate resale market, etc.), the common notion that leasing should be done by tax-constrained firms may be reasonable, after all.

This analysis has two implications for empirical work. First, leases may well represent a form of disguised debt that belongs in the construction of estimated debt-asset ratios. Second, leases have different tax characteristics than traditional debt, and may be an attractive substitute for firms facing low effective tax rates. Thus, leases should respond differently than explicit

debt to changes in the firm's marginal tax rate. This result is confirmed by empirical evidence relating leasing to the tax loss carry-forward (Barclay and Smith 1995, Sharpe and Nguyen 1995), to a more sophisticated measure of the firm's marginal tax rate (Graham *et al.* 1998), and to the limitations on interest deductions by multinational corporations induced by interest allocation rules (Froot and Hines 1995).

4. Organizational form and ownership structure

To this point, we have considered the financial decisions of a given corporation, taking its organizational form and ownership structure as given. However, each of these aspects of the firm may change significantly, even over a very short period of time. This section considers the related topics of changes in organizational form – between regular corporate status and available alternatives – and changes in ownership structure – mergers, acquisitions and spinoffs – in each case considering how these changes may be induced by tax incentives.

4.1. The choice of organizational form

Firms need not exist as corporations. In the United States, for example, master limited partnerships and "S" corporations (named for a location in the tax code and as distinguished from the traditional "C" corporations) permit multiple equity holders and preserve the traditional corporate benefit of limited liability. Yet the earnings generated by each form of enterprise are "passed through" and subject to taxation only of individual owners, with no additional tax imposed at the entity level. Thus, the tax incentives affecting the choice between corporate and non-corporate status resembles that between debt and equity.

As with the debt-equity decision, recent configurations of corporate and individual tax rates appear to point in favor of taxation at the individual level only. However, there are a

number of other aspects of the corporate-non-corporate choice that distinguish it from the debt-equity choice already analyzed. First, the choice is a discrete one for any given firm, which cannot choose to be "partially" corporate.[19] However, heterogeneity among firms will still generally lead to interior solutions with regard to corporate status for any given industry or group of firms.

Second, the non-tax costs of opting out of the corporate form differ from those of borrowing. While borrowing may occasion agency and bankruptcy costs, choosing not to be a corporation involves restrictions on ownership and marketability that make equity less liquid and diversifiable. Thus, we would still expect the choice between corporate and non-corporate status to reflect a trade-off of tax and non-tax factors. But the types of firms choosing not to incorporate might differ from those choosing high debt-equity ratios within the corporate sector. The most obvious distinction relates to size, as larger entities that might have ready access to borrowed funds are likely to find the restrictions on non-corporate ownership structure very costly.

Finally, the relevant individual tax rates may differ when considering debt ownership and non-corporate status as alternatives to corporate equity ownership. While a large share of corporate debt is held by tax-exempt institutions, these institutions are effectively excluded from holding non-corporate equity in the United States by the imposition of unrelated business income taxes (UBIT). Thus, tax reforms might have different predicted effects on debt-equity and corporate-non-corporate choices. For example, the Tax Reform Act of 1986 sharply reduced the individual tax rate, but also reduced the corporate tax rate. Thus, tax-exempt institutions would have been pushed in the direction of holding equity versus debt (see expression 3.10), while

[19] Of course, a business seeking to constitute a portion of its operations in corporate form and another portion in non-corporate form can do so by spinning off one of the units as a separate entity. But this involves considerably

high-bracket investors would have been pushed toward debt. However, only the latter group would be relevant when considering the corporate-non-corporate ownership choice, leading to a clearer prediction favoring a shift out of corporate form.

Considering the choice of organizational form adds a dimension to the measurement of corporate tax distortions. The classic analysis by Harberger (1966), empirically refined by Shoven (1976), treats the corporate and non-corporate sectors as distinct and exogenous, with distortions resulting from a misallocation of capital and labor between the two sectors. But the choice of organizational form introduces another potential tax distortion to the picture. One cannot simply count distortions and conclude that this will make things worse, of course, for one distortion may mitigate another, in classic second-best fashion. For example, the favorable tax treatment of debt not only distorts the debt-equity decision, but also reduces the corporate cost of capital and may lessen the distortion of the choice between corporate and non-corporate status. Similarly, being able to adopt the tax-favored non-corporate form may lessen the capital allocation distortions associated with the corporate tax. It is a question to be resolved empirically how the choice of organizational form contributes to the distortions of the corporate tax. To date, though, most examinations have considered this distortion in isolation, rather than in conjunction with other distortions.

Perhaps the most straightforward method of estimating the distortions arising from choice of organizational form is first to estimate the sensitivity of this choice to variations in tax and non-tax factors, and then to apply these estimates in a deadweight loss calculation. MacKie-Mason and Gordon (1997) and Goolsbee (1998) take this approach by considering the share of aggregate assets in corporate and non-corporate form for the periods 1959-86 and 1900-39,

---

higher transaction costs than an adjustment of the firm's debt level.

respectively. Both studies find the corporate-non-corporate tax differential to have a significant but relatively small impact on the share of assets in corporate form.[20] As a result of the small measured effects on behavior, each paper's estimate of the deadweight loss arising purely from the corporate-non-corporate distortion is also relatively small, respectively 16 percent of business tax revenue and 5-10 percent of corporate tax revenue. These estimates stand in marked contrast to those derived by Gravelle and Kotlikoff (1989) using a calibrated simulation model based on a particular specification of the non-tax differences between corporate and non-corporate enterprises.

