Taxes and Corporate Finance: A Review

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This article reviews tax research related to domestic and multinational capital structure, payout policy, compensation policy, risk management, and organizational form. For each topic, the theoretical arguments explaining how taxes can affect corporate decision making and firm value are reviewed, followed by a summary of the related empirical evidence and a discussion of unresolved issues. Tax research generally supports the hypothesis that high tax rate firms pursue policies that provide tax benefits. Many issues remain unresolved, however, including understanding whether tax effects are of first-order importance, why firms do not pursue tax benefits more aggressively, and whether corporate actions are affected by investor-level taxes.

Modigliani and Miller (1958) and Miller and Modigliani (1961; hereafter MM) demonstrate that corporate financial decisions are irrelevant in a perfect, frictionless world. To derive this result, MM assume there are (1) no corporate or personal taxes, (2) no transactions costs, (3) symmetric information, (4) complete contracting, and (5) complete markets. During the past 45 years, research has focused on whether financial decisions become relevant if these assumptions are relaxed, that is, when imperfections are introduced into the MM framework. The research reviewed in this article investigates the consequences of relaxing the first assumption, highlighting the role that corporate and investor taxes play in affecting corporate policies and firm value.[1] This role is potentially very important, given the sizable tax rates that many corporations and individuals face (see Figure 1).

Modigliani and Miller argue that corporate financial policies do not add value in equilibrium, and therefore firm value equals the present value of operating cash flows. Once imperfections are introduced, however,

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[1] The interested reader can find excellent reviews of how taxes affect household investment decisions [Poterba (2001)] and the current state of tax research from the perspective of accountants [Shackelford and Shevlin (2001)] and public economists [Auerbach (2002)]. Articles reviewing how nontax factors such as agency and informational imperfections affect corporate financial decisions can be found in the *Handbook of Corporate Finance* [Eckbo (2004)].

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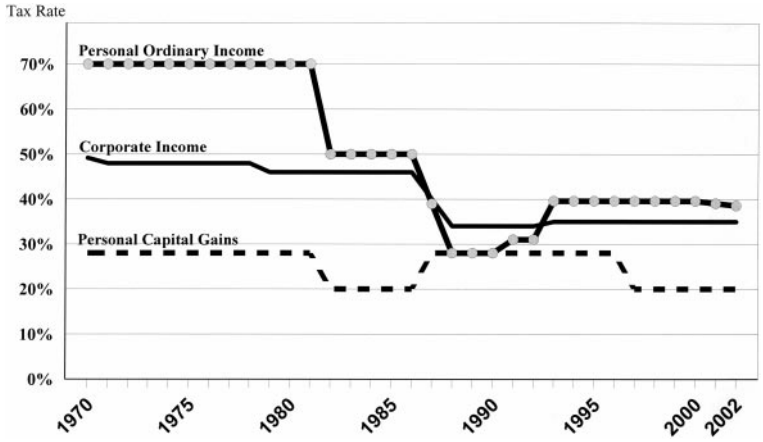

Figure 1
Corporate and personal income tax rates
The highest tax bracket statutory rates are shown for individuals and C corporations. The corporate capital gains tax rate (not shown) was equal to the corporate income tax rate every year after 1987 and equal to 28% every year before 1988. In May 2003 President Bush signed into law a reduction in the top personal income tax rate from 38.6% in 2002 to 35% in 2003 and beyond. This same law reduced top personal tax rates on capital gains and dividends to 15%.

corporate financial policies can affect firm value, and firms should pursue a given policy until the marginal benefit of doing so equals the marginal cost. A common theme in tax research involves expressing how various tax rules and regulations affect the marginal benefit of corporate actions. For example, when tax rules allow interest deductibility, a \$1 interest deduction provides tax savings of $\$1x\tau_C(\cdot)$. $\tau_C(\cdot)$ measures corporate marginal tax benefits and is a function of statutory tax rates, nondebt tax shields, the probability of experiencing a loss, international tax rules about dividend imputation and interest allocation, organizational form, and various other tax rules. A common thread that runs throughout this article is the demonstration of how various tax rules affect the $\tau_C(\cdot)$ benefit function, and therefore how they affect corporate incentives and decisions. A second but less common theme in tax research is related to how market imperfections affect costs. Given that this is a tax review, I emphasize research that describes how taxes affect costs and benefits — and only briefly discuss the influence of nontax factors.

There are multiple avenues for taxes to affect corporate decisions. Taxes can affect capital structure decisions [both domestic (Section 1) and multinational (Section 2)], organizational form and restructurings (Section 3), payout policy (Section 4), compensation policy (Section 5), and risk management (Section 6).[2] For each of these areas, the sections that follow

[2] I limit the number of topics to keep the review focused and of reasonable length. Beyond what is covered here, I ignore hypotheses that tax incentives affect debt maturity, pension management, research and

provide a theoretical framework describing how taxes might affect corporate decisions, empirical predictions based on the theory, and summaries of the related empirical evidence. This approach is intended to highlight important questions about how taxes affect corporate decisions, and to summarize and in some cases critique the answers that have been thus far provided. Each section concludes with a discussion of unanswered questions and possible avenues for future research. Overall, substantial progress has been made investigating if and how taxes affect corporate financial decisions — but much work remains to be done. Section 7 concludes and proposes directions for future research.

1. Taxes and Capital Structure: U.S. Tax System

1.1 Theory and empirical predictions

This section reviews capital structure research related to the "classical" tax system found in the United States. (Section 2 reviews multinational and imputation tax systems.) The key features of the classical system are that corporate income is taxed at a rate τ_C, interest is deductible and so is paid out of income before taxes, and equity payout is not deductible but is paid from the residual remaining after corporate taxation. In this tax system, interest, dividends, and capital gains income are taxed upon receipt by investors (at tax rates τ_P, $\tau_{div} = \tau_P$, and τ_G, respectively).[3] Most of the research assumes that equity is the marginal source of funds and that dividends are paid according to a fixed payout policy.[4] To narrow the discussion, I assume that regulations or transaction costs prevent investors from following the tax avoidance schemes implied by Miller and Scholes (1978), in which investors borrow via insurance or other tax-free vehicles to avoid personal tax on interest or dividend income.

In this framework, the after-personal-tax value to investors of a corporation paying \$1 of interest is $\$1(1 - \tau_P)$. In contrast, if that capital were

development (R&D) partnerships, transfer pricing, and tax shelters. For more on these policies, see the expanded version of this article [Graham (2004)].

[3] In early 2003 the Bush Administration proposed reducing or (if the corporation paid sufficient taxes) eliminating dividend taxes at the investor level. It became clear upon clarification that the president's proposal would also reduce taxes on capital gains via the "deemed dividend" provision. If this proposal had been adopted, the taxation of equity income would have been reduced to close to zero (under certain conditions) and the degree to which the United States followed a classical tax system would have been dramatically reduced or eliminated. The final tax law, however, only reduced taxation on dividends and capital gains to a maximum rate of 15%. Under this new law, signed in May 2003, the United States still follows a classical tax system, but with relatively light taxation of equity income. This should increase the personal tax penalty of debt relative to equity and reduce the overall use of leverage among U.S. corporations, all else equal.

[4] This assumption implies that retained earnings are not "trapped equity" that is implicitly taxed at the dividend tax rate, even while still retained. See Auerbach (2002) for more on the trapped equity or "new" view.

instead returned as equity income, it would be subject to taxation at both the corporate and personal level, and the investor would receive $\$1(1-\tau_{\mathrm{C}})(1-\tau_{\mathrm{E}})$. The equity tax rate, τ_{E}, is often modeled as a blended dividend and capital gains tax rate. The net tax advantage of \$1 of debt payout, relative to \$1 of equity payout, is

$$(1-\tau_P)-(1-\tau_C)(1-\tau_E). \tag{1}$$

If Equation (1) is positive, the tax implication is that investors value interest income more than equity income. In this case, to maximize firm value, a company has a tax incentive to issue debt instead of equity.

Equation (1) captures the benefit of a firm paying out \$1 as debt interest in the current period, relative to paying out \$1 as equity income. If a firm has $\$D$ of debt with coupon rate r_D, the net benefit of using debt rather than equity is

$$[(1-\tau_P)-(1-\tau_C)(1-\tau_E)]r_D D. \tag{2}$$

Given this expression, the value of a firm with debt can be written as

$$\mathrm{Value}_{\text{with debt}} = \mathrm{Value}_{\text{no debt}} + \mathrm{PV}[(1-\tau_{\mathrm{P}})-(1-\tau_{\mathrm{C}})(1-\tau_{\mathrm{E}})r_D D], \tag{3}$$

where the PV term measures the present value of all current and future interest deductions. Note that Equation (3) implicitly assumes that using debt adds tax benefits but has no other effect on incentives, operations, or value.[5]

Modigliani and Miller (1958) is the seminal capital structure article. If capital markets are perfect, τ_{C}, τ_{P}, and τ_{E} all equal zero, and it does not matter whether the firm finances with debt or equity (i.e., $\mathrm{Value}_{\text{with debt}} = \mathrm{Value}_{\text{no debt}}$). That is, the value of the firm equals the value of equity plus the value of debt — but total value is not affected by the proportions of debt and equity. I use this implication as the null throughout the capital structure discussion.

Null hypotheses. *(i) Firms do not have optimal tax-driven capital structures. (ii) The value of a firm with debt is equal to the value of an identical firm without debt* (*i.e., there is no net tax advantage to debt*).

In their "correction article," MM (1963) consider corporate income taxation but continue to assume that τ_{P} and τ_{E} equal zero. In this case,

[5] There are other approaches to modeling the tax benefits of debt that do not fit directly into this general framework. For example, Goldstein, Ju, and Leland (2001) develop a dynamic contingent-claims model in which firms can restructure debt. They estimate that the tax benefits of debt should equal between 8% and 9% percent of firm value. See Goldstein, Ju, and Leland (2001) for references to other contingent-claims models.

the second term in Equation (3) collapses to PV[$\tau_C r_D D$]: Because interest is deductible, relative to returning capital as equity, paying $\$r_D D$ of interest saves $\tau_C r_D D$ in taxes each period. MM (1963) assume that interest deductions are as risky as the debt that generates them and should be discounted by r_D.[6] With perpetual debt, MM (1963) argue that the value of a firm with debt financing is

$$\text{Value}_{\text{with debt}} = \text{Value}_{\text{no debt}} + \frac{\tau_C r_D D}{r_D} = \text{Value}_{\text{no debt}} + \tau_C D, \qquad (4)$$

where the $\tau_C D$ term represents the tax advantage of debt. Note that Equation (4) contains a term that captures the tax benefit of using debt ($\tau_C D$) but no offsetting cost-of-debt term. Equation (4) has two strong implications. First, corporations should finance with 100% debt because the marginal benefit of debt is τ_C, which is often assumed to be a positive constant. Second, due to tax benefits, firm value increases (linearly) with D.

The first implication was recognized as extreme, so researchers developed models that relax the MM (1958) assumptions and consider the cost of debt. In the early models, firms trade off the tax benefits of debt with costs of financial distress [Kraus and Litzenberger (1973) and Scott (1976)], thereby choosing an optimal capital structure that involves less than 100% debt. A great many additional models have also been derived in the trade-off tradition [e.g., agency cost models like Jensen and Meckling (1976) or Myers (1977)] that introduce different costs that balance against the tax benefits of debt. The basic implications, however, remain similar to those in MM (1963): (1) the incentive to finance with debt increases with the corporate tax rate, and (2) firm value increases with the use of debt (up to the point where the marginal cost equals the marginal benefit of debt). Note also that in these models, different firms can have different optimal debt ratios depending on the relative costs and benefits of debt (i.e., depending on differing firm characteristics).

Prediction 1. *All else being constant, for taxable firms, value increases with the use of debt because of tax benefits.*

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[6] The assumption that debt should be discounted at r_D is controversial because it requires the amount of debt to remain fixed. Miles and Ezzel (1985) demonstrate that if the dollar amount of debt is not fixed, but instead is set to maintain a target debt-equity ratio, then interest deductions have equity risk and should be discounted with the return on assets, r_A, rather than r_D. [Miles and Ezzel (1985) allow first-period financing to be fixed, which requires adjusting the discount rate by $(1+r_A)/(1+r_D)$]. In contrast, Grinblatt and Titman (2002) argue that firms often pay down debt when things are going well and stock returns are high, and do not alter debt when returns are low. Such behavior can produce a low or negative beta for debt, and hence a low discount rate for the tax benefits of debt. In either the Miles and Ezzel or Grinblatt and Titman case, however, the value of a levered firm still equals the value of the unlevered firm plus a "coefficient times debt" term — the discounting controversy only affects the coefficient.

Prediction 2. *Corporations have a tax incentive to finance with debt that increases with the corporate marginal tax rate. All else being equal, this implies that firms have differing optimal debt ratios if their tax rates differ.*

Prediction 1 is based directly on Equation (4), while Prediction 2 is based on the first derivative of Equation (4) with respect to D.

Miller (1977) argues that personal taxes can eliminate the "100% debt" implication, without the need for bankruptcy or agency costs. [Farrar and Selwyn (1967) took the first steps in this direction.] Miller's argument is that the marginal costs of debt and equity, net of the effects of personal and corporate taxes, should be equal in equilibrium, so firms are indifferent between the two financing sources. In essence, the corporate tax savings from debt is offset by the personal tax disadvantage to investors from holding debt relative to holding equity. All else being equal (including risk), this personal tax disadvantage causes investors to demand higher pretax returns on debt relative to equity returns. From the firm's perspective, paying this higher pretax return wipes out the tax advantage of using debt financing.

Figure 2 illustrates Miller's point. The horizontal line in panel A depicts the supply curve for debt; the line is horizontal because Miller assumes that the benefit of debt for all firms equals a fixed constant τ_{C}. The demand for debt curve is initially horizontal at zero, representing demand by tax-free investors, but eventually slopes upward because the return on debt must increase to attract investors with higher personal income tax rates. By making the simplifying assumption that $\tau_{\mathrm{E}} = 0$, Miller's equilibrium is reached when the marginal investor with $\tau_P^* = \tau_C$ is attracted to purchase debt. In this equilibrium, the entire surplus (the area between the supply and demand curves) accrues to investors subject to personal tax rates less than τ_P^*.