Further evidence of the role of tax factors in affecting organizational form comes from the period around the Tax Reform Act of 1986, after which elections of S corporation status surged almost immediately (Gordon and MacKie-Mason 1990), particularly for profitable firms (Carroll and Joulfaian 1997). While not the primary focus of his comparison of the financial polices of master limited partnerships and corporations in the oil and gas industry, Gentry (1994) does find that the choice between these two forms relates to certain tax and non-tax factors in predicted ways. For example, leverage appears to substitute for opting out of the corporate sector, and riskier firms are also less likely to choose partnership form.

4.2. Mergers and acquisitions

Mergers and acquisitions occur continually in a dynamic corporate environment, the ebbs and flows of activity being attributable to many factors, including the pace of technological change and the tone of government anti-trust policy. In response to a sharp surge in U.S. merger activity in the 1980s, though, many attempts at explanation centered on the role of tax incentives.

[20] MacKie-Mason and Gordon find further confirmation of the role of tax factors in the opposite responses of firms with losses and firms with gains, and the responses over time to changes in tax rules other than simple tax rate changes.

Identifying the potential tax benefits of mergers and acquisitions confronts two significant obstacles at the outset. First, the tax law governing these transactions is complex. There are many different types of transactions within the general category, and the tax treatment of corporations and their shareholders varies by transaction type. Scholes and Wolfson (1992) provide a good discussion of the types of transactions and their tax consequences, but a brief summary is useful here. At the corporate level, the main distinction is whether the acquired company's tax attributes are carried over by the acquirer, or whether the target is treated as having been liquidated, in which case there are both immediate tax consequences and an establishment of new tax attributes. The parallel issue at the shareholder level is whether the those who tender their shares in the target company are treated as having closed a position, or whether the tax basis in tendered shares carries over to the shares in the parent company that are received as payment. In order to qualify for tax-free treatment at the shareholder level (through a tax-free reorganization), the means of payment must be an exchange of stock, and the corporate attributes of the target must be carried over. Otherwise, for transactions that are taxable at the shareholder level, the corporate tax treatment is at the option of the acquiring company.

A second problem encountered in identifying the potential tax benefits of mergers and acquisitions is that benefits associated with mergers and acquisitions generally may be obtained through alternative transactions, though not necessarily as easily or at the same cost. Thus, the incremental tax benefits to merger and acquisition activity may be smaller than they might first appear to be. Indeed, Gilson *et al.* (1988) go through these alternatives and argue that the theoretical case for tax-induced merger activity is weak. Still, if firms are found to respond to the apparent tax incentives to merge, this suggests that they do not view the alternative means of

obtaining tax benefits as perfect substitutes. Thus, the response of firms and markets to the tax incentives to merge remains an open question for empirical investigation.

4.2.1. Potential corporate tax benefits of mergers and acquisitions

There are three types of potential corporate tax benefits from a merger or acquisition: increased utilization of tax loss and tax credit carry-forwards, increased depreciation deductions obtained by stepping up the basis of assets, and increased interest deductions associated with an increase in the debt-equity ratio of the combined enterprise.

If a fully taxable firm acquires a firm with tax loss and/or tax credit carry-forwards, it may increase the value of these tax benefits by offsetting them against its own taxable income. The extent to which this increased utilization represents an incentive to merge depends on the available alternatives to using the benefits. As discussed above, a company can reduce the extent of its tax exhaustion by reducing its borrowing or by leasing assets, but neither of these is a cost-less transaction; otherwise, we would not observe such a significant incidence of tax exhaustion in the first place.

An acquisition of a firm's unused tax deductions and credits is possible only if that firm's tax benefits are carried over by the acquirer. If, instead, the target is treated as having been liquidated, its tax books are closed, any unused tax shields disappear, any final corporate level capital gains taxes are due, and its assets are treated as if purchased directly by the acquirer. This has offsetting tax consequences. On the one hand, there may be taxes immediately payable. On the other hand, the present value of depreciation deductions may be substantially increased by an increase in asset basis and the ability to depreciate assets anew. In general such a trade (an immediate tax on basis step-up in exchange for the depreciation of this basis over time) might seem unattractive, but its appeal may be enhanced by a number of factors. First, the corporate

capital gains tax rate is below the rate at which depreciation allowances are deducted. Second, the new depreciation schedule might be more attractive than that being used by the target, because of changes in law. Third, there may be circumstances under which the initial capital gains tax liability is forgiven when a corporation is liquidated. This was the case in the United States under the so-called General Utilities doctrine, until its repeal by the Tax Reform Act of 1986. This provision, while it existed, made the transfer of assets through a corporate acquisition more attractive than direct purchases of existing assets.

Perhaps the most problematic of the apparent corporate tax benefits from a merger or acquisition is increased interest deductions. This benefit looms large in perception, particularly with reference to leveraged buyouts in which a significant fraction of the cost of an acquisition is financed by newly issued debt. But in what sense is this a tax benefit connected to the acquisition, if the target company could have done the borrowing itself? There are two potential responses to this critique. First, a merger may pool the idiosyncratic risks of individual firms, reducing the non-tax borrowing costs for the combined entity. Second, existing management might be reluctant to borrow up to the value-maximizing level. In each case, an acquisition enhances the tax benefit of borrowing.