There are several implications from Miller's (1977) analysis. The first two are new:

Prediction 3. *High personal taxes on interest income (relative to personal taxes on equity income) create a disincentive for firms to use debt.*

Prediction 4. *The aggregate supply of debt is affected by relative corporate and personal taxes.*

The other implications are consistent with the null hypotheses stated above: (1) there is no net tax advantage to debt at the corporate level (once one accounts for the higher debt yields investors demand because of the relatively high personal taxes associated with receiving interest); (2) though taxes affect the aggregate supply of debt in equilibrium, they do not affect the optimal capital structure for any particular firm (i.e., it does not matter which particular firms issue debt, as long as aggregate supply equals aggregate demand); and (3) using debt does not increase firm value.

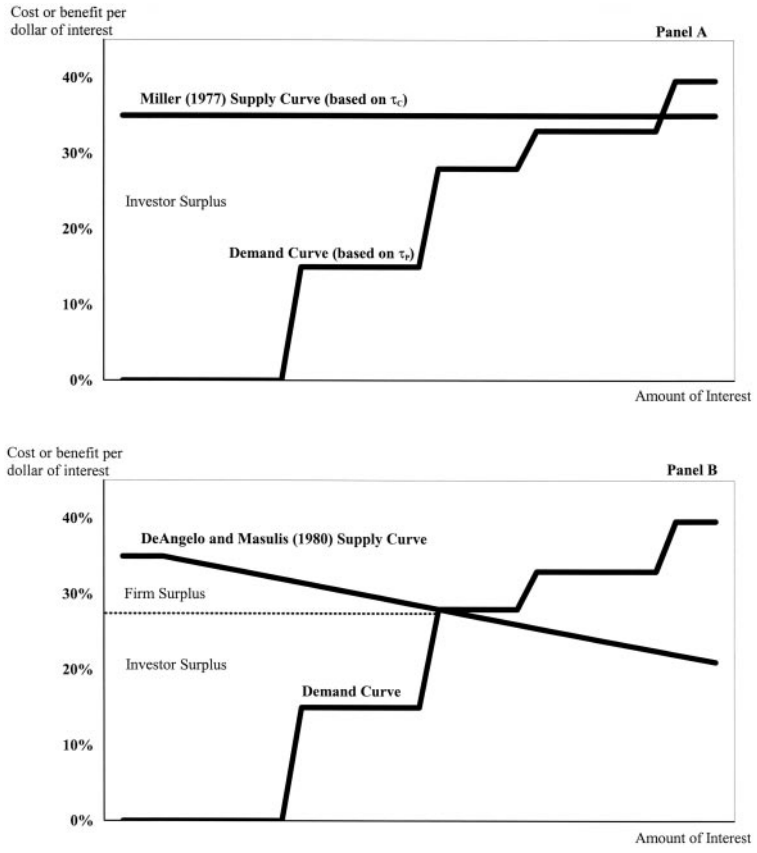

Figure 2
Equilibrium supply and demand curves for corporate debt
The supply curve shows the expected tax rate (and therefore the tax benefit of a dollar of interest) for the firms that issue debt. The demand curve shows the tax rate (and therefore the tax cost of a dollar of interest) for the investors that purchase debt. The tax rates for the marginal supplier of and investor in debt are determined by the intersection of the two curves. In the Miller equilibrium (panel A), all firms have the same tax rate in every state of nature, so the supply curve is flat. The demand curve slopes upward because tax-free investors are the initial purchasers of corporate bonds, followed by low tax rate investors, and eventually followed by high tax rate investors. In the Miller equilibrium, all investors with tax rate less than the marginal investor's (i.e., investors with tax rates of 33% or less in panel A) are inframarginal and enjoy an "investor surplus" in the form of an after-tax return on debt higher than their reservation return. In panel B, the supply curve is downward sloping because firms differ in terms of the probability that they can fully utilize interest deductions (or have varying amounts of nondebt tax shields), and therefore have differing benefits of interest deductibility. Firms with tax rates higher than that for the marginal supplier of debt (i.e., firms with tax rates greater than 28% in panel B) are inframarginal and enjoy "firm surplus" because the benefit of interest deductibility is larger than the personal tax cost implicit in the debt interest rate.

A general version of Miller's argument (that does not assume $\tau_E = 0$) can be expressed in terms of Equation (3). Once personal taxes are introduced into this framework, the appropriate discount rate is measured after personal income taxes to capture the (after personal tax)

opportunity cost of investing in debt. In this case, the value of a firm using perpetual debt is[7]

$$\text{Value}_{\text{with debt}} = \text{Value}_{\text{no debt}} + \frac{[(1-\tau_P)-(1-\tau_C)(1-\tau_E)]r_D D}{(1-\tau_P)r_D}$$

$$= \text{Value}_{\text{no debt}} + [1 - \frac{(1-\tau_C)(1-\tau_E)}{(1-\tau_P)}]D. \quad (5)$$

Note that Equation (5) is identical to Equation (4) if there are no personal taxes, or if $\tau_{\text{P}} = \tau_{\text{E}}$.

If the investor-level tax on interest income (τ_{P}) is large relative to tax rates on corporate and equity income (τ_{C} and τ_{E}), the net tax advantage of debt can be zero or even negative. One way that Equation (5) can be an equilibrium expression is for the right-most term in Equation (5) to equal zero in equilibrium [e.g., $(1-\tau_{\text{P}}) = (1-\tau_{\text{C}})(1-\tau_{\text{E}})$], in which case the implications from Miller (1977) are unchanged. Alternatively, the tax benefit term in Equation (5) can be positive and a separate cost term can be introduced in the spirit of the trade-off models; in this case, the corporate incentive to issue debt and firm value both increase with $[1-(1-\tau_{\text{C}})(1-\tau_{\text{E}})/(1-\tau_{\text{P}})]$ and firm-specific optimal debt ratios can exist. The bracketed expression specifies the degree to which personal taxes (Prediction 3) offset the corporate incentive to use debt (Prediction 2). Recall that τ_{P} and τ_{E} are personal tax rates for the marginal investor(s), and therefore are difficult to pin down empirically (more on this in Section 1.4).

DeAngelo and Masulis (1980; hereafter DM) broaden Miller's (1977) model and put the focus on the marginal tax benefit of debt, represented above by τ_{C}. DM argue that $\tau_{\text{C}}(\cdot)$ is not constant and always equal to the statutory rate. Instead, $\tau_{\text{C}}(\cdot)$ is a function that decreases in nondebt tax shields (NDTSs) (e.g., depreciation and investment tax credits) because NDTSs crowd out the tax benefit of interest. Further, Kim (1989) highlights that firms do not always benefit fully from incremental interest deductions because they are not taxed when taxable income is negative. This implies that $\tau_{\text{C}}(\cdot)$ is a decreasing function of a firm's debt usage because existing interest deductions crowd out the tax benefit of incremental interest.

Modeling $\tau_{\text{C}}(\cdot)$ as a function has important implications because the supply of debt function can become downward sloping (see panel B in Figure 2). This implies that there is a corporate advantage to using debt, as measured by the "firm surplus" of issuing debt (the area above the dotted line but below the supply curve in panel B). Moreover, high tax rate firms

[7] See Sick (1990), Taggart (1991), or Benninga and Sarig (1997) for derivation of expressions like Equation (5) under various discounting assumptions. These expressions are of the form $\text{Value}_{\text{with debt}} = \text{Value}_{\text{no debt}} +$ coefficient $* D$. The coefficient is always an increasing (decreasing) function of corporate (personal income) tax rates.

supply debt (i.e., are on the portion of the supply curve to the left of its intersection with demand), which implies that there exist tax-driven firm-specific optimal debt ratios (as in Prediction 2), and that the tax benefits of debt add value for high tax rate firms (as in Prediction 1). The DM (1980) approach leads to the following prediction, which essentially expands Prediction 2:

Prediction 2′. *All else being equal, to the extent that they reduce* $\tau_C(.)$*, nondebt tax shields and/or interest deductions from already existing debt reduce the tax incentive to use debt. Similarly the incentive decreases with the probability that a firm will experience nontaxable states of the world.*

The discussion thus far has considered the debt versus equity choice; however, it can be extended to leasing arrangements. In certain circumstances, a high tax rate firm can have a tax incentive to borrow to purchase an asset, even if it allows another firm to lease and use the asset. With true leases (as defined by the Internal Revenue Service [IRS]) the lessor purchases an asset, and deducts depreciation and (if it borrows to buy) interest from taxable income. The lessee, in turn, obtains use of the asset but cannot deduct interest or depreciation. The depreciation effect therefore encourages low tax rate firms to lease assets from high tax rate lessors. This occurs because the lessee effectively "sells" the depreciation (and associated tax deduction) to the lessor, who values it more highly (assuming that the lessee has a lower tax rate than the lessor).[8] This incentive for low tax rate firms to lease is magnified when depreciation is accelerated, relative to straight-line depreciation. Further, the alternative minimum tax (AMT) system can provide an additional incentive for a lessee to lease, in order to remove some depreciation from its books and stay out of AMT status altogether.

There are other tax effects that can reinforce or offset the incentive for low tax rate firms to lease. Lessors with relatively large tax rates receive a relatively large tax benefit of debt, which provides an additional incentive (to borrow) to buy an asset and lease it to the lessee. Moreover, tax incentives provided by investment tax credits (which have existed at various times but are not currently on the books in the United States) associated with asset purchases are also relatively beneficial to high tax rate lessors. In contrast, the relatively high taxes that the lessor must pay on lease income provide a tax disincentive for firms with high tax rates to be lessors (and similarly the relatively small tax advantage that a low tax rate firm enjoys from deducting lease expense works against the incentive for low tax rate firms to lease rather than buy). The traditional argument is that low tax rate firms have a tax incentive to lease from high tax rate

[8] Analogously, R&D limited partnerships allow low tax firms to sell start-up costs and losses to high tax rate partners. See Shevlin (1987) or Graham (2004) for more details.

lessors, though this implication is only true for some combinations of tax rules (e.g., depreciation rules, range of corporate tax rates, existence of investment tax credits, or AMT) and leasing arrangements (e.g., structure of lease payments). See Smith and Wakeman (1985) for details on how nontax effects can also influence the leasing decision.

Prediction 5. *All else being equal, the traditional argument is that low tax rate firms should lease assets from high tax rate lessors, though this implication is conditional on specifics of the tax code and leasing contract.*

1.2 Empirical evidence on whether the tax advantage of debt increases firm value

Prediction 1 indicates that the tax benefits of debt add $\tau_C D$ [Equation (4)] or $[1-(1-\tau_C)(1-\tau_E)/(1-\tau_P)]D$ [Equation (5)] to firm value. If $\tau_C = 40\%$ and the debt ratio is 35%, Equation (4) indicates that the contribution of taxes to firm value equals 14% ($0.14 = \tau_C \times$ debt-to-value). This calculation is an upper bound, however, because it ignores costs and other factors that reduce the corporate tax benefit of interest deductibility, such as personal taxes, nontax costs of debt, and the possibility that interest deductions are not fully valued in every state of the world. This section reviews empirical research that attempts to quantify the net tax benefits of debt. The first group of articles study market reactions to exchange offers, which should net out the various costs and benefits of debt. The remainder of the section reviews recent analyses based on large-sample regressions and concludes by examining explicit benefit functions for interest deductions.

1.2.1 Exchange offers. To investigate whether the tax benefits of debt increase firm value (Prediction 1), Masulis (1980) examines exchange offers made during the 1960s and 1970s. Because one security is issued and another simultaneously retired in an exchange offer, Masulis argues that exchanges hold investment policy relatively constant and are primarily changes in capital structure. Masulis' tax hypothesis is that leverage-increasing (decreasing) exchange offers increase (decrease) firm value because they increase (decrease) tax deductions.[9]

Masulis (1980) finds evidence consistent with his predictions: leverage-increasing exchange offers increase equity value by 7.6%, and leverage-decreasing transactions decrease value by 5.4%. Moreover, the exchange offers with the largest increases in tax deductions (debt-for-common and debt-for-preferred) have the largest positive stock price reactions (9.8% and 4.7%, respectively). Using a similar sample, Masulis (1983) regresses stock returns on the change in debt in exchange offers and finds a debt

[9] Note that Masulis implicitly assumes that firms are underlevered. For a company already at its optimum, a movement in either direction (i.e., increasing or decreasing debt) would decrease firm value.

coefficient of approximately 0.40 (which is statistically indistinguishable from the top statutory corporate tax rate at that time). This is consistent with taxes increasing firm value as in Equation (4) (and also consistent with some alternative hypotheses discussed below), but it is surprising because such a large coefficient implies near-zero personal tax and non tax costs to debt. That is, the debt coefficient in Masulis (1983) measures the average benefit of debt (averaged across firms and averaged over the incremental net benefit of each dollar of debt for a given firm) *net of the costs*. An average net benefit of 0.40 requires that the costs are much smaller than the benefits for most dollars of debt. For the post exchange offer capital structure to satisfy the MB = MC equilibrium condition, the benefit or cost curves (or both) must be very steeply sloped near their intersection.

Myers (1984) and Cornett and Travlos (1989) argue that Masulis' (1980) hypothesis is problematic. If firms optimize, they should only adjust capital structure to move toward an optimal debt ratio, whether that involves increasing debt or equity. In other words, increasing debt will not always add to firm value, even if interest reduces tax liabilities. Therefore nontax reactions might explain Masulis' (1980) results. As described next, several articles have found evidence of nontax factors affecting exchange offer market reactions. It is important to note that these post-Masulis articles do not prove that the tax interpretation is wrong — but they do offer alternative interpretations.

First, some articles find evidence of positive (negative) stock reactions to leverage-increasing (leverage-decreasing) events that are unrelated to tax deductions: Asquith and Mullins (1986), Masulis and Korwar (1986), and Mikkelson and Partch (1986) find negative stock price reactions to straight equity issuance, and Pinegar and Lease (1986) find positive stock price reactions to preferred-for-common exchanges. Second, Mikkelson and Partch (1986) and Eckbo (1986) find that straight debt issuance (without equity retirement) produces a stock price reaction that is indistinguishable from zero. Third, some articles find that exchange offers convey nontax information that affects security prices, perhaps due to asymmetric information problems along the lines suggested by Myers and Majluf (1984) or due to signaling [Ross (1977) and Leland and Pyle (1977)]. For example, Shah (1994) correlates exchange offers with information about reduced future cash flows (for leverage-decreasing offers) and decreased risk (for leverage-increasing offers). Finally, Cornett and Travlos (1989) provide evidence that weakens Masulis' (1983) conclusions. Cornett and Travlos regress event stock returns on the change-in-debt and two variables that control for information effects (the ex-post change in inside ownership and ex-post abnormal earnings). They find the coefficient on the change-in-debt variable is insignificant while the coefficients on the other variables are significant, which implies that the positive stock price reaction is related to positive information conveyed by the

exchange.[10] Cornett and Travlos conclude that equity-for-debt exchanges convey information about the future — but find no evidence of increased value due to tax benefits.

Two recent articles examine the exchange of traditional preferred stock for monthly income preferred stock (MIPS). These two securities differ primarily in terms of their tax characteristics, so any market reaction should have minimal nontax explanations. MIPS interest is tax deductible for corporations (like debt interest) and preferred dividends are not. On the investor side, corporate investors enjoy a 70% dividends received deduction (DRD) for preferred dividends, but recipients of MIPS interest receive no parallel deduction.[11] When issuing MIPS to retire preferred, corporations gain the tax benefit of interest deductibility but experience two costs: underwriting costs, and possibly an increased coupon due to the personal tax penalty (because investors are fully taxed on MIPS interest in contrast to corporate investors receiving the DRD on preferred dividends). Engel, Erickson, and Maydew (1999) compare MIPS yields to preferred yields and conclude that the tax benefit of MIPS is approximately \$0.28 per dollar of face value, net of the aforementioned costs. Irvine and Rosenfeld (2000) use abnormal announcement returns to estimate the value at \$0.26. Given that MIPS and preferred are nearly identical in all legal and informational respects, these studies provide straightforward evidence of the positive contribution of taxes to firm value, net of underwriting and personal tax costs.

1.2.2 Cross-sectional regressions. Fama and French (1998; hereafter FF) attempt to estimate Equation (4) and Prediction 1 directly, by regressing V_L on debt interest, dividends, and a proxy for V_U. They argue that a positive coefficient on interest is evidence of positive tax benefits of debt. FF measure V_L as the excess of market value over book assets. They proxy V_U with a collection of control variables including current earnings, assets, and R&D spending, as well as future changes in these same variables. (All the variables in the regression are deflated by assets.) If these control variables adequately proxy for V_U, the regression coefficient on interest will measure the tax benefit of debt (which is hypothesized to be positive). The main difficulty with this approach is that if the control variables measure V_U with error, the regression coefficients can be biased. FF perform a series of regressions on a broad cross section of firms, using both level-form and first-difference specifications. In all cases, the

[10] Unfortunately Cornett and Travlos do not report whether they get a significant positive tax coefficient [like Masulis (1983) did] when they exclude the information variables. Therefore their results could be driven by their using a different sample than Masulis used.

[11] A 70% DRD means that a corporation that owns another firm's stock only pays tax on 30% of the dividends received. Note that evidence in Erickson and Maydew (1998) implies that corporations are the marginal investor in preferred stock (see note 32).

coefficient on interest is either insignificant or negative. FF interpret their results as being inconsistent with debt tax benefits having a first-order effect on firm value. Instead, they argue that interest provides information about earnings that is not otherwise captured by their controls for V_U. In other words, V_U is measured with error, which results in the interest coefficient picking up a negative valuation effect related to financial distress or some other cost.

Kemsley and Nissim (2002) attempt to circumvent this measurement problem. They perform a switch of variables, moving the earnings variable (which they assume proxies V_U with error) to the left-hand side of the regression and V_L to the right side. When they regress earnings before interest and tax (EBIT) on V_L and debt, the debt coefficient is negative, which they interpret as evidence that debt contributes to firm value. The coefficient also changes through time in conjunction with changes in statutory tax rates. In my opinion, the Kemsley and Nissim analysis should be interpreted carefully. First, their regression specification can be interpreted as measuring the effect of debt on earnings just as well as it can be interpreted as a switch-of-variables that fixes a measurement error problem in Fama and French (1998). Second, the debt coefficient has the correct sign for the full sample only in a nonlinear specification in which all the right-hand-side variables are interacted with a crude measure of the discount rate. Finally, the coefficient that measures the net benefit of debt has an absolute value of 0.40. While consistent with Masulis (1983), such a large coefficient implies near-zero average debt costs and a near-zero effect of personal taxes.

1.2.3 Marginal benefit functions. Using a different approach, Graham (2000) simulates interest deduction benefit functions and uses them to estimate the tax-reducing value of each incremental dollar of interest expense. For a given level of interest deductions, Graham essentially integrates over possible states of the world (i.e., both taxable and nontaxable states) to determine a firm's expected τ_C, which specifies the expected tax benefit of an incremental dollar of interest deduction. Marginal tax benefits of debt decline as more debt is added because the probability increases with each incremental dollar of interest that it will not be fully valued in every state of the world. Using simulation methods (described more fully in Section 1.3.2) and various levels of interest deductions, Graham maps out firm-specific interest benefit functions analogous to the top curve in panel B of Figure 2.

By integrating under these benefit functions, Graham (2000) estimates that the tax benefit of debt equals approximately 9–10% of firm value during 1980–1994 (ignoring all costs). The fact that this figure is less than the 14% estimated (at the beginning of Section 1) with the back of the envelope "$\tau_C D$" calculation reflects the reduced value of interest deductions in

some states of the world. When personal taxes are considered, the tax benefit of debt falls to 7–8% of firm value (i.e., this is Graham's estimate of the "firm surplus" in panel B of Figure 2). Graham also estimates the "money left on the table" that firms could obtain if they levered up to the point where their last dollar of interest deduction is valued at the full statutory tax rate (i.e., the point just before incremental tax benefits begin to decline).[12] His estimates imply that large tax benefits of debt appear to go unexploited, and that large, profitable firms (which would seem to face the lowest costs of debt) are the most conservative in their use of debt.[13] These implications are hard for a trade-off model to explain.

To sum up, a fair amount of research has found evidence consistent with tax benefits adding to firm value. However, some of this evidence is ambiguous because nontax explanations or econometric issues cloud interpretation. Additional research in three specific areas would be helpful. First, we need more market-based research along the lines of the MIPS exchanges, where tax effects are isolated from information and other factors and therefore the tax interpretation is fairly unambiguous. Second, additional cross-sectional regression research that investigates the market value of the tax benefits of debt would be helpful in terms of clarifying or confirming the interpretation of existing cross-sectional regression analysis. Finally, if the tax benefits of debt do in fact add to firm value, an important unanswered question is why firms do not use more debt, especially large, profitable firms.[14] We need to better understand whether this implies that some firms are not optimizing or whether there are costs and other influences that have not been adequately modeled in previous research.

1.3 Empirical evidence on whether corporate taxes affect debt versus equity policy

Trade-off models imply that firms should issue debt as long as the marginal benefit of doing so (measured by τ_C) is larger than the marginal cost.

[12] For example, if during 1995–1999 all firms levered up to just before the point of declining benefit, simulations performed for this article indicate that the average company would have total tax benefits of debt of around 18% of firm value. That is, by levering up, the typical firm could add interest deductions with tax benefit equal to 10% of firm value, above and beyond their current level of tax benefits. This number can be interpreted as a measure of the value loss due to conservative corporate debt policy or as a lower bound on the costs of debt that would occur if a company were to lever up.

[13] McDonald (2002) argues that the prevalence of writing puts or purchasing calls on their own shares is also evidence that many firms pass up potential interest deductions. For example, writing a put (which involves implicit borrowing) can be replicated by explicitly borrowing today to purchase a share on the open market and repaying the loan in the future. The cash flows are identical in these two strategies but the latter results in the firm receiving a tax deduction. The fact that many firms write puts is consistent with them passing up interest tax deductions.

[14] Shyum-Sunder and Myers (1999), Lemmon and Zender (2002), and related articles investigate whether the trade-off model is the correct model of capital structure, which has implications toward interpreting these results. Lemmon and Zender (2001) and Minton and Wruck (2001) investigate whether some firms are in fact underlevered, or whether there are alternative explanations.

$\tau_C(\cdot)$ is a decreasing function of nondebt tax shields, existing debt tax shields, and the probability of experiencing losses, so the incentive to use debt declines with these three factors (Prediction 2′). In general, high tax rate firms should use more debt than low tax rate firms (Prediction 2). The articles reviewed in this section generally use reduced-form cross-sectional or panel regressions to test these predictions — and ignore personal taxes altogether. For expositional reasons, I start with tests of Prediction 2′.

1.3.1 Nondebt tax shields, profitability, and the use of debt. Bradley, Jarrell, and Kim (1984) perform one of the early regression tests for tax effects along the lines suggested by DeAngelo and Masulis (1980). Bradley, Jarrell, and Kim regress firm-specific debt-to-value ratios on nondebt tax shields (as measured by depreciation plus investment tax credits), R&D expense, the time-series volatility of earnings before interest, tax, depreciation, and amortization [EBITDA], and industry dummies.[15] The tax hypothesis is that nondebt tax shields are negatively related to debt use because they substitute for interest deductions (Prediction 2′). However, Bradley, Jarrell, and Kim find that debt is positively related to nondebt tax shields, opposite the tax prediction. This surprising finding, and others like it, prompted Myers (1984) to state in his presidential address to the American Finance Association, "I know of no study clearly demonstrating that a firm's tax status has predictable, material effects on its debt policy. I think the wait for such a study will be protracted" (p. 588).

One problem with using nondebt tax shields, in the form of depreciation and investment tax credits, to explain debt policy is that nondebt tax shields are positively correlated with profitability and investment. If profitable (i.e., high tax rate) firms invest heavily and also borrow to fund this investment, this can induce a positive relation between debt and nondebt tax shields and overwhelm the tax substitution between interest and nondebt tax shields [Dammon and Senbet (1988)]. Another issue is that nondebt tax shields (as well as existing interest deductions or the probability of experiencing losses) should only affect debt decisions to the extent that they affect a firm's marginal tax rate (MTR). Only for modestly profitable firms is it likely that nondebt tax shields have impact sufficient to affect the MTR and therefore debt policy.[16]

MacKie-Mason (1990) and Dhaliwal, Trezevant, and Wang (1992) address these issues by interacting NDTS with a variable that identifies firms near "tax exhaustion," at which point the substitution between

[15] An alternative test would be to match NDTS-intensive firms to companies that are similar in all ways except for their use of nondebt tax shields and examine whether the NDTS-intensive firms use less debt.

[16] The marginal tax rate for unprofitable firms will be close to zero whether or not the firm has NDTS. The tax rate for highly profitable firms will be near the top statutory rate, unless a firm has a very large amount of NDTS.

nondebt tax shields and interest is most important. Both articles find that tax-exhausted firms substitute away from debt when nondebt tax shields are high.[17] Even though these articles find a negative relation between the interacted NDTS variable and debt usage, this solution is not ideal. For one thing, the definition of tax exhaustion is ad hoc. Moreover, Graham (1996a) shows that the interacted NDTS variable has low power to detect tax effects and that depreciation and investment tax credits (the usual components of nondebt tax shields) have a very small empirical effect on the MTR. Ideally researchers should capture the effects (if any) of nondebt tax shields, existing interest, and the probability of experiencing losses directly in the estimated MTR, rather than including these factors as stand-alone variables.

A similar issue exists with respect to using profitability as a measure of tax status. Profitable firms usually have high tax rates and therefore some articles argue that the tax hypothesis implies they should use more debt. Empirically, however, the use of debt declines with profitability, which is often interpreted as evidence against the tax hypothesis [e.g., Myers (1993)]. My view is that profitability should only affect the tax incentive to use debt to the extent that it affects the corporate MTR;[18] therefore, when testing for tax effects, the effects (if any) of profitability should be captured directly in the estimated MTR. Researchers would then interpret a stand-alone profitability variable to control for potential nontax influences.

1.3.2 Directly estimating the MTR. One of the problems that led to Myers' capital structure puzzle is related to properly quantifying corporate tax rates and incentives. For example, many studies use static MTRs which ignore important dynamic features of the tax code related to net operating loss carrybacks and carryforwards, investment tax credits and other nondebt tax shields, and the alternative minimum tax. Static MTRs miss the fact that a company might be profitable today but expect to experience losses in the near future. This firm might erroneously be assigned a high current-period tax rate even though its true economic tax rate is low.[19] Conversely, an unprofitable firm might have a large current economic marginal tax rate if it is expected to soon become and remain profitable (because extra income earned today increases taxes paid

[17] Ekman (1995) finds the same for Swedish firms. Trezevant (1992) finds that Compustat PST firms most likely to be tax-exhausted decreased debt usage the most following the 1981 liberalization of tax laws that increased nondebt tax shields.

[18] Keep in mind that a marginal tax rate is bound between zero and the top statutory rate while profitability is not bounded, which can induce errors from interpreting profitability as a proxy for the tax rate.

[19] Scholes and Wolfson (1992) define the *economic marginal tax rate* as the present value of current and future taxes owed on an extra dollar of income earned today, which accounts for the probability that taxes paid today will be refunded in the near future.

in the future: an extra dollar of income today reduces losses that could be carried forward to delay future tax payments, thereby increasing present value tax liabilities).

Shevlin (1987, 1990) uses simulation techniques to capture the dynamic features of the tax code related to net operating loss carrybacks and carryforwards.[20] The first step in simulating an MTR for a given firm-year involves calculating the historic mean and variance of the change in taxable income for each firm. The second step uses this historic information to forecast future income for each firm. These forecasts are generated with random draws from a normal distribution, with mean and variance equal to that gathered in the first step; therefore many different forecasts of the future can be generated for each firm. The third step calculates the present value tax liability along each of the income paths generated in the second step, accounting for the tax-loss carryback and carryforward features of the tax code. The fourth step adds $1 to current-year income and recalculates the present value tax liability along each path. The incremental tax liability from the fourth step above that in the third step is the present value tax liability from earning an extra dollar today, in other words, the economic MTR. A separate MTR is calculated along each of the forecasted income paths to capture the different tax situations a firm might experience in different future scenarios. The idea is to mimic the different planning scenarios that a manager might consider. The fifth step averages across the MTRs from the different scenarios to calculate the expected economic MTR for a given firm-year. Note that these five steps produce the expected MTR for a single firm-year. The steps are replicated for each firm for each year to produce a panel of firm-year MTRs. The MTRs in this panel vary across firms and can also vary through time for a given firm. The end result is greater cross-sectional variation in corporate tax rates (and hence tax incentives) than implied by statutory rates.[21]

Note that by construction the simulated tax rates capture the influence of profitability on the corporate MTR. Graham (1996a) extends the simulation approach to directly capture the effects of nondebt tax shields, investment tax credits, and the alternative minimum tax. Graham (1996b) demonstrates that simulated tax rates are the best commonly available

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[20] Auerbach and Poterba (1987) and Altshuler and Auerbach (1990) simulate tax rates using first-order Markov probabilities that weight the probability of transition between taxable and nontaxable states.