4.2.2. Potential shareholder tax benefits of mergers and acquisitions

In nontaxable stock transactions, there are no immediate tax consequences for shareholders, but there may still be implicit tax benefits. Tendering shareholders typically receive shares in a larger, more diversified enterprise, a process that can result in a more balanced portfolio without the capital gains taxes usually attendant upon such rebalancing. In taxable cash transactions, the acquiring firm distributes cash out of corporate form at capital gains rates, thus effecting share repurchases on a larger scale than those in which companies

typically engage. As in the case of interest deductions, the tax benefit hinges on the acquisition facilitating the repurchase of shares.

4.2.3. Evidence on the role of taxes in mergers and acquisitions

Evidence concerning the impact of tax incentives on mergers and acquisitions may be adduced from patterns of merger activity and the market valuation of merger announcements. Each type of evidence provides at least some support for the argument that tax incentives affect mergers and acquisitions. Auerbach and Reishus (1988) considered a sample of mergers and acquisitions that took place during the period 1968-83. They estimated that potential corporate tax benefits were significant in a number of cases, but also found that these benefits were not noticeably different from those that would have arisen from a matched sample of randomly chosen "pseudo-mergers". Using a "marriage model", they estimated that few of the apparent tax benefits affected whether a firm merged or the company with which it merged, the main exception being the tax status of the *acquiring* company. As the ability to offset unused tax shields against the new partner's taxable income is a benefit that applies symmetrically, tax exhausted companies may be attractive targets, but apparently are even more likely to be energetic suitors.

Whatever the tax benefits to merging during the period studied by Auerbach and Reishus, things changed with the Tax Reform Act of 1986, due to the repeal of the General Utilities doctrine as well as newly imposed limits on the transfer of the tax benefits. These changes, in conjunction with the increased tax rate on the capital gains of individual shareholders, provided an incentive to time mergers to occur before January 1, 1987. Indeed, there was a strong surge in merger and acquisition activity, as measured by firm value, during the last quarter of 1986 (Scholes and Wolfson 1990). This does not necessarily contradict the finding of Auerbach and

Reishus, for it is possible for tax factors to matter relatively little in determining whether transactions occur at all but enough to affect the timing of transactions within a short window. In fact, although the aggregate value of acquisitions did fall between 1986 and 1987, it surged again in 1988 and 1989 (Auerbach and Slemrod 1997).

Evidence that tax factors play some role in influencing mergers and acquisitions – or at least that they *should* play some role, if managers strive to increase shareholder value – also comes from market responses to the announcement of acquisitions. In an event study covering the period 1970-85, Hayn (1989) found the tax attributes of target firms to be significant in explaining the abnormal returns to shareholders in both target and acquiring firms, with loss and credit carry-forwards mattering for tax-free reorganizations and basis step-up mattering for taxable acquisitions. In an analysis of 76 management buyouts during the period 1980-86, Kaplan (1989) suggested that a significant fraction of the buyout premiums, ranging from 21 percent to 143 percent, could be justified by tax benefits, depending on the imputed valuation of incremental interest deductions.

5. Taxes and financial innovation

As noted in the introduction to this chapter, financial policy decisions are typically measured in terms of observable categories such as debt and dividends, but fundamental financial decisions relate to the allocation of state-contingent claims. The perspective taken above generally assumes some given relationship between these nominal categories and underlying claims, so that the firm's choice, say, between debt and equity involves a trade-off between tax benefits and a different allocation of commitments across states of nature.

However, there may be flexibility in the correspondence between formal categories and underlying claims, and firms will seek to widen categories that are tax-preferred. In these

instances, there is another type of trade-off, as attempts to extend favorable tax treatment to a wider class of financial claims may involve offsetting costs. Sometimes, the true social costs may be relatively trivial (e.g., the time of a good tax advisor) unless the government steps in to impose costs in the form of tax penalties or other legal sanctions. The benefits of the government's doing so aren't always clear, though, as avoiding taxes does typically reduce distortions. For example, firms that successfully characterize as debt claims that possess equity-like characteristics can reduce their cost of capital, reducing the tax wedges facing corporate investment and the decision to operate as a corporation. But if this outcome represents an improvement to overall economic welfare, then why does the tax system attempt to distinguish between these two types of claims in the first place? Unless political inertia is such that improvements in social welfare must proceed through such "do-it-yourself" tax cuts, it is not clear what the optimal policy response is to such financial innovation.

Scholes and Wolfson (1992, Chapter 20) provide a cogent discussion of the difficulties tax authorities face in identifying financial innovation and the dilemma of what to do about it. They also provide many illustrations of such transactions. (Also see the discussion by Bulow *et al.* 1990.) Not all of the choices available to firms involve the creation of exotic new combinations of claims, or "synthetic" assets. For example, a convertible bond is equivalent to a combination of a warrant and a straight bond, yet taxed differently. But the scope for tax arbitrage has continually widened, with new conceptions of how to break down and repackage contingent claims continually appearing. An illustration is the "unbundled stock units" briefly considered in the late 1980s, which would have divided equity claims into pieces to allow the dividend-paying portion to be treated as debt. Had such financial instruments taken root (the IRS

having played a role in their not doing so), their large-scale use could have largely eliminated the corporate income tax.