[21] One difficulty with simulated tax rates is that they require a time series of firm-specific data. Moreover, they are usually calculated using financial statement data, even though it would be preferable to use tax return data. With respect to the first problem, Graham (1996b) shows that an easy-to-calculate trichotomous variable (equal to the top statutory rate if a firm has neither negative taxable income nor NOL carryforwards, equal to one-half the statutory rate if it has one but not the other, and equal to zero if it has both) is a reasonable replacement for the simulated rate. With respect to the tax return issue, Plesko (2003) compares financial-statement-based simulated rates for 586 firms to a static tax variable calculated using actual tax return data. He finds that simulated rates (based on financial statements) are highly correlated with tax variables based on tax return data. Plesko's evidence implies that the simulated tax rates are a robust measure of corporate tax status.

proxy for the "true" MTR (when "true" is defined as the economic tax rate based on realized taxable income, rather than simulations of the future). Using the simulated corporate MTR, Graham (1996a) documents a positive relation between tax rates and changes in debt ratios (consistent with Prediction 2), as do Graham, Lemmon, and Schallheim (1998) and Graham (1999) for debt levels. Since that time, numerous other studies have also used simulated tax rates to document tax effects in debt decisions. These results help to resolve Myers' (1984) capital structure puzzle; when tax rates are properly measured, it is possible to link tax status with corporate debt policy.

1.3.3 Endogeneity of corporate tax status. Even if measured very precisely, tax rates are endogenous to debt policy, which can have important effects on tax research. If a company issues debt, it reduces taxable income, which in turn can reduce its tax rate. The more debt issued, the greater the reduction in the MTR. Therefore, if one regresses debt ratios on MTRs, the endogeneity of corporate tax status can impose a negative bias on the tax coefficient. This could explain the negative tax coefficient detected in some specifications [e.g., Hovakimian, Opler, and Titman (2001) and Barclay and Smith (1995)]. Note that endogeneity can affect all sorts of tax variables, including those based on NOLs or that use an average tax rate (i.e., taxes paid/taxable income).

There are two solutions to the endogeneity problem. MacKie-Mason (1990) proposed the first solution by looking at (0,1) debt versus equity issuance decisions (rather than the debt level) in his influential examination of 1747 issuances from 1977 to 1987. Debt levels (such as debt ratios) are the culmination of many historical decisions, which may obscure whether taxes influence current-period financing choice. Detecting tax effects in the incremental approach only requires that a firm make the appropriate debt-equity choice at the time of security issuance, given its current position, and not necessarily that the firm rebalance to its optimal debt-equity ratio with each issuance (as is implicit in many debt-level studies). To avoid the endogenous effect of debt decisions on the MTR, MacKie-Mason uses the lagged marginal tax rate to explain current-period financing choice.[22] He finds a positive relation between debt issuance and tax rates. Graham (1996a) follows a similar approach and examines the relation between changes in the debt ratio and lagged

[22] Wang (2000) argues that firms do not consider the level of the MTR when making incremental decisions but rather consider how far the MTR is from the "optimal MTR." Holding the level of the tax rate constant, Wang shows that companies with tax rates above the optimum are those that use the most debt (an action which should endogenously reduce the MTR and move it closer to the optimum, essentially reducing marginal benefit until it equals marginal cost). The difficulty with this approach is that Wang's "optimal MTR" is ad hoc.

simulated MTRs. He finds positive tax effects for a large sample of Compustat firms.[23]

If taxes exert a positive influence on each incremental financing decision, then the sum of these incremental decisions should show up in an analysis of current debt levels — if one could fix the endogenous negative effect on tax rates induced by cumulative debt usage.[24] The second approach to fixing the endogeneity problem is to measure tax rates "but-for" financing decisions. Graham, Lemmon, and Schallheim (1998) measure tax rates before financing (i.e., based on income before interest is deducted). They find a positive relation between debt-to-value and (endogeneity-corrected) but-for tax rates. (They also find a "spurious" negative correlation in an experiment that uses an endogenously affected after-financing tax rate.)

Examining changes in debt answers the question "are incremental decisions affected by tax status?" An alternative approach is to ask, "if tax rates change, how will a firm alter debt usage?" The Tax Reform Act of 1986 greatly reduced corporate marginal tax rates (see Figure 1), which in isolation implies a reduction in the corporate use of debt. Givoly et al. (1992) find that firms with high tax rates prior to tax reform (and which therefore probably experience the largest drop in their tax rate) reduce debt the most after tax reform. This finding is somewhat surprising because their corporate marginal tax rate suffers from the negative endogeneity bias described above. Moreover, personal taxes are not modeled directly, even though they fell by more than corporate tax rates after the 1986 tax reform.[25]

1.3.4 Time-series evidence of tax effects. The empirical evidence described thus far confirms cross-sectionally that firms with high tax rates use more debt than those with low tax rates. Presumably there should also be time-series tax effects. For example, if a firm starts public life with a low tax rate, one would expect increased debt usage if the tax rate increases as the firm matures. I am not aware of any study that

[23] A number of other articles corroborate these results. For example, Shum (1996) finds similar evidence for Canadian firms. Alworth and Arachi (2000) show that lagged after-financing simulated tax rates are positively related to changes in debt for Italian firms. Henderson (2001) finds that changes in total liabilities and changes in long-term debt are both positively related to simulated tax rates in a sample of U.S. banks.

[24] Dittmar (2002) studies corporate spin-offs, which potentially allows her to avoid the endogeneity problem by observing capital structures that are not the end result of a long history of accumulated debt policy decisions. However, it is still the case that past decisions can influence the parent's and/or spun-off unit's new capital structure. Dittmar does not find evidence that corporate tax rates affect spin-off debt ratios.

[25] Givoly et al. (1992) include lagged dividend yield in their specification to control for personal tax effects, which might allow their tax variable to isolate corporate tax effects. Personal tax effects are examined more fully in Section 1.4.

documents tax-related time-series effects in debt usage.[26] For example, Graham (1999) uses panel data to document that cross-sectional variation in tax status affects debt usage, but he finds no evidence that time-series variation does.

To summarize this section, once issues related to measuring debt policy and tax rates are addressed, researchers have supplied evidence in response to Myers' (1984) challenge to show that corporate debt usage is positively affected by tax rates. These results are consistent with survey evidence that interest tax deductibility is an important factor affecting debt policy decisions (ranking below only maintaining financial flexibility, credit ratings, and earnings volatility), and is especially important for large industrial firms [Graham and Harvey (2001)]. Notwithstanding these empirical results, Myers is still not entirely convinced [Myers et al. (1998)]; he argues that tax incentives are of "third-order" importance in the hierarchy of corporate decisions. It would be helpful for future research to investigate whether the tax effects on debt versus equity choice are economically important, and if they are not, determine why not.

Several other challenges remain. First, none of the articles cited above provide time-series evidence that firm-specific changes in tax status affect debt policy. It would be quite helpful to examine whether a firm changes its debt policy as it matures and presumably its tax status changes. Second, Fama and French (2001) point out that with few exceptions the panel data examinations do not use statistical techniques that account for cross-correlation in residuals, and therefore many articles do not allow for proper determination of statistical significance for the tax coefficients. Therefore it is not clear if all of the tax effects documented above are robustly significant. Finally, most articles ignore the tax cost of receiving interest income from the investor's perspective, an issue to which I now turn.

1.4 Empirical evidence on whether personal taxes affect corporate debt versus equity policy

Miller (1977) identifies a puzzle: the benefits of debt seem large relative to expected costs, and yet firms appear to use debt conservatively. Miller proposes that the personal tax cost of interest income (relative to the personal tax cost of equity) is large enough at the margin to completely offset the corporate tax advantage of debt. The Miller equilibrium is difficult to test empirically for several reasons, not the least of which is that the identity and tax status of the marginal investors between debt and

[26] Pittman and Klassen (2001) examine capital structure in the years following the initial public offering (IPO). They perform annual (i.e., years since IPO) cross-sectional regressions and find evidence that taxes have a positive effect on the use of debt in the early years of a firm's public life — but this relation wanes as the firm ages. Pittman and Klassen attribute this waning to an increase in refinancing transaction costs as firms age. Note that their evidence is not time series in terms of firms altering capital structure as tax rates change through time, though they do link debt policy to firm age.

equity are unknown. Anecdotally I note that the tax rate on interest income (τ_P) was large relative to tax rates on corporate and equity income (τ_C and τ_E) when Miller wrote his article, so the Miller equilibrium was plausible. However, the statutory tax rates shown in Figure 1 imply that Equation (1) has been positive since 1981, so the strict form of the Miller equilibrium is less plausible in the last two decades.[27]

To quantify the effect of personal taxes in Equation (1), Gordon and MacKie-Mason (1990) and others implicitly assume that investors form clienteles based on firm-specific dividend payout ratios, and therefore that τ_E is a weighted combination of the tax rates on dividend payout and capital gains income: $\tau_E = (payout)\tau_{div} + (1 - payout)\tau_{cap\ gains}$. This and related articles use historic averages to estimate dividend payout and measure $\tau_{div} = \tau_P$ implicitly using the difference between the yield on taxable and tax-free government bonds. $\tau_{cap\ gains}$ is often assumed to equal a fraction of the statutory capital gains tax rate (to capture the benefit of reduced effective tax rates due to deferral of equity taxation and omission of equity tax at death).[28]

Given these assumptions, Gordon and MacKie-Mason (1990) estimate that the tax advantage of debt, net of the personal tax penalty, increased following the Tax Reform Act of 1986. Recall that Miller (1977) implies that the aggregate supply of debt is determined by relative corporate and personal tax rates. Gordon and MacKie-Mason document that aggregate corporate debt ratios increased slightly in response to tax reform (consistent with Prediction 4). This is the only research of which I am aware that investigates this aggregate prediction. Note that Gordon and MacKie-Mason focus on a single point in time, while the Miller equilibrium has implications for any point in time.

Graham (1999) tests similar predictions using firm-specific data. He finds that the net tax advantage of the first dollar of interest averaged between 140 and 650 basis points between 1980 and 1994. He finds that the firms for which the net advantage is largest use the most debt in virtually every year. Graham also separately identifies a positive (negative) relation between the corporate tax rate (personal tax penalty) and debt usage. These results are consistent with Predictions 2 and 3.

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[27] If the statutory tax rates depicted in Figure 1 are not representative of the tax rates applicable to the marginal investors, or if capital gains tax rates are effectively reduced through deferral and/or elimination at death, then the Miller equilibrium is technically possible even in recent years.

[28] Green and Hollifield (2003) simulate an economy to investigate the degree to which capital gains deferral reduces the effective tax rate on equity income (and therefore, from the company's perspective, increases the personal tax penalty for debt relative to equity). Green and Hollifield find that the ability to defer taxation reduces the implicit tax on capital gains by about 60%. Overall, their evidence suggests that there is a measurable personal tax disadvantage to debt, but it does not appear large enough to offset the corporate tax benefits of debt. However, Green and Hollifield find that when coupled with fairly small costs of bankruptcy (e.g., realized bankruptcy costs equal to 3% of pretax firm value), the personal tax penalty is sufficient to offset the corporate tax advantage to debt at the margin and lead to interior optimal debt ratios.

Campello (2001) assumes that a given firm's debt *and* equity are held by a particular clientele of investors (with the clienteles based on investor tax rates). He investigates the capital structure response to the large reduction in personal taxes (relative to the smaller reduction in corporate tax rates) after the Tax Reform Act of 1986. Campello finds that zero-dividend firms (which presumably have high tax rate investors and therefore experienced the largest reduction in the personal tax penalty) increased debt ratios in response to tax reform, while high dividend payout firms (which presumably have low tax rate investors and therefore experienced a small reduction in the personal tax penalty) reduced debt usage relative to peer firms.

1.4.1 Market-based evidence on how personal taxes affect security returns. While consistent with personal taxes affecting corporate financing decisions in the manner suggested by Prediction 3, the articles cited above are not closely tied to market-based evidence about the tax characteristics of the marginal investor between debt and equity. Instead, these articles assume that dividend clienteles exist, and also make assumptions about the personal tax characteristics of these clienteles based on a firm's payout policy. For example, these articles implicitly assume that there is a certain marginal investor who owns both equity and debt *and* (to estimate τ_P) that this same investor sets prices between taxable and tax-free bonds. The truth is that we know very little about the identity or tax status of the marginal investors between any two sets of securities, and deducing this information is difficult.[29]

It would be helpful if future research could quantify the relative importance of personal taxes on security prices, with an eye toward feedback into capital structure decisions.[30] As an example of what I have in mind, consider the implications from Engel, Erickson, and Maydew (1999) and Irvine and Rosenfeld (2000) about the personal tax penalty.[31] Assume that corporations are the marginal investors in preferred stock but not in debt.[32] Given the similarity of the securities, in equilibrium we expect their

[29] Williams (2000) points out that when there are more than two assets, different pairs of assets can be arbitraged by different investors, so prices might reflect a mixture of tax characteristics. It is difficult to know which assets are directly benchmarked to each other by the marginal investors and which are "indirectly arbitraged," and it is even difficult to know whether capital gains or income tax rates are impounded into security returns.

[30] The investor tax rate implicit between municipals and taxable government bonds has been investigated extensively [see Poterba (1989), Green (1993), and Chalmers (1998)].

[31] Recall that these authors investigate MIPS for preferred exchanges. These two securities are similar in most respects, except that MIPS interest is tax deductible for issuing corporations and preferred dividends are not. On the investor side, corporate investors can take the 70% dividends-received deduction (DRD) for preferred dividends, but recipients of MIPS interest receive no parallel deduction.

[32] Erickson and Maydew (1998) provide evidence that corporations are the marginal investors in preferred stock. They study the market reaction to the December 1995 announced (but never implemented)

after-investor-tax returns to be equal, within transaction cost bounds: $r_{\text{preferred}}(1-\tau_{\text{DRD}}) = r_{\text{MIPS}}(1-\tau_{\text{P}})$. Plugging in $r_{\text{preferred}} = 8.14\%$ and $r_{\text{MIPS}} = 8.37\%$ from Engel, Erickson, and Maydew's (1999) Table 4, and assuming that the marginal corporate investor is taxed at 35% so that $\tau_{\text{DRD}} = 10.5\%$, we can back out the personal tax rate associated with interest income: $0.0814(1-0.105) = 0.0837(1-\tau_{\text{P}})$ implies that $\tau_{\text{P}} = 13\%$. Note that MIPS interest is analogous to debt interest, and that personal tax costs of this magnitude are close to the mean after-financing simulated corporate tax rate (i.e., the mean tax benefit of incremental debt) of approximately 18% for Compustat firms during 1993–1999. This suggests that it would only take small nontax costs or benefits of debt to produce an equilibrium with internal optimal debt ratios.