The nature of tax arbitrage goes beyond the characterization of financial instruments. Even if the tax treatment of a particular transaction for a given taxpayer is clear, it may be possible and advantageous for one taxpayer to shift income to a related taxpayer subject to more favorable rules, as in the case of a domestic corporation and its foreign subsidiary.[21] Unrelated firms (or individuals) can engage in tax arbitrage by exchanging income and/or deductions, following the principle of comparative advantage based on relative tax treatment. This type of behavior is exemplified by the leasing transactions between taxable and nontaxable firms discussed above, but certainly not limited to such transactions.

As financial innovation can be expected to occur, applying increasingly to international as well as domestic transactions, perhaps the clearest conclusion one can draw is of the declining viability of tax systems attempting to enforce tax provisions that treat similar transactions inconsistently. Though the responsiveness of taxpayers to tax arbitrage opportunities may increase, the distortions of underlying financial policy may actually decline as a result. But the new sources of revenue needed to replace the funds lost to financial innovation will undoubtedly have distortions of their own.

[21] See this Handbook's chapter by Gordon and Hines for further discussion.

References

Altshuler, Rosanne, and Alan J. Auerbach, 1990, The significance of tax law asymmetries: an empirical investigation, Quarterly Journal of Economics 105, 61-86.

American Law Institute, 1992, Federal income tax project, subchapter c: proposals on corporate acquisitions and distributions and reporter's study on corporate distributions (American Law Institute, Philadelphia).

Asquith, Paul R., and David W. Mullins, 1986, Equity issues and offering dilution, Journal of Financial Economics 15, 61-89.

Auerbach, Alan J., 1979a, Share valuation and corporate equity policy, Journal of Public Economics 11, 291-305.

Auerbach, Alan J., 1979b, Wealth maximization and the cost of capital, Quarterly Journal of Economics 93, 433-446.

Auerbach, Alan J., 1981, Tax Integration and the "new view" of the corporate tax: a 1980s perspective, Proceedings of the National Tax Association–Tax Institute of America, 21-27.

Auerbach, Alan J., 1983a, Taxation, corporate financial policy, and the cost of capital, Journal of Economic Literature 21, 905-40.

Auerbach, Alan J., 1983b, Stockholder tax rates and firm attributes, Journal of Public Economics 21, 107-27.

Auerbach, Alan J., 1984, Taxes, firm financial policy and the cost of capital: an empirical analysis," Journal of Public Economics 23, 27-57.

Auerbach, Alan J., 1985, Real determinants of corporate leverage, in B. Friedman, ed., Corporate capital structures in the United States (University of Chicago Press, Chicago), 301-22.

Auerbach, Alan J., 1990, Debt, equity and the taxation of corporate cash flows." in J. Shoven and J. Waldfogel, eds., Taxes and corporate restructuring (Brookings, Washington, DC), 91-126.

Auerbach, Alan J., and Kevin A. Hassett, 2000, On the marginal source of investment funds, unpublished paper.

Auerbach, Alan J., and Mervyn A. King, 1983, Taxation, portfolio choice, and debt-equity ratios: a general equilibrium model, Quarterly Journal of Economics 98, 587-609.

Auerbach, Alan J. and Laurence J. Kotlikoff, 1987, Dynamic fiscal policy (Cambridge University Press, Cambridge, UK).

Auerbach, Alan J., and James M. Poterba, 1987, Tax-loss carryforwards and corporate tax incentives, in M. Feldstein, ed., The effects of taxation on capital accumulation (University of Chicago Press, Chicago), 305-38.

Auerbach, Alan J., and David Reishus, 1988, The effects of taxation on the merger decision, in A. Auerbach, ed., Corporate takeovers: causes and consequences (University of Chicago Press, Chicago), 157-83.

Auerbach, Alan J., and Joel Slemrod, 1997, The economic effects of the tax reform act of 1986, Journal of Economic Literature 35, 589-632.

Bagwell, Laurie Simon, and John B. Shoven, 1989, Cash distributions to shareholders, Journal of Economic Perspectives 3, Summer, 129-140.

Barclay, Michael J., and Clifford W. Smith, Jr., 1988, Corporate payout policy: cash dividends versus open-market repurchases, Journal of Financial Economics 22, 61-82.

Barclay, Michael J., and Clifford W. Smith, Jr., 1995, The priority structure of corporate liabilities, Journal of Finance 50, 899-917.

Bernheim, B. Douglas, 1991, Tax policy and the dividend puzzle, Rand Journal of Economics 22, 455-476.

Bernheim, B. Douglas, and Adam Wantz, 1995, A tax-based test of the dividend-signaling hypothesis, American Economic Review 85, 532-551.

Black, Fischer, and Myron Scholes, 1973, The pricing of options and corporate liabilities, Journal of Political Economy 81, 637-59.

Boadway, Robin, and Neil Bruce, 1992, Problems with integrating corporate and personal income taxes in an open economy, Journal of Public Economics 48, 39-66.

Bond, Stephen, and Costas Meghir, 1994, Dynamic investment models and the firm's financial policy, Review of Economic Studies 61, 197-222.

Bradford, David, 1981, The incidence and allocation effects of a tax on corporate distributions, Journal of Public Economics 15, 1-22.