Overall, the tax status of the marginal investor and therefore the empirical magnitude of the personal tax penalty is an open empirical question. This is an important issue. For one thing, failing to control for personal tax considerations can result in an omitted variable bias. Moreover, business students are often taught that the tax advantage of debt is captured by $\tau_C D$ [see Equation (4)], which ignores personal tax effects. If it can be demonstrated that personal tax effects are not particularly important, this simplified view of the world might be justified. In contrast, if investor taxes affect security returns in important ways, more care needs to be taken in modeling these effects in corporate finance research. Investigations of personal tax effects face several challenges, not the least of which is that risk differences between securities must be properly controlled to allow one to deduce implicit tax rates from market return data.

1.5 Empirical evidence on whether low tax rate firms lease from high tax rate lessors

There are several complications associated with investigating whether firms lease in response to tax incentives. First, because leasing expense is tax deductible, leasing endogenously reduces a lessee's effective tax rate, which can bias an experiment in favor of detecting tax effects. Likewise, lessor tax rates could be endogenously increased from the effects of lease income. Second, financial statement definitions of leasing are not one-to-one with IRS definitions, making it difficult to use Compustat data to test Prediction 5. Using endogenously affected tax variables, Barclay and Smith (1995) and Sharpe and Nguyen (1995) find that low tax rate firms use relatively many capital leases. However, capital leases do not meet the IRS definition of true leases (instead they are likely a mixture

Treasury plan to reduce the DRD from 70% to 50%. They found that the typical preferred stock experienced a statistically significant −1% abnormal return. There was no reaction for common shares. This implies that corporations are the marginal price setters in preferred stocks but not in common stocks.

of true leases and conditional sales contracts, the latter of which are treated like debt so the lessee deducts interest and depreciation expense), and therefore the documented negative relation between capital leases and taxes is hard to interpret because it might be spurious.

Graham, Lemmon, and Schallheim (1998) address the first issue by measuring tax incentives "but-for financing decisions," that is, calculating tax rates using income before debt interest and the implicit interest portion of lease payments are deducted. They address the second issue by focusing on operating leases, which are defined in a manner similar to the IRS definition of true leases. Graham, Lemmon, and Schallheim (1998) find that the use of operating leases is negatively related to before-financing tax rates, consistent with Prediction 5, and that capital leases are unrelated to before-financing tax rates. Graham, Lemmon, and Schallheim also show that erroneously using an after-financing tax rate would double the magnitude of the negative tax coefficient for operating leases, and spuriously assign a negative tax coefficient to capital lease usage.

Eades and Marston (2001) find that lessors tend to be high tax rate firms (consistent with Prediction 5). We need research investigating whether the tax benefit of leasing adds to firm value. The jury is also still out on whether debt and leasing are substitutes for the lessee [as they might be in a DeAngelo and Masulis (1980) sense because both lead to tax deductions].

2. Taxes and Capital Structure: International Tax Issues

Section 1 reviews capital structure choice in the context of a domestic-only firm operating in a classical tax system (in which interest is tax deductible but equity payments are not). While much academic research focuses on this paradigm, international tax issues have become more important in recent years. This section reviews how international tax law can affect corporate financing decisions in a multinational firm. The general framework is still based on taxes affecting firm value via an expression like $\text{Value}_{\text{with debt}} = \text{Value}_{\text{no debt}} + \tau_C(\cdot) * D$. The research in this section demonstrates that multinational tax rules can affect the $\tau_C(\cdot)$ function and therefore the incentive to use both domestic and foreign debt. So as not to bog down in international tax law, this section only sketches the effects of multinational tax incentives. The reader is encouraged to consult Graham (2004) for a more complete review of multinational tax rules and references.

Four multinational tax considerations are examined in this section. First, consider an imputation or integrated tax system (like in the United Kingdom or France). In a full imputation tax system, dividend recipients receive a tax credit for income taxed at the corporate level, which they can use to offset their personal tax liability. In a partial imputation system,

stockholders only receive a partial credit for taxes paid at the corporate level. These imputation credits have an effect analogous to making equity (at least partially) tax deductible, which reduces the net tax advantage of debt. I am not aware of research that investigates the following prediction.

Prediction 6. *The tax incentive to issue debt decreases with the degree of dividend imputation dictated by the tax law under which a company operates.*

Second, the U.S. government taxes individuals and corporations on the basis of residence or place of incorporation, meaning that they are taxed because they are from the United States, regardless of where they earn income. The United States recognizes that income earned abroad is taxed by a foreign government at rate τ_{For}, so the United States offers foreign tax credits to offset taxes paid abroad.[33] Moreover, the United States only taxes active foreign source income at the time of repatriation to the U.S. parent. In simplest terms, if the foreign tax rate is smaller than the U.S. corporate income tax rate (τ_{US}), a firm receives credit for foreign taxes paid but still must remit to the U.S. government taxes equal to $(\tau_{\text{US}} - \tau_{\text{For}}) *$ (foreign source income). Such a firm is called *deficit credit* because it lacks sufficient foreign tax credits to avoid all U.S. taxes. In contrast, if $\tau_{\text{For}} > \tau_{\text{US}}$, the firm does not have to pay U.S. tax because it receives foreign tax credits proportional to τ_{For}. This firm is *excess credit* because it has more foreign tax credits (FTCs) than it is allowed to use in the current year and accumulates the excess tax credits to potentially shield income in another year. The tax benefit of debt, $\tau_{\text{C}}(\cdot)$, can be modeled as a decreasing function of accumulated FTCs because they can act as nondebt tax shields that are substituted for interest deductions.[34]

Prediction 7. *All else being equal, the incentive* $\tau_{\text{C}}(\cdot)$ *to finance with domestic debt decreases with accumulated foreign tax credits for deficit credit firms.*[35]

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[33] Think of the foreign tax rate (τ_{For}) as a weighted average of tax rates the firm pays in the various countries in which it earns foreign income, with the weights being the relative share of nonpassive foreign source income repatriated from each country.

[34] Consider a firm with \$1 in pretax foreign earnings that it will repatriate back to the United States to pay investors. Assume that the firm has \$0.15 in accumulated FTCs, $\tau_{\text{P}} = 0.40$, $\tau_{\text{E}} = 0.20$, $\tau_{\text{For}} = 0.20$, and the U.S. corporate tax rate is $\tau_{\text{US}} = 0.35$. Ignoring foreign considerations, $\tau_{\text{C}} = 0.35$ and Equation (1) equals 0.08, so it appears that the firm should finance with domestic debt. However, $\tau_{\text{C}} = 0.20$ once the effect of FTCs is considered (the firm pays \$0.20 in foreign tax and no U.S. tax because the FTCs offset any potential tax owed to the United States); therefore, Equation (1) equals -0.04 and the firm should finance with equity. This implication holds for deficit credit firms but not for excess credit firms (because an excess credit firm would not pay U.S. tax at repatriation, regardless of whether there are accumulated FTCs).

[35] This is a static prediction. Considering the dynamic carryback and carryforward features of the tax code, a dynamic prediction is that the tax incentive to finance with debt decreases with the probability of a firm being deficit credit and the probability of accumulating FTCs.

I am not aware of any research that investigates whether firms with *accumulated* foreign tax credits rely on relatively little domestic debt.

Third, $\tau_C(\cdot)$ also declines with the degree of interest allocation, which in turn dampens the incentive of multinational firms to finance with domestic debt. The United States limits allowable foreign tax credits by "allocating" abroad a portion of interest on domestic debt, meaning that this portion cannot be deducted from worldwide tax liability. (The United States does this to limit tax deductions on debt that might possibly be used to finance foreign operations and produce foreign profits.) To implement this policy, the United States allocates domestic interest to foreign operations based on the proportion of total assets that are in foreign subsidiaries. When a firm is excess credit (i.e., $\tau_{US} < \tau_{For}$) and taxable on both foreign and domestic operations, the interest allocation procedure reduces the tax benefit of domestic interest deductions by setting $\tau_C(.)$ equal to $\tau_{US}(\cdot) *$ [domestic assets/worldwide assets]. Thus, for excess credit firms, the incentive to finance with domestic debt decreases with the proportion of assets held abroad.[36] One implication of the interest allocation rules is that researchers cannot assume that financial statement (i.e., Compustat) "domestic interest expense" is fully deductible to U.S. multinationals.

Prediction 8. *Due to interest allocation, the tax benefit of domestic interest deductions declines with the probability that a firm will operate as excess credit and with the proportion of assets held in foreign subsidiaries.*

Froot and Hines (1995) find that debt usage is reduced for excess credit firms, with the reduction proportional to the fraction of assets that are foreign. Altshuler and Mintz (1995) also show that the use of foreign debt increases with the proportion of assets held overseas (presumably because domestic interest would be allocated abroad). Newberry (1998) and Newberry and Dhaliwal (2001) find that the likelihood of issuing domestic debt is highest when a firm is not excess credit and when less interest is allocated abroad.

Finally, there are incentives for a foreign subsidiary to use debt that, generally speaking, increase with the foreign tax rate τ_{For}. First, a firm might choose to provide funding to its foreign subsidiaries in the form of internal debt. The ensuing deduction allows the subsidiary to save τ_{For} in foreign taxes per dollar of interest; however, the domestic parent has to pay domestic tax on the interest income at the rate of τ_{US}. On net, the

[36] If a U.S. multinational is deficit credit (i.e., $\tau_{US} > \tau_{For}$) and taxable both in the United States and overseas, $\tau_C(\cdot) = \tau_{US}$ and the incentive to use domestic debt is not affected by interest allocation rules. The interest allocation rules limit the deductions a firm is allowed to use to offset repatriated foreign income. When a firm is deficit credit, it pays tax at the rate τ_{US} regardless of the amount of FTCs applied to foreign-source income, so reducing allowable FTCs via interest allocation does not affect the current-year tax liability.

incentive to issue internal debt to a foreign subsidiary increases in $\tau_{\mathrm{For}} - \tau_{\mathrm{US}}$. Second, a foreign subsidiary can directly issue external debt in the foreign market, which produces foreign tax savings of τ_{For} per dollar of interest. This incentive to save on foreign taxes might be tempered by investor-level taxes along the lines suggested in Miller (1977).

Prediction 9. *The tax incentive to fund a foreign subsidiary with internal debt increases with* $\tau_{For} - \tau_{US}$.

Prediction 10. *The tax incentive to issue external foreign debt increases with* τ_{For}, *although this incentive can be affected by the relative taxation of interest and equity income at the investor level.*

Examining a cross section of countries with differing foreign tax rates, Desai (1997) indicates that the net internal debt infusion into foreign subsidiaries increases with τ_{For} (Prediction 9). Newberry and Dhaliwahl (2001) find that the propensity to issue bonds in foreign markets increases in τ_{For} (Prediction 10).

Other than Altshuler and Mintz (1995), most articles use very general specifications to test for foreign tax effects or the influence of interest allocation. For example, when they are considered at all, separate terms indicating excess credit status, τ_{For}, or the ratio of foreign to worldwide assets are used rather than interacting the variables in the manner suggested by the theory. Also, the sharper predictions are often ignored. Finally, I am not aware of any multinational tax research that directly links the tax benefits of debt to firm value. To the extent that data are available, variation across countries in tax rules and incentives provides a rich and under researched environment within which to investigate how variation in tax rules affect $\tau_{\mathrm{C}}(\cdot)$ and therefore the financing decisions of multinational firms.

3. Taxes, Leveraged Buy-Outs (LBO), Corporate Restructuring, and Organizational Form

3.1 Theory and predictions

Under perfect capital markets, an MM analysis implies a null hypothesis that organizational form and restructurings are irrelevant to firm value. However, imperfections in the tax, legal, and information environments can create situations in which the form of the organization or restructuring can matter.

First, there is a tax incentive for corporations to use substantial leverage in the management buyout process. This flows directly from the predictions in Section 1 that high tax rate firms have incentive to use debt and that the associated tax benefits add to firm value. LBOs are particularly

interesting because they lead to a much larger increase in leverage than do most debt issuances. LBOs also can provide an opportunity to mark assets to market, thereby increasing depreciation and the associated tax savings.

Prediction 11. *All else being equal, the tax incentive to perform a highly levered buyout increases with the firm's expected postdeal tax rate,* $\tau_C(\cdot)$.

Second, tax incentives can affect distressed reorganizations. Distressed firms with substantial accumulated net operating losses (NOLs) have an incentive to file Chapter 11 because it facilitates reducing debt ratios [Gilson (1997)]. Chapter 11 allows the firm that emerges from bankruptcy to have unlimited use of the pre filing NOLs to shield future income, as long as there is no change in ownership (i.e., a large change in who owns the firm's equity in the ensuing two years). Reducing the debt ratio during reorganization preserves debt capacity and decreases the likelihood of precipitating an ownership change by future equity issuances.

Prediction 12. *The tax incentive for a firm to file Chapter 11 (versus a work out) to better facilitate reducing its debt ratio in reorganization increases with the firm's accumulated NOL carryforwards and its expected postdeal tax rate.*

Taxes affect organizational form in general, not just reorganizations. When an entity operates as a common "C corporation," revenues returned to investors as equity are taxed at both the firm (at τ_C) and investor (at τ_E) levels. In contrast, partnership and S corporation income is passed through and taxed only at the investor level, at ordinary income tax rates (τ_P). The tax burden is often disadvantageous to corporate form.[37] There are, however, governance and legal benefits to corporate form (such as limited liability) that offset the tax costs, and are traded off with the costs to yield an optimal choice of corporate form.[38]

Prediction 13. *All else being equal, the tax incentive to operate as a C corporation (versus a partnership or S corporation) increases in* $[(1-\tau_P)-(1-\tau_C)(1-\tau_E)]$.

Finally, tax incentives can also affect the valuation, purchase, and sale of assets. Alford and Berger (1998) argue that spinoffs are preferred by high tax rate firms when they shed assets that lead to taxable gains because spin-offs can be structured to avoid taxes to both the seller and buyer.

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[37] At maximum statutory federal tax rates in 2000 (Figure 1), an investor would receive \$0.604 in partnership income; in contrast, corporate equity payments would return only approximately \$0.52 after double taxation (assuming that equity is taxed at a 20% capital gains tax rate).

[38] Gordon and MacKie-Mason (1994) argue that these nontax benefits are large, annually equaling about 4% of equity value. See Gordon and MacKie-Mason (1997) and Scholes et al. (2002) for details about nontax costs and benefits of corporate form. See Shelley, Omer, and Atwood (1998) for discussion of the costs and benefits of partnership form.

In contrast, all else being equal, sales are preferred when the transaction results in a loss because this loss can be deducted against corporate income. Moreover, when a firm sells an asset, the deal can be structured to benefit the seller or purchaser, possibly by financing the deal with debt [Erickson (1998)].

Prediction 14. *There is a tax incentive for high tax firms to shed assets in spin-offs when the deal is profitable and via sales when the deal is not profitable. When a firm acquires assets, high tax firms have incentive to use "taxable deals" financed with debt.*

3.2 Empirical evidence

Kaplan (1989) and others investigate tax benefits in LBOs. LBOs provide large interest tax deductions and also can provide an opportunity for asset value to be stepped up to market value. Note that the tax benefit of $1 of interest does not necessarily equal the top statutory tax rate. The net benefit is less than the top rate if all of the LBO interest expense cannot be deducted in the current year, if there is a personal tax penalty on interest income, or if there are nontax costs to debt. If he assumes that the net tax benefit of $1 of interest is $0.15 and that LBO debt is retired in eight years, Kaplan estimates that the tax benefit of interest deductions equals 21% of the premium paid to LBO target shareholders. Kaplan also estimates that among firms electing to step up asset value, the incremental depreciation tax benefit equals 28% of the premium. I am not aware of any research that explicitly investigates whether the probability of choosing a highly levered form of reorganization increases with the expected postdeal MTR (Prediction 11).

Gilson (1997) shows that firms in Chapter 11 reduce their debt ratios more when prefiling NOLs are large (Prediction 12). He concludes that firms file Chapter 11 (versus a workout) in part because of tax incentives: Chapter 11 status offers smaller transaction costs to reducing the debt ratio, thereby minimizing the chance of an ownership change that would result in the loss of prefiling NOLs.

The Tax Reform Act of 1986 (TRA86) set corporate tax rates above personal income tax rates, and also equalized capital gains and ordinary tax rates, providing a natural environment to test Prediction 13. These tax rate changes made partnerships attractive by greatly increasing the tax disadvantage to operating as a corporation. Scholes et al. (2002) point out that there was a huge increase in formation of S corporations (which are taxed as partnerships) following TRA86. Gordon and MacKie-Mason (1997) show that the increased corporate tax disadvantage resulted in a reduction in the portion of aggregate profits paid via (and assets held in) corporate form; however, the economic importance of this reduction was modest. Additional research investigating organizational form choices

using firm- and owner-specific tax information would be helpful, though this would likely require accessing confidential tax returns.

Alford and Berger (1998) show that firms trade off tax and nontax considerations when choosing between spin-offs and asset sales (Prediction 14). The authors estimate tax benefits as a means of determining the size and nature of nontax costs and argue that adverse selection, moral hazard, and agency costs are all traded off against tax benefits to influence how firms structure their deals. Erickson (1998) also demonstrates that the structure of deals is affected by tax concerns. He shows that the probability that a sale is structured as a "taxable deal," financed with tax-deductible debt, increases with the acquirer's tax rate; however, he finds no evidence that seller tax characteristics affect deal structure. Erickson and Wang (2000) find that the price of subsidiary sales can be affected by tax considerations. These authors show that premiums (and seller abnormal stock returns) increase when the sale is structured to allow a step up in subsidiary basis, so that the acquiring firm receives additional depreciation tax benefits. Thus, contrary to an MM prefect markets null hypothesis, tax considerations affect both the pricing and structure of asset sales.

4. Taxes and Payout Policy

Miller and Modigliani (1961) provide the theoretical foundation of payout policy and conclude that dividend policy is irrelevant in a frictionless world with perfect capital markets. Research since that time has explored how market imperfections create an environment in which payout policy affects firm value. This section highlights tax incentives related to corporate payout policy. For brevity, I narrow the discussion to payout issues that parallel those in Section 1 or that shed light on unresolved capital structure issues (e.g., whether personal taxes affect security prices). See Allen and Michaely (1995, 2001) and Poterba (2001) for broad reviews of the various tax and nontax imperfections that can lead to payout policy affecting firm value and corporate decisions.

4.1 Theory and empirical predictions

Miller and Modigliani (1961) argue that in a perfect economic environment, firm value is determined by operating cash flows, not by whether a company retains or pays out profits, nor by the form of payout. This line of reasoning produces the null hypotheses for this section.

Null hypotheses. *(i) Firm value is not affected by payout policy.*
(ii) Taxes do not affect corporate payout decisions.

Allen and Michaely (2001) show that the null can also hold if different classes of investors are taxed differently and firms have differing payout policies, as long as the marginal price setter is tax free.

Alternatively, firms can have a tax incentive to return equity capital via share repurchases rather than dividends if dividends are taxed more heavily than are capital gains for the marginal investors. Statements by financial executives that repurchases are a "tax efficient means of returning capital to investors" support this point of view [though Brav et al. (2003) conclude that taxes only play a second-order role in payout decisions].

If dividends are taxed more heavily than repurchases, there can be a negative valuation of dividends (relative to repurchased shares) [e.g., the capital asset pricing model (CAPM) with corporate and investor taxation in Brennan (1970) or Auerbach and King (1983)]. All else being equal, if a firm were to increase dividends, the pretax return on its stock would need to increase so that after-tax returns do not change. This effect increases as dividend taxation increases relative to capital gains taxation.

Prediction 15. *All else being equal, tax effects imply that firm value is negatively related to* (1) *the portion of payout dedicated to dividends, and* (2) *dividend taxation relative to capital gains taxation. Analogously, required pretax stock returns increase with dividend payout and relative dividend taxation.*

There are nontax factors that also can lead to negative [e.g., reduced funds to pursue positive net present value (NPV) projects] or positive [e.g., signaling or agency alleviation] dividend valuation [see Allen and Michaely (2001)].

Note that dividend clienteles, in which high tax rate investors own stocks with low dividend payouts, can occur under the null or Prediction 15. Under the null, firms can have different payout policies that do not affect value, even if some investors are taxed more heavily on dividends (capital gains) and have a tax preference for capital gain (dividend) income. Similar clienteles can form under Prediction 15, based on the relative taxation of dividends and capital gains for different groups of investors.

To the extent that transactions are not costless, clientele tax characteristics can affect security prices. For example, the price of a stock changes from P_{cum} to P_{ex} as the stock goes ex-dividend. If the firm issues a dividend Div, its investors receive $Div(1-\tau_{\text{div}})$ but simultaneously avoid capital gains taxes of the amount $(P_{\text{cum}}-P_{\text{ex}})\tau_{\text{cap gain}}$. With risk neutrality, continuous prices, and no transaction costs, and clienteles that do not vary before and after ex-days, Elton and Gruber (1970) show that $(P_{\text{cum}}-P_{\text{ex}})(1-\tau_{\text{cap gain}}) = Div(1-\tau_{\text{div}})$ in equilibrium, and therefore

$$\frac{P_{\text{cum}}-P_{\text{ex}}}{Div} = \frac{(1-\tau_{\text{div}})}{(1-\tau_{\text{cap gain}})},$$

where $(P_{\text{cum}}-P_{\text{ex}})/Div$ is referred to as the ex-day premium.

Prediction 16. *The ex-day premium reflects the relative taxation of dividends and capital gains for a given stock's clientele of investors.*

Allen and Michaely (2001) call dividend clienteles "static" if they do not vary through time. Alternatively, if there are advantages to trade among differentially taxed investors, dividend clienteles might be dynamic, which can lead to changes in the composition of the clientele around certain dates. Dynamic clienteles might lead to abnormally high volume around ex-days. For example, low dividend tax investors might buy stocks just before ex-day, capture the dividend, then sell the stock after it goes ex-dividend. This might lead to ex-day behavior that produces trading volume but where the ex-day premium is close to one. Thus Prediction 16 is a joint prediction about clienteles being static as well as tax effects.

Payout effects should vary with the tax rules of the country under consideration. For example, assuming static clienteles, the ex-day premium should increase with the degree of dividend imputation in a given country (because a tax refund for corporate taxes paid is attached to dividends in imputation countries, which reduces the effect of dividend taxation). The premium can be greater than one if imputation makes dividends tax favored relative to capital gains [Bell and Jenkinson (2002)].

4.2 Empirical evidence on whether firm value is negatively affected by dividend payments

Black and Scholes (1974) test Prediction 15 by adding dividend yield as a right-hand-side variable in the market model. They conclude that firm value is not related to dividends. In contrast, Litzenberger and Ramaswamy (1979) find a significant, positive dividend yield coefficient. Kalay and Michaely (2000) emphasize that the positive dividend effect should show up in cross-sectional (because of cross-firm variation in dividend payout) long-run returns (i.e., returns for stocks held long enough to qualify for capital gains treatment). They point out that Litzenberger and Ramaswamy (1979) use monthly returns, and allow high dividend yield firms to be considered zero dividend in nondividend months. Kalay and Michaely (2000) do not find cross-sectional or long-run return evidence that high-dividend stocks earn a tax premium. Kalay and Michaely's findings imply that the effect identified by Litzenberger and Ramaswamy occurs for short-run returns, perhaps only during the ex-dividend week.

Fama and French (1998) test Prediction 15 by regressing (changes in) firm value on (changes in) dividends and "firm value if no dividends."[39]

[39] As discussed in Section 1.2.2, Fama and French regress the excess of market value over book assets on dividends, interest, and a collection of variables that proxy for V_U, with all variables deflated by assets. The variables that proxy for V_U include current earnings, assets, R&D spending, and interest, as well as future changes in earnings, assets, R&D, interest, and firm value. V_U is probably measured with error, which clouds interpretation of Fama and French's results.

If personal taxes reduce the value of dividends, and one could design a clean statistical experiment that isolates tax effects, there should be a negative coefficient on the dividend variable in this specification. In contrast, Fama and French find a positive coefficient, which probably occurs because either their proxy for "firm value if no dividends" is measured with error and/or nontax effects overwhelm the tax influence of dividends. For example, if firms use dividends to signal quality, dividend payments might be positively correlated with firm value. Or, if dividends are priced by tax-free investors, one would not expect a negative influence of dividends on firm value. Fama and French conduct the only study of which I am aware that directly regresses firm value on dividend variables in an attempt to determine the tax effect of dividends.[40]

4.3 Evidence on whether ex-day stock returns and payout policy are affected by investor taxes

4.3.1 Dividend clienteles. Prediction 16 is based on the existence of static dividend clienteles, so I start by reviewing dividend clientele research. Blume, Crocket, and Friend (1974), Pettit (1977), and Chaplinsky and Seyhun (1987) provide weak evidence that investors hold stocks such that dividend yield is inversely related to personal tax rates; Lewellen et al. (1978) find no such evidence. However, these studies have poor measures for tax, risk, and wealth effects and therefore are hard to interpret. Auerbach (1983) concludes that tax-related preferences result in clienteles of investors that purchase stocks based on firm-specific dividend-price ratios. In perhaps the cleanest evidence on the subject, Sholz (1992) uses self-reported data from the 1983 Survey of Consumer Finances. This survey has information on retail investor stock holdings, a sophisticated measure of the investor's relative dividend and capital gains tax rates, household wealth, and self-declared risk preferences. Sholz finds a negative relation between the dividend yield for an investor's stock holdings and the relative taxation of dividends, which is consistent with a general preference for dividends by low-tax investors. In contrast, however, Allen and Michaely (2001) show that rich investors receive the bulk of dividend income (though perhaps not proportionally so, relative to wealth).

Strickland (1996) finds that mutual funds and money managers hold low dividend yield portfolios, while untaxed institutions such as pension funds show no preference. Dhaliwal, Erickson, and Trezevant (1999) find that the percentage of shares owned by institutional investors increases by

[40] Another approach to study whether personal taxes affect asset prices investigates tax capitalization. Some articles argue that personal taxes are capitalized into share prices due to the eventual taxation of retained earnings. This in turn can affect the relative tax advantage to debt because these articles argue that retained earnings are the marginal source of equity funding. See Harris and Kemsley (1999), Lang and Shackelford (2000), and Auerbach (2002) for more on this "new" or "trapped equity" view.

about 600 basis points in the year after a firm initiates paying a dividend.[41] Overall, there is weak evidence that the preference for dividends decreases with income tax rates — but no direct evidence that this preference leads to static tax-based clienteles.

Several articles link corporate actions to the (assumed) tax characteristics of their investors. Pérez-González (2000) classifies firms by whether their largest shareholder is an individual or an institution and finds that the former pay 30% fewer dividends than the latter. He also finds that when tax reform increases (decreases) the taxation of dividends relative to capital gains, firms with large retail shareholders decrease (increase) dividend payout. Poterba and Summers (1985) find a similar result for aggregate dividend behavior in the United Kingdom from 1950 to 1983. Lie and Lie (1999) also conclude that investor-level taxes affect payout policy. They find that firms with low dividend payout (and presumably high tax rate investors) use self-tender-offer share repurchases more often than they use special dividends, and these firms also use open-market repurchases more often than they increase regular dividends.

Allen and Michaely (1995) point out that the trading volume around ex-days provides evidence about whether clienteles are static (which would imply that trading only occurs between investors in the same tax bracket, who always hold stocks with the same dividend characteristics) or dynamic (in which case there might be advantages to trade among differentially taxed investors, potentially involving dividend capture or arbitrage by low-dividend-tax investors). In the static case, there should be no abnormal volume because there are no abnormal advantages to trade around the ex-day. Grundy (1985), Lakonishok and Vermaelen (1986), and Michaely and Vila (1996) find evidence of abnormal trading volume on the ex-day, which is consistent with dynamic tax-related trading on the ex-day.[42]

4.3.2 Ex-day premia and returns. Elton and Gruber (1970) find that the ex-day premium was 0.78 on average in the 1960s, which they interpret to imply that dividends are priced at a 22% disadvantage relative to capital gains (Prediction 16). Moreover, the premium ranged from 0.70 (for the lowest dividend yield decile of stocks) to 1.18 (for the highest decile), which is consistent with the highest (lowest) tax rate investors purchasing

[41] See Del Guercio (1996) and Brav and Heaton (1997) for evidence that institutional investors favor high-dividend stocks for nontax reasons like prudent-man regulations.