Bradley, Michael, Gregg A. Jarrell, and E. Han Kim, 1984, On the existence of an optimal capital structure: theory and evidence, Journal of Finance 39, 857-78.

Brealey, R. A., and C. M. Young, 1980, Debt, taxes and leasing – a note, Journal of Finance 35, 1245-50.

Brennan, Michael J., and Anjan V. Thakor, 1990, Shareholder preferences and dividend policy, Journal of Finance 45, 993-1018.

Bulow, Jeremy I., Lawrence H. Summers, and Victoria P. Summers, 1990, Distinguishing debt from equity in the junk bond era, in J. Shoven and J. Waldfogel, eds., Taxes and corporate restructuring (Brookings, Washington, DC), 135-66.

Carroll, Robert and David Joulfaian, 1997, Taxes and corporate choice of organizational form, U.S. Department of the Treasury, OTA Paper 73, October.

Cummins, Jason G., Kevin A. Hassett, and R. Glenn Hubbard, 1994, A reconsideration of investment behavior using tax reforms as natural experiments, Brookings Papers on Economic Activity 25, 1-59.

DeAngelo, Harry, and Ronald W. Masulis, 1980, Optimal capital structure under corporate and personal taxation, Journal of Financial Economics 8, 3-29.

Devereux, Michael P., and Harold Freeman, 1995, The impact of tax on foreign direct investment: empirical evidence and the implications for tax integration schemes, International Tax and Public Finance 2, 85-106.

Edwards, J. S. S., and M. J. Keen, 1984, Wealth maximization and the cost of capital: a comment, Quarterly Journal of Economics 99, 211-14.

Edwards, J. S. S., and C. P. Mayer, 1991, Leasing, taxes, and the cost of capital, Journal of Public Economics 44, 173-97.

Fama, Eugene F., and Kenneth R. French, 1998, Taxes, financing decisions, and firm value, Journal of Finance 53, 819-43.

Fama, Eugene F., and Kenneth R. French, 2000, Disappearing dividends: changing firm characteristics or lower propensity to pay? CRSP Working Paper No. 509.

Fazzari, Steven M., R. Glenn Hubbard, and Bruce C. Petersen, 1988, Financing constraints and corporate investment, Brookings Papers on Economic Activity 19, 141-95.

Froot, Kenneth A., and James R. Hines, Jr., 1995, Interest allocation rules, financing patterns, and the operations of U.S. multinationals, in M. Feldstein, J. Hines, and G. Hubbard, eds., The effects of taxation on multinational corporations (University of Chicago Press, Chicago), 277-307.

Gentry, William M., 1994, Taxes, financial decisions and organizational form: evidence from publicly traded partnerships, Journal of Public Economics 53, 223-44.

Gilson, Ronald J., Myron S. Scholes, and Mark A. Wolfson, 1988, Taxation and the dynamics of corporate control: the uncertain case for tax-motivated transactions, in J. Coffee,

Lowenstein, and S. Rose-Ackerman, eds., Knights, raiders, and targets: the impact of the hostile takeover (Oxford University Press, New York), 271-99.

Givoly, Dan, Carla Hayn, Aharon R. Ofer, and Oded Sarig, 1992, Taxes and capital structure: evidence from firms' response to the Tax Reform Act of 1986, Review of Financial Studies 5, 331-55.

Goolsbee, Austan, 1998, Taxes, organizational form, and the deadweight loss of the corporate income tax, Journal of Public Economics 69, 143-52.

Gordon, Roger H., and Jeffrey K. MacKie-Mason, 1990, Effects of the Tax Reform Act of 1986 on corporate financial policy and organizational form, in J. Slemrod, ed., Do taxes matter? the impact of the Tax Reform Act of 1986 (MIT Press, Cambridge), 91-131.

Graham, John R., 1996, Debt and the marginal tax rate, Journal of Financial Economics 41, 41-73.

Graham, John R., 1999, Do personal taxes affect corporate financing decisions? Journal of Public Economics 73, 147-185.

Graham, John R., Michael L. Lemmon, and James S. Schallheim, 1998, Debt, leases, taxes, and the endogeneity of corporate tax status, Journal of Finance 53, 131-62.

Gravelle, Jane G., and Laurence J. Kotlikoff, 1989, The incidence and efficiency costs of corporate taxation when corporate and non-corporate firms produce the same good, Journal of Political Economy 97, 749-80.

Harberger, Arnold C., 1966, Efficiency effects of taxes on income from capital, in M. Krzyzaniak, Effects of the corporation income tax (Wayne State University Press, Detroit), 107-17.

Hayn, Carla, 1989, Tax attributes as determinants of shareholder gains in corporate acquisitions, Journal of Financial Economics 23, 121-53.

Jensen, Michael, 1986, Agency costs of free cash flow, corporate finance, and takeovers, American Economic Review 76, 323-29.

Judd, Kenneth L., and Bruce C. Petersen, 1986, Dynamic limit pricing and internal finance, Journal of Economic Theory 39, 268-99.

Kanniainen, Vesa, and Jan Södersten, 1994, Costs of monitoring and corporate taxation, Journal of Public Economics 55, 307-21.

Kanniainen, Vesa, and Jan Södersten, 1995, The importance of reporting conventions for the theory of corporate taxation, Journal of Public Economics 57, 417-30.

Kaplan, Steven, 1989, Management buyouts: evidence on taxes as a source of value, Journal of Finance 44, 611-32.

King, Mervyn A., 1974, Taxation and the cost of capital, Review of Economic Studies 41, 21-35.

King, Mervyn A., 1977, Public policy and the corporation (Chapman and Hall, London).

King, Mervyn A., and Don Fullerton, eds., 1984, The taxation of income from capital (University of Chicago Press, Chicago).

Lyon, Andrew B., 1990, Investment incentives under the alternative minimum tax, National Tax Journal 43, 451-65.

MacKie-Mason, Jeffrey K., 1990, Do taxes affect corporate financing decisions? Journal of Finance 45, 1471-93.

MacKie-Mason, Jeffrey K., and Roger H. Gordon, 1997, How much do taxes discourage incorporation? Journal of Finance 52, 477-505.

Miller, Merton H., 1977, Debt and taxes, Journal of Finance 32, 261-75.

Miller, Merton H., and Franco Modigliani, 1961, Dividend policy, growth, and the valuation of shares, Journal of Business 34, 411-33.

Modigliani, Franco, and Merton Miller, 1958, The cost of capital, corporation finance, and the theory of investment, American Economic Review 48, 261-297.

Myers, Stewart C., 1977, Determinants of corporate borrowing, Journal of Financial Economics 5, 147-75.

Myers, Stewart C., David A. Dill, and Alberto J. Bautista, 1976, Valuation of financial lease contracts, Journal of Finance 31, 799-819.

Myers, Stewart C., and Nicholas Majluf, 1984, Corporate financing and investment decisions when firms have information that investors do not have, Journal of Financial Economics 13, 187-221.

Poterba, James M., and Lawrence H. Summers, 1985, The economic effects of dividend taxation," in E. Altman and M. Subrahmanyam, eds., Recent advances in corporate finance (Homewood, IL: Richard D. Irwin), 227-284.

Rajan, Raghuram G., and Luigi Zingales, 1995, What do we know about capital structure? some evidence from international data, Journal of Finance 50, 1421-60.

Samuelson, Paul A., 1964, Tax deductibility of economic depreciation to insure invariant valuations, Journal of Political Economy 72, 604-06.

Scholes, Myron S., G. Peter Wilson, and Mark A. Wolfson, 1990, Tax planning, regulatory capital planning, and financial reporting strategy for commercial banks, Review of Financial Studies 3, 625-50.

Scholes, Myron S., and Mark A. Wolfson, 1990, The effects of changes in tax laws on corporate reorganization activity, Journal of Business 63, S141-64.

Scholes, Myron S., and Mark A. Wolfson, 1992, Taxes and business strategy (Prentice-Hall, Englewood Cliffs, NJ).

Sharpe, Steven A., and Hien H. Nguyen, 1995, Capital market imperfections and the incentive to lease, Journal of Financial Economics 39, 271-94.

Shoven, John B., 1976, The incidence and efficiency effects of taxes on income from capital, Journal of Political Economy 84, 1261-83.

Sinn, Hans-Werner, 1987, Capital income taxation and resource allocation (North-Holland, Amsterdam).

Sinn, Hans-Werner, 1991a, The vanishing Harberger triangle, Journal of Public Economics 45, 271-300.

Sinn, Hans-Werner, 1991b, Taxation and the cost of capital: the 'old' view, the 'new' view, and another view, in D. Bradford, ed. Tax Policy and the Economy 5, 25-54.

Sørensen, Peter Birch, 1994, Some old and new issues in the theory of corporate income taxation, FinanzArchiv 51, 425-56.

Stiglitz, Joseph E., 1973, Taxation, corporate financial policy and the cost of capital, Journal of Public Economics 2, 1-34.

Stiglitz, Joseph E., and Andrew Weiss, 1981, Credit rationing in markets with imperfect information, American Economic Review 71, 393-410.

Titman, Sheridan, and Roberto Wessels, 1988, The determinants of capital structure choice, Journal of Finance 43, 1-19.

Figure 2.1. Alternative Equity Policy Regimes

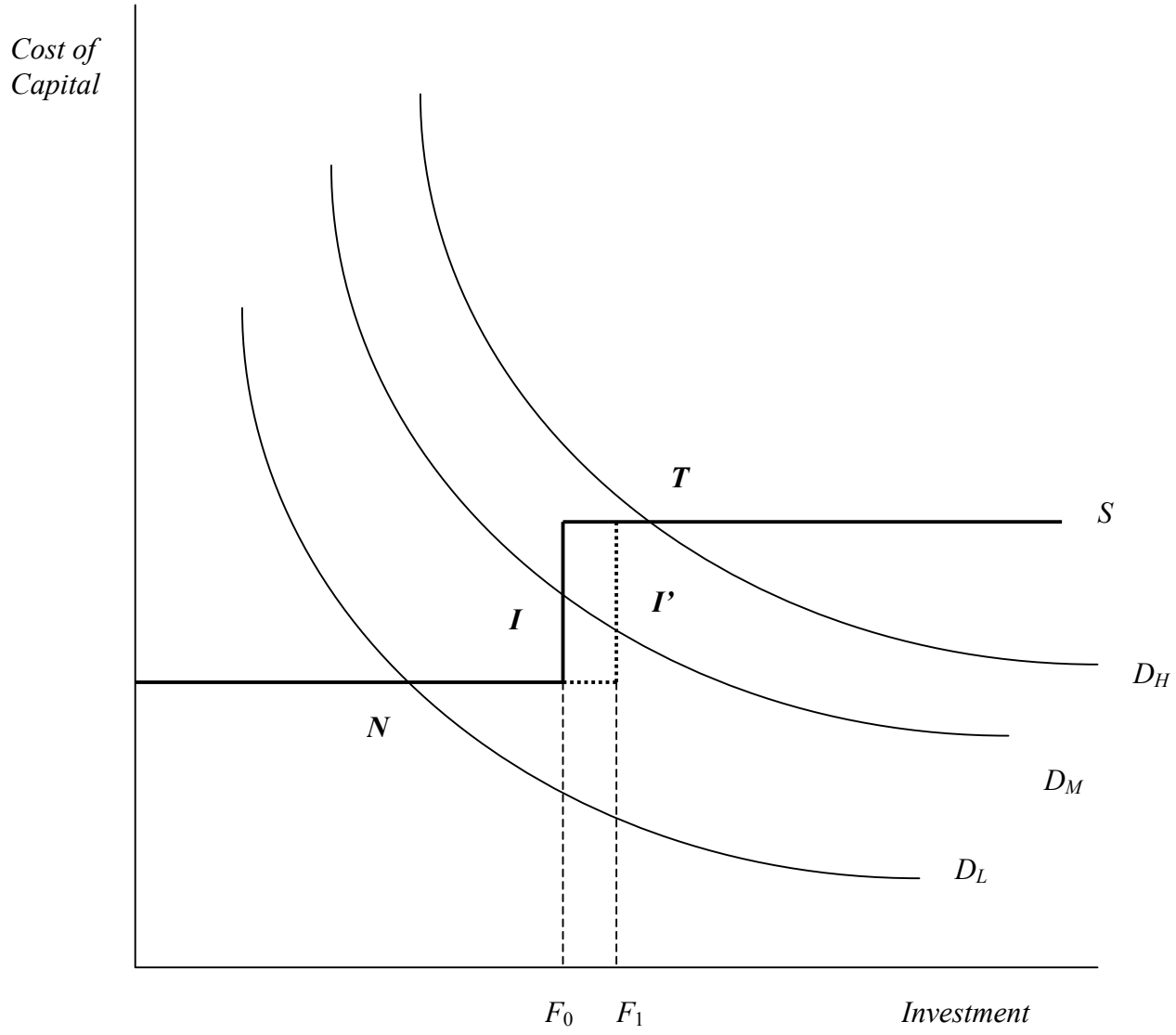

Figure 3.1. Borrowing and Moral Hazard

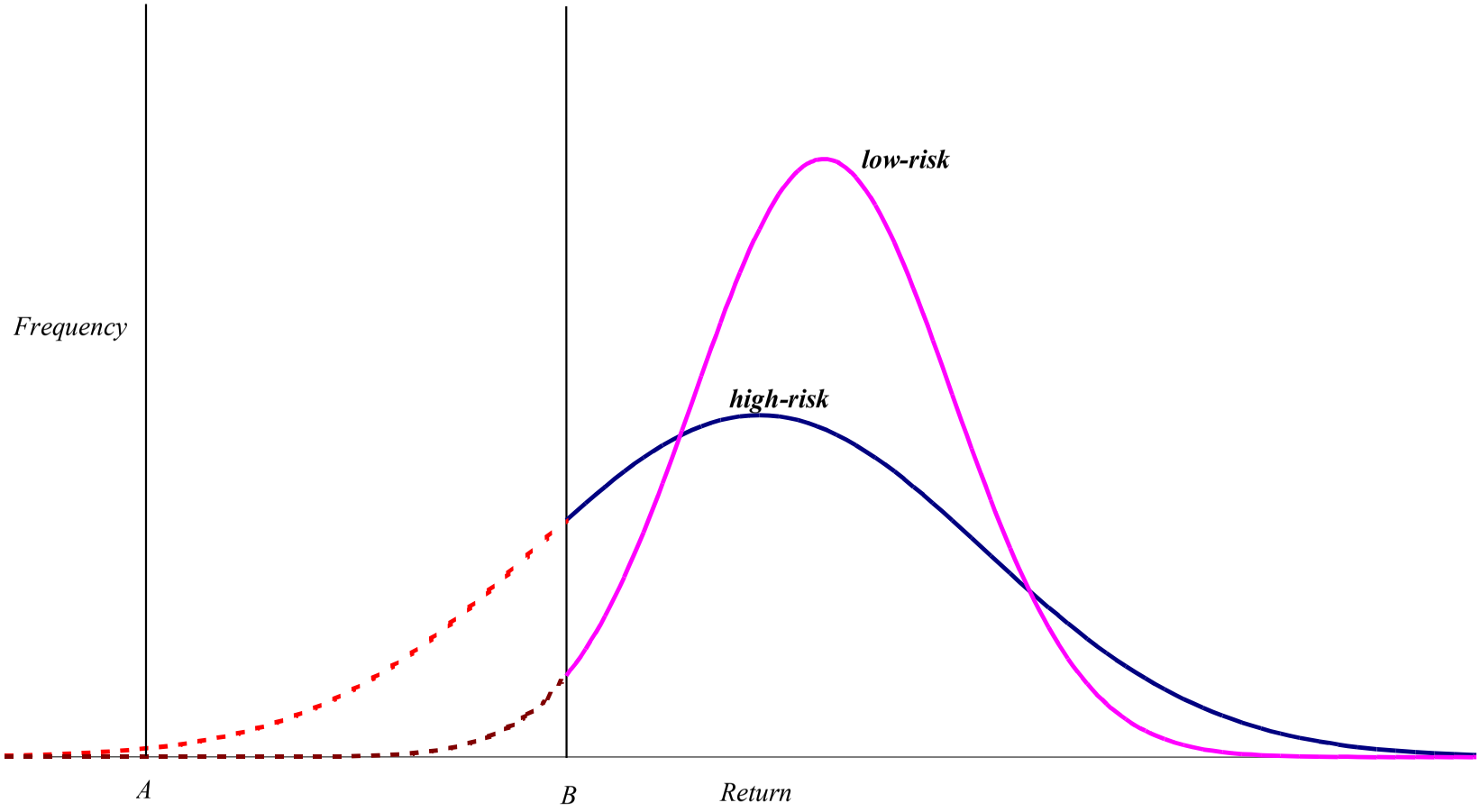

Figure 3.2. The Miller Equilibrium

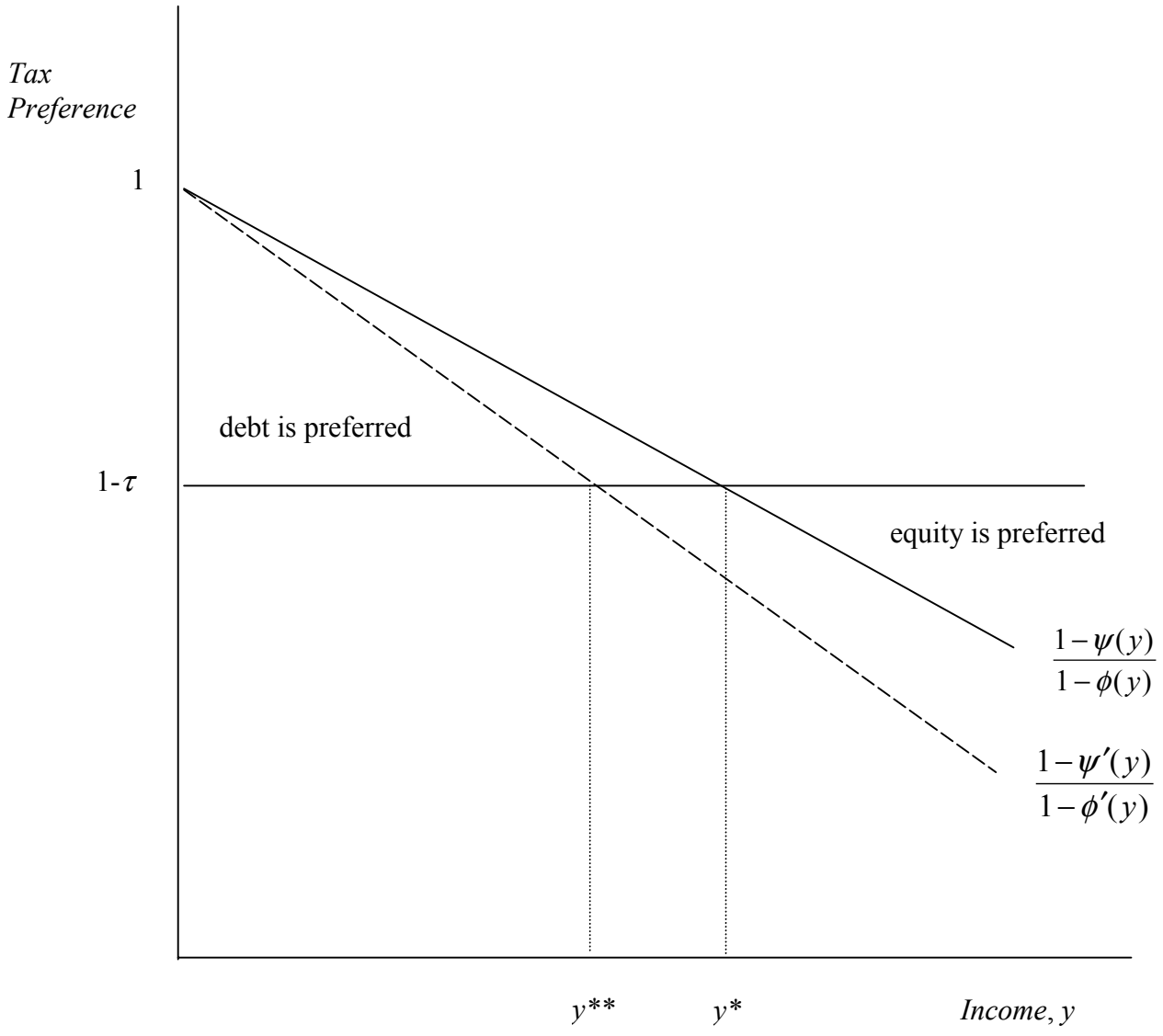

Figure 3.3. The Leasing Decision