[42] Koski and Michaely (2000) find that abnormal volume can be quite large on ex-days due to nontax activity. In their case, Japanese insurance companies captured dividends for regulatory reasons, using nonstandard settlement procedures that allowed them to buy just before and sell just after the ex-day. Note, however, that this form of nonstandard settlement ended in 1989, so it cannot explain abnormal ex-day volume in recent years.

the lowest (highest) dividend yield stocks. The Elton and Gruber evidence is consistent with personal taxes affecting stock prices via dividend payout and dividend clienteles. Their findings are strengthened by Barclay's (1987) evidence that the premium was 1.0 in the early 1900s, before the advent of personal income taxes.

There are several complications to interpreting the ex-day phenomenon. Kalay (1982) points out that absent transaction costs and risk, arbitrage by tax-free investors should push the premium to 1.0. Kalay argues that transaction costs are too large for individual investors to be the marginal price setters, but instead zero-tax-rate institutions might fulfill that role at ex-day. Kalay's findings suggest that inferring tax rates from ex-day returns is complicated by transaction costs and the effect of institutional traders. Consistent with this view, Michaely (1991) finds that the mean premium equaled approximately 1.0 in both 1986 (when capital gains tax rates were much lower than dividend tax rates for wealthy individuals) and in 1987–1988 (when statutory dividend and capital gains tax rates were nearly equal), and was relatively invariant across dividend yield deciles during these years. Michaely's evidence is not consistent with retail investor taxation affecting stock prices, suggesting that prices might have been set by institutional investors in the mid-1980s.[43]

Bali and Hite (1998) argue that discrete stock prices lead to patterns consistent with those observed by Elton and Gruber (1970). Suppose a \$0.20 dividend is paid and, during the era when stock prices were divisible by one-eighth, the stock price drops by the largest increment less than the dividend: \$0.125. This implies an ex-day premium of 0.625, which occurs in the absence of personal tax effects. Moreover, this effect is strongest for low dividend stocks. Bali and Hite's (1998) argument might explain some of the observed ex-day phenomenon, however, it does not explain abnormal volume on the ex day, which Michaely and Vila (1996) argue is evidence of tax-motivated trading.

Frank and Jagannathan (1998) argue that dividends are a nuisance, and that market makers are well situated to handle their collection and reinvestment. Therefore investors unload the stock cum-dividend to market makers, who are compensated for handling the dividend by the dividend itself. This is especially true for low-dividend stocks, for which the nuisance remains relatively the same but for which the reward for handling the dividend is smallest. The implication is that prices should fall by less than the dividend in part because transactions are at the bid when the

[43] This discussion ignores the effect of risk [see Michaely and Vila (1995)] and transaction costs [see Boyd and Jagannathan (1994), Michaely and Vila (1996), and Michaely, Vila, and Wang (1996)] on ex-day behavior. For example, Boyd and Jagannathan (1994) regress capital return on dividend yield and find a slope coefficient of one and a negative intercept. They interpret the negative intercept as a measure of transaction costs.

market maker buys the stock on the cum date and are at the ask when the market maker sells the stock ex-dividend, and in part due to reduced demand on the cum date. They find evidence consistent with their arguments on the Hong Kong exchange, where the average premium was approximately one-half during 1980–1993, even though dividends and capital gains are not taxed at the personal level. Kadapakkam (2000) strengthens this argument by showing that when the nuisance of handling dividends (i.e., cumbersome physical settlement procedures) was greatly reduced with the onset of electronic settlement, the premium in Hong Kong became indistinguishable from 1.0.

Graham, Michaely, and Roberts (2003) cast doubt on price discreteness (Bali and Hite) or bid-ask bounce (Frank and Jagannathan) explaining ex-day pricing in the United States. These authors note that price discreteness and bid-ask bounce were greatly reduced as pricing increments changed from eights to sixteenths (in 1997) to decimals (in 2001) on the NYSE. According to the price discreteness and bid-ask bounce hypotheses, the ex-day premium should have moved closer to one as the pricing grid became finer. In contrast, the ex-day premium got smaller (further from one), which is inconsistent with the price discreteness and bid-ask bounce hypotheses. Graham, Michaely, and Roberts do find evidence consistent with the original Elton and Gruber tax hypothesis, however. They find that the ex-day premium fell in conjunction with the 1997 reduction in capital gains tax rates.

Overall, it is not possible to unambiguously interpret the ex-dividend day evidence in terms of personal taxes. Green and Rydqvist (1999), however, provide convincing evidence of personal taxes being impounded into asset prices. Swedish lottery bonds are taxed like common stock with tax-free dividends (i.e., the coupon is tax-free and capital gains are taxed). Therefore one would expect prices to be bid up cum coupon (as high tax rate investors purchase the bonds) and drop after the coupon is paid (with the drop leading to a capital loss deduction, which reduces taxes in proportion to the capital gains rate). Because the coupon is tax-free, the ratio of price drop to coupon should be greater than 1.0, reflecting the personal tax advantage of the coupon. Moreover, regulations prohibit coupon capture or arbitrage of the type that might be expected to force the ratio to 1.0, and unlike the case of stock dividends, frictions and price discreteness work in the opposite direction of the proposed tax effect. Green and Rydqvist (1999) find that the ratio of price drop to coupon averages 1.30 for Swedish lottery bonds, implying that the relative tax advantage of coupons relative to capital gains is impounded into bond prices. They also find that this implicit tax rate declined as tax reform reduced the top statutory personal tax rate during the 1980s and 1990s. Florentsen and Rydqvist (2001) find that the ratio averages about 1.46 for similar lottery bonds in Denmark.

McDonald (2001) investigates ex-day behavior in Germany, where the dividend imputation tax system attached to most dividends a tax credit for corporate taxes (until this feature was repealed in late 2000). This tax credit means that dividends are more valuable to German investors than are capital gains, all else being equal. McDonald shows that tax considerations imply that the ex-day premium should be 1.43. In his empirical work, McDonald finds that the average premium is 1.26, indicating that about 60% of the dividend tax credit is impounded into the ex-day price. He also finds that 55% (35%) of the tax credit is reflected in futures (options) prices. Finally, McDonald demonstrates that there is abnormal volume for the six days leading up to and including the ex-day, and that abnormal volume increases in the dividend yield. This is consistent with foreigners, who do not enjoy the German tax credit, selling the stock just before ex-day.

Bell and Jenkinson (2002) investigate the effects of a July 1997 tax reform in the United Kingdom. Prior to 1997, the imputation tax credit attached to dividends was such that tax-free investors received a full tax refund, even though they did not pay taxes on the dividend. In other words, a $1 dividend was worth more than $1 to tax-free investors. The tax reform eliminated imputation credits for tax-free investors, implying that a $1 dividend is now worth only $1 to these investors. Bell and Jenkinson show that tax-free institutions like pension funds own the majority of U.K. equities and argue that they therefore are the marginal price setters. Bell and Jenkinson find that dividend valuation decreased after the tax reform effectively reduced the imputation tax benefit of dividends. It would be helpful if there were more research like this that exploits the rich variation in tax codes around the world.

Overall, some ex-day articles provide clear evidence that personal taxes affect asset prices. This conclusion is not unambiguous across all articles, however, because of potential nontax explanations for abnormal ex-day returns. If these alternative hypotheses completely explain ex-day returns, then in these circumstances personal taxes are not impounded into stock prices. However, even if tax rates do not appear to affect stock returns directly, tax considerations might still affect financial markets if they increase trading volume.

The payout results have implications for capital structure research. If the marginal investor in equities is tax-free but the debt price setter is not, then the personal tax penalty to using debt might be quite large. If the marginal investor in equities *and* debt is tax-free, there is no personal tax penalty associated with debt financing. Finally, if the marginal price setter for equities is taxable and his tax rate is impounded into stock returns, this reduces the personal tax penalty on debt relative to the Miller (1977) scenario. Understanding the tax characteristics of the marginal price setter(s) in various securities is an important issue for future research.

5. Taxes and Compensation Policy

5.1 Theory and empirical predictions

An MM perfect capital markets analysis would lead to a null hypothesis that compensation policy does not affect firm value absent market imperfections. There has been a great deal of research investigating how agency costs and informational asymmetry can drive a wedge between employee objectives and shareholder wealth, as well as how compensation policy can improve the situation.[44] Another strand of the literature investigates how the tax code can affect the choice of when and how to pay employees. Analogous to Miller's (1977) arguments about capital structure, Scholes et al. (2002) argue that to understand compensation policy, one must consider the tax implications for both the employer and employee. Scholes et al. show how different tax rates for the firm and its employees, or changing tax rates for either party, produce trade-offs between salary and bonuses, deferred compensation, compensatory loans, pension contributions, fringe benefits, and stock option compensation. This section reviews compensation research most closely linked to taxes and corporate finance: the choice of salary versus equity compensation, the choice between incentive stock options (ISOs) and nonqualified stock options (NQOs), and, linking back to Section 1 of this article, the trade-off between compensation deductions and debt tax shields.

The first tax issue is straightforward. Salary payments lead to an immediate deduction that reduces tax liabilities, while employee stock options lead to a corporate deduction only when the options are eventually exercised (if then — see below). Ignoring incentives and other nontax issues, the first compensation prediction is

Prediction 17. *All else being equal, the tax preference of paying salary compensation instead of option compensation increases with the corporation's tax rate because salary expense is deducted immediately and option expense is delayed.*

The second tax issue involves the choice between paying employees with ISOs versus NQOs. ISOs and NQOs are similar in most respects other than tax treatment, allowing researchers to isolate how tax imperfections affect corporate compensation decisions.[45] With ISOs, the firm never gets a tax deduction, and the employee pays capital gains tax on the amount

[44] See Murphy (1999) for a broad review of compensation research including pay-performance sensitivity and linking salary, bonuses, and stock compensation to firm performance. See Core, Guay, and Larcker (2002) for a review that focuses on using equity compensation to align executive and shareholder incentives.

[45] Stock appreciation rights are similar except the net benefit is paid in cash, not shares of stock. With stock appreciation rights, the employee pays tax at ordinary personal tax rates on the cash benefit when it is paid, and the firm contemporaneously deducts the cash benefit.

the share price exceeds the grant price when the stock is eventually sold (assuming that the option is exercised at least 12 months after grant and the share of stock is sold at least 12 months after exercise). With NQOs, on the exercise date the firm gets a deduction equal to the amount by which the price upon exercise exceeds the grant price, and the employee pays ordinary income taxes on this same amount. The tax trade-off between ISOs and NQOs amounts to comparing the relatively light burden of the employee paying capital gains taxes for ISOs to the net NQO benefit (i.e., the corporate deduction less the cost to the employee of paying taxes sooner and at a higher rate with NQOs).

Prediction 18. *All else being equal, when the corporation is taxed at a higher rate than the employee on ordinary income, nonqualified options are preferred to incentive stock options because they lead to lower "all parties" taxation of option compensation. ISOs are generally preferred if the corporation has a low tax rate relative to the employees.*

The final tax issue reviewed in this section investigates whether deductions from employee stock options serve as nondebt tax shields that substitute for the use of interest tax deductions by corporations. DeAngelo and Masulis (1980) argue that firms with substantial nondebt tax shields will use less debt. Among articles investigating this hypothesis, most find weak or no evidence that the traditional measure of nondebt tax shields (depreciation) crowds out debt tax shields (see Section 1). Section 5.2 reviews recent research that examines whether option deductions might serve the role of nondebt tax shields as laid out in DeAngelo and Masulis. I do not formally state this as a prediction because it is already stated in Prediction 2′.

5.2 Empirical evidence

Several articles investigate whether corporate and employee tax status affect compensation choice and draw mixed conclusions. Hall and Liebman (2000) assume that all firms pay the top statutory tax rate and find some evidence that the use of executive options increased as the corporate tax rate declined from the 1970s to the 1980s. This is consistent with Prediction 17 (the tax benefit of options increases as corporate tax rates fall because the forgone opportunity to deduct salary expense immediately is less important). However, when they allow for cross-sectional differences in tax rates and annual fixed effects, the Hall and Liebman tax coefficient becomes insignificant.

In contrast, Core and Guay (2001) examine stock option plans for employees other than the top five executives. Nonexecutives hold two-thirds of outstanding compensation options. Core and Guay find that high tax rate firms grant fewer options, consistent with Prediction 17; however, they do not find evidence that low tax rate firms grant more

options. Finally, Klassen and Mawani (2000) find that among Canadian corporations option use decreases with the corporate marginal tax rate, as in Prediction 17 (note that option compensation is not deductible for Canadian corporations, which only strengthens the incentive to deduct salary expense immediately). Overall, then, the evidence is weakly consistent with Prediction 17.

Several articles investigate whether corporate and employee tax status affect the choice between incentive and nonqualified options. Austin, Gaver, and Gaver (1998) assume that executives are taxed at the highest statutory rate and investigate whether high tax rate firms use NQOs. They use five different variables to measure the corporate tax rate and find that none of them are statistically related to the form of option plan. This conclusion is generally consistent with the finding by Madeo and Omer (1994) that low rather than high tax rate firms switched from ISOs to NQOs following the 1969 tax act, opposite the tax prediction. I am not aware of research that provides evidence unambiguously consistent with Prediction 18.

Overall, there is only modest evidence that taxes are a driving factor affecting corporate or employee compensation decisions. This is perhaps surprising because popular press articles indicate that the size of the corporate deduction provided by NQOs is huge, completely eliminating corporate taxes for many large, profitable firms in the late 1990s (e.g., *New York Times*, June 13, 2000).

To investigate this issue, I gather financial statement footnote information on option compensation for all options exercised from 1996 to 1998 by employees of Fortune 500 firms (see Table 1). Assuming that all options are nonqualified implies that the corporate options deduction equals the difference between the exercise and grant prices of the exercised options. The average (median) Fortune 500 firm had \$85 (\$16) million of annual deductions resulting from employees exercising stock options during 1996–1998 (panel A of Table 1). As a percentage of financial statement tax expense, the deductions average 50%. Panel B shows the numbers for some specific firms. In the years shown in the table, option deductions are larger than interest deductions for Dell Computer, Intel, Dollar General Corporation, General Motors, and Circuit City. Moreover, option deductions are larger than tax expense for Intel, GM, and Circuit City.[46]

Option deductions are a form of nondebt tax shield that might substitute for interest deductions (Section 1.1). Two recent articles investigate whether option deductions displace the use of debt along the lines of suggested in DeAngelo and Masulis (1980). Graham, Lang, and

[46] One shortcoming of this analysis is that I measure the tax benefit of *realized* compensation deductions, which are not necessarily the same as the deductions that managers expect ex ante, when they make their plans. Nor do I distinguish between ISOs and NQOs, although Hall and Liebman (2000) note that NQOs account for 95% of option grants.

Table 1
Corporate tax deductions resulting from option compensation for Fortune 500 firms, 1996–1998

Panel A: Fortune 500 (1996–1998)	Annual option deduction ($ million)	Deduction/ interest expense	Deduction/ tax expense
Mean	85.2	9.371	0.495
25th percentile	3.8	0.030	0.029
Median	16.1	0.153	0.097
75th percentile	58.1	0.585	0.283
90th percentile	184.7	1.800	0.632
95th percentile	378.6	4.088	1.136

Panel B: Specific firms	Option deduction ($million)	Interest expense ($million)	Tax expense ($million)	Deduction/ interest expense	Deduction/ tax expense
Dell Computer (1997)	468.6	3.0	424.0	156.19	1.11
Intel Corp. (1998)	1185.7	40.0	3069.0	29.64	0.39
Dollar General (1997)	57.8	3.7	87.2	15.36	0.66
GM (1998)	157.1	72.8	−44.7	2.16	−3.51
Circuit City (1998)	27.2	9.1	−15.0	3.00	−1.81

Option deduction is the dollar amount of option compensation expense that a firm can deduct from its taxable income in a given year, which is calculated as the number of options exercised in a given year times the difference between the weighted average exercise price and the weighted average grant price. This calculation treats all exercised options as if they are nonqualified options. Deduction/interest is the option compensation deduction divided by interest expense, where *interest expense* is from financial statements. Deduction/tax expense is the compensation deduction divided by tax expense, where *tax expense* is from financial statements.

Shackelford (2003) find that the magnitude of option deductions is large enough to reduce the median MTR for Nasdaq 100 and S&P 100 firms from 34% (when option deductions are ignored) to 26% (when option deductions are considered) in 2000.[47] Documenting a reduction in MTRs is important because, as argued in Section 1.3.1, nondebt tax shields should reduce the use of debt to the extent that the NDTS alter the marginal tax rate. Graham, Lang, and Shackelford find that debt ratios are positively related to tax rates and negatively related to the amount by which option deductions reduce marginal tax rates (consistent with Prediction 2′). Similarly, Kahle and Shastri (2002) find that long- and short-term debt ratios are negatively related to the size of tax benefits from option exercise. Finally, Graham, Lang, and Shackelford show that firms that appear to use debt conservatively when option deductions are ignored appear significantly less underlevered when options are considered. Overall, the evidence is consistent with managers substituting away from debt when their firm has substantial option deductions. It would be interesting for future research to investigate whether other nondebt tax shields play this role (e.g., R&D tax credits or foreign tax credits), especially in eras during which option deductions were less prevalent.

6. Taxes, Corporate Risk Management, and Earnings Management

If capital markets were perfect, there would be no benefit to corporate hedging because investors would be able to achieve the same outcome by hedging on personal account. The null hypothesis is therefore that corporate hedging does not increase firm value. And yet the corporate use of derivatives (presumably) to hedge has increased enormously in the past decade. For example, over-the-counter (OTC) swaps increased from $11 trillion in 1994 to $69 trillion by 2001 (http://www.isda.org/index.html). A great deal of corporate finance research investigates which market imperfections create situations that can make corporate hedging advantageous.

Theory suggests that hedging to reduce volatility can reduce expected costs of bankruptcy [Smith and Stulz (1985)], reduce underinvestment costs by shifting funds into states where they would otherwise be scarce [Froot, Scharfstein, and Stein (1993)], help offset conservative decision-making that results from employee risk-aversion [Tufano (1996)], and reduce the effects of information asymmetry between managers, investors, and the labor market [DeMarzo and Duffie (1991) and Breeden and Viswanathan (1998)]. Though narrower in scope, taxes can also provide an incentive to hedge. In this section, I review imperfections in the tax code

[47] In light of the large reduction in tax rates for some firms, it is surprising that (for tax reasons) some of these firms do not use more ISOs and fewer NQOs. One reason might be restrictions on the total amount of ISOs that can be granted in a given year.

that can lead to corporate hedging being beneficial and also explore how similar imperfections can provide an incentive to manage earnings.

6.1 Theory and empirical predictions

Smith and Stulz (1985) show that if the function that maps taxable income into tax liabilities is convex, a firm can reduce its expected tax liability by hedging to reduce income volatility. The tax function is generally convex because corporate income tax rates are progressive, though the degree of progressivity for positive income is small. The main form of progressivity occurs because profits are immediately taxed at a positive rate, while the tax reducing effect of losses is effectively spread through time via tax loss carrybacks and carryforwards and is only valuable in states in which the firm is profitable. Due to the time value of money, therefore, the tax function is convex because the present value tax benefit of $1 in losses is less than the tax cost of $1 in profits.[48] With a convex tax code, firms have incentive to use derivatives to shift taxable income from good to bad states to reduce volatility and expected tax liabilities.

Prediction 19. *All else being equal, the corporate incentive to hedge increases with the degree of tax schedule convexity.*

The second tax incentive to hedge involves increasing debt capacity by reducing income volatility. To the extent that increased debt capacity leads to greater debt usage, it also leads to greater tax benefits and firm value. Alternatively, increased debt capacity might go unexploited, thereby reducing expected bankruptcy costs [Smith and Stulz (1985)]. Ross (1997) and Leland (1998) argue that the former effect dominates and therefore that hedging increases firm value via the tax benefits of debt.

Prediction 20. *There is a tax incentive to hedge because it increases debt capacity. When firms use this extra debt capacity, the tax benefits of debt increase.*

Hedging with derivatives transfers income across states within a given time period. In contrast, earnings management is usually thought of as smoothing income through time. Like the hedging case, tax function convexity can provide an incentive to smooth income.[49] However, tax

[48] The logic is that the government effectively holds a call option on corporate tax liabilities and writes a put on corporate tax refunds, the net value of which can be reduced by reducing volatility. That is, present value considerations from delayed tax refunds reduce the value of the government's written put, so on net the governmental call option on tax collections is more valuable. Reducing volatility reduces the value of the call and the government's claim on corporate earnings.

[49] There are numerous nontax explanations for earnings management. Schipper's (1989) review notes that firms might manage earnings to reduce required returns by lowering earnings variance, to impress outside investors who value stock via earnings multiples, because executive compensation is tied to accounting numbers, and because insiders cannot credibly convey private information via other means.

incentives to smooth are more unidirectional: All else being equal, companies prefer to delay paying taxes due to the time value of money. Moreover, if tax rates are expected to fall, tax incentives to delay income are strengthened. The following prediction summarizes three conditions that can lead to a convexity-like incentive to smooth that works against the incentive to delay income recognition.

Prediction 21. *Unless one or more of the following conditions are met, there exists a tax incentive to delay recognition of taxable income*: (1) *the tax function is progressive,* (2) *net operating loss carryforward and other deductions are less than fully valued due to limitations on use and the time value of money, and/or* (3) *tax rates are expected to increase.*

6.2 Empirical evidence

Many empirical articles measure tax function convexity using variables based on the existence of NOL or tax credit carryforwards (Prediction 19). These articles regress corporate derivative usage on a proxy for convexity and several other right-hand-side variables and generally do not find evidence that convexity affects the corporate use of derivatives [e.g., Nance, Smith, and Smithson (1993) for Fortune 500 types of firms or Tufano (1996) for gold-mining firms). Rather than proxying for convexity, Graham and Smith (1999) explicitly map out tax functions and find that they are convex for about half of Compustat firms, and that the average among these firms could save approximately $125,000 in expected tax liabilities by reducing income volatility by 5%. Graham and Rogers (2001) compare this explicit measure of tax function convexity to derivatives usage for a broad cross section of firms and find no evidence that firms hedge in response to tax function convexity. In contrast, Dionne and Garand (2000) use regression coefficients from Graham and Smith (1999) to estimate convexity and find that hedging among gold-mining firms is positively related to estimated convexity.

Graham and Rogers (2001) use simultaneous equations to investigate the joint hedging/capital structure decision to determine whether firms hedge to increase debt capacity (Prediction 20). In one equation they regress derivatives usage on variables, including debt ratios, that explain corporate hedging and in the other equation they regress debt ratios on variables, including derivatives usage, that explain debt policy. Graham and Rogers find that hedging leads to greater debt usage. For the average firm, hedging with derivatives increases the debt ratio by 3% and adds tax shields equal to 1.1% of firm value.

Overall, the empirical evidence suggests that the tax incentive to hedge because of tax function convexity is weak at best. The statistical evidence is stronger so that the tax incentive to increase debt capacity leads to

greater hedging — though the economic importance of this effect appears to be only moderate.

In terms of earnings management, very little research directly investigates the conditions that can lead to a tax incentive to smooth earnings, particularly with respect to the three conditions in Prediction 21. Scholes, Wilson, and Wolfson (1992) find that firms delayed recognizing income in 1986 in anticipation of lower future tax rates. Barton (2001) regresses a measure of earnings management (i.e., discretionary accruals) on a crude convexity variable. Barton's measure of convexity is the excess of a firm's marginal tax rate over its average tax rate (i.e., tax expense divided by taxable income); a positive number indicates a progressive tax function. Barton finds that the absolute value of discretionary accruals is positively related to this measure of convexity, which he interprets as evidence of income smoothing in response to tax incentives. Similarly, using a NOL-based convexity variable, Pincus and Rajgopal (2002) find that profitable oil and gas firms use derivatives to smooth income in response to tax incentives. As with the corporate hedging evidence, tax incentives appear to be a second-order consideration rather than a dominant influence on earnings management.

7. Conclusion and Suggestions for Future Research

This article reviews research related to how taxes affect corporate activities. The research often finds that taxes affect corporate financial decisions — but the magnitude of the effect is not always large.

With respect to capital structure, there is cross-sectional regression evidence that high tax rate firms use debt more intensively than do low tax rate firms. There is also exchange offer evidence that indicates that debt tax benefits add to firm value. However, there is room for much additional research to improve our understanding of capital structure tax effects.

One gap is the lack of time-series evidence about whether firm-specific changes in tax status affect debt policy. Another important area for future research is to isolate the market value of the tax benefits of debt for the broad cross section of firms. Additional research is also needed to explain the apparently conservative debt policy of many firms. Such analysis might investigate whether nondebt tax shields substitute for interest deductions — and help solve the "underlevered puzzle." Two such nondebt tax shields include employee stock option deductions and accumulated foreign tax credits. Recent research indicates that the former help to (partially) explain apparent underleverage in some firms. Keep in mind, though, that nondebt tax shields should only matter to the extent that they affect the corporate MTR.

We have also only scratched the surface regarding tax-related leasing research. There is currently not much analysis of whether taxes affect the pricing and structure of lease (or other financial) contracts, analysis of whether leases and debt are substitutes for the lessee, or evidence about how lessor tax rates affect leasing. There is also little research into the effect of relative corporate and personal taxes on the aggregate demand and supply of debt. Finally, all of this research should emphasize robust statistical treatment of standard errors and the economic importance of tax effects, in light of Myers et al. (1998) statement that taxes are of third-order importance in the hierarchy of corporate decisions.

Though intriguing in theory, the profession has made only modest progress documenting whether investor taxes affect asset prices and in turn affect the costs and benefits of corporate policies. There is strong evidence that personal taxes drive a wedge between corporate and municipal bond yields. There is also plausible evidence that the personal tax penalty on MIPs interest income is only modest, which might imply that the personal tax penalty on debt is only modest (relative to using equity) — but this implication needs to be verified. Several articles assume that companies have clienteles of investors that have similar tax characteristics, and then link these companies' policies to the assumed investor tax rates; however, it would be helpful to make these linkages more direct. In general, we need more market evidence about the importance of personal taxes affecting asset prices, the effective equity tax rate for the marginal investors, and information related to the identity of the marginal investors between different securities. One level deeper, we also need evidence that corporate policies are altered in response to these investor tax influences on security prices. Some of this evidence will be hard to come by and might require access to confidential information or data from countries with unique data or institutional settings.

Progress has been made relating multinational tax considerations to corporate financing decisions, especially in terms of the use of debt by affiliated foreign entities when foreign tax rates are high. However, there is a need for research that highlights capital structure comparisons between classical and other tax systems and direct tests of multinational tax incentives, including the interaction of explanatory variables when appropriate (e.g., excess credit status interacted with interest allocation considerations). It would be helpful if excess (or deficit) credit tax position were measured more precisely than simply using current-period average tax rates.

Several studies link corporate payout policy to tax considerations. In particular, the ex-day stock return and volume evidence is consistent with investor tax considerations influencing asset markets; however, this evidence is somewhat ambiguous because several nontax explanations have been proposed that produce similar ex-day effects. The Green and Rydqvist (1999) study of Swedish lottery bonds stands out in terms of

presenting clean ex-day evidence documenting personal tax effects and serves as a model for future research that isolates tax effects. Unique insights into some payout issues might be provided by comparing payout policy in classical versus other tax systems. In addition, there currently is no convincing evidence that the interaction of investor tax characteristics and payout policy affect firm value and stock returns. Finally, there is a need for direct evidence that tax-based investor clienteles exist (i.e., that investors hold certain securities because of the investor's tax status and the form of payout)—because many of the payout hypotheses implicitly assume that such clienteles exist.

There is some recent evidence documenting tax motivated compensation payments (i.e., the choice between salary and options paid to nonexecutive employees), risk management (i.e., hedging to increase debt capacity and the tax benefits of debt), and earnings management. However, we need more "all parties, all deductions" research in these areas, as well as analysis of whether these forms of nondebt tax shields are substitutes for each other or for debt interest. We also need compensation studies based on firm- and employee-specific tax rates and the choice between ISO and NQO plans. Finally, to date there have been few direct tests of whether earnings management is related to progressive tax schedules, less than full valuation of accumulated NOLs and other deductions, and/or expectations of changes in future tax rates.

Some studies have documented that firms choose organizational form based on relative corporate and personal tax rates, that asset sales are structured in response to tax considerations, and that corporate bankruptcy and highly levered restructurings have tax implications. However, we need more evidence about the choice of corporate form using firm-specific data, evidence that firms choose ex ante to perform highly leveraged buyouts in response to tax incentives, and, in general, more evidence about tax incentives affecting corporate reorganizations, spin-offs, and other forms of restructuring.

Finally, while it is convenient for academic research to investigate these tax issues one by one, there is potential for large gains from investigating how these various policies and tax incentives interact from the perspective of a corporate financial manager or tax planner. Overall, there are numerous important areas in which careful research can contribute to our understanding of how the imperfections created by taxes affect corporate decisions and firm value.

